UROP

Undergraduate Research Opportunities Program

Proceedings 2010-11

香港科技大學
THE HONG KONG
UNIVERSITY OF SCIENCE
AND TECHNOLOGY

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* Abstracts from each School are listed first by alphabetical order of Department name, and then by alphabetical order of Advisor's surname.

Summary of UROP Courses for HKUST Students

UROP 1000   Undergraduate Research Opportunities
(0 credit, offered in summer session only)

UROP 1100   Undergraduate Research Opportunities Series 1
(1 credit, offered throughout the year)

UROP 1200   Undergraduate Research Opportunities Series 2
(1 credit, offered throughout the year; prerequisite is pass in UROP1100, with approval by project advisor)

UROP 1300   Undergraduate Research Opportunities Series 3
(1 credit, offered throughout the year; prerequisite is pass in UROP1200, with approval by project advisor)

Message from the President

UROP is a signature program of our University. Its success is best measured by some very impressive figures. In the last academic year (2010-11), the total enrollment in UROP at various course levels was close to 300, with over 170 projects in different disciplines offered by 100 of our faculty members, who have taken additional responsibility of mentoring students in the research process. Since UROP was first launched in 2005, close to 20% of UROP participants decided to pursue further studies upon graduation, either in HKUST or other top universities around the world, and many of them were admitted directly into Ph.D. programs.

This Proceedings showcases the fruits of labor by our students in faculty-led UROP projects that lasted from one to three semesters. It demonstrates strongly our internationally regarded strength in academic research, and what undergraduates can achieve when they have the chance to work alongside top researchers. Through hands-on research and access to cutting-edge laboratory facilities, students gain learning opportunities that is normally open only to postgraduates. I highly recommend UROP to any academically ambitious student, and I encourage both faculty and students to explore this Proceedings to see how UROP can be a challenging and intellectually stimulating experience for you.

Tony F Chan
President
HKUST

UROP Overview 2010-11

Undergraduate Research Opportunities Program (UROP) is a Program that provides a unique opportunity for undergraduates to engage in academic research and help them develop a broad and insightful perspective of their areas of interest. It was first launched in 2005 and was offered in summer for students to immerse themselves in various tailor-made research projects. Over the years, UROP has been well received by both students and faculty, and enrolment has increased year after year.

Starting from the 2010-11 academic year, a new initiative was introduced in UROP, and students now have the option to participate in one or both streams – the **Tasting Stream**, with a 0-credit course offered in summer session (UROP1000), is suitable for those who have never participated in UROP before and would like to have a taste of research experience; the **Series Stream**, consists of three courses (UROP1100/1200/1300) with 1-credit each, is designed for students who are seriously committed to research after their initial experience in the Tasting Stream. In the 2010-11 academic year, there was a total enrollment of 295 in UROP, with 141 participated in the Tasting Stream and 154 in the Series Stream. The Program was supported by 100 faculty advisors offering 174 projects.

2011 Mr Armin and Mrs Lillian Kitchell Undergraduate Research Award

With the generous support from a donor, the **Mr Armin and Mrs Lillian Kitchell Undergraduate Research Award** was established in 2009 to honor the outstanding performance of UROP students and to encourage more student participation. Candidates for the Award were nominated by their UROP advisors, and finalists were invited to present their research to the UROP Advisory Board. Five award recipients were selected (1 Winner, 2 First Runner-Ups and 2 Second Runner-Ups) and they received the Award at the Presentation Ceremony held at HKUST on 5 May 2011.

School of
Science

Construction of an Odorant Receptor to be Ectopically Expressed in Transgenic Animals

Advisor : CHOW King Lau / LIFS
Student : KE Ying / BIOL
(UROP1000, Summer 2011)

Caenorhabditis elegans (C. elegans) is a transparent nematode living in soil of temperate environment. It normally feeds on bacteria developed on decaying matter. There are two sexes in the species: males and hermaphrodite which can be self-inseminated and lay eggs. Previous study shows that males of both *C. elegans* and *C. remanei*, can be attracted by sex pheromone produced by female *C. remanei*. There are two sets of neurons related to this behavior in *C. elegans*: AWA neuron – a sensory neuron located at lateral ganglia of the head of both males and hermaphrodites; and CEM neuron – a sex specific neuron which is present only in males.

The objective of the project is to test whether the CEM neurons are chemosensitive. In order to achieve the objective, a plasmid was constructed to induce the expression of *odr-10* (a gene which encodes the diacetyl receptor expressed normally only in AWA neuron) in CEM neuron, and give it the ability of sensing diacetyl. The newly constructed plasmid is then injected into the gonads of hermaphrodites of *daf-6, him-5 mutant C. elegans*. Since only the CEM neurons of the transgenic *daf-6, him-5 C. elegans* could sense the diacetyl and be activated, if the diacetyl assays shows that the transgenic animals are attracted by the diacetyl, it could be concluded that CEM neurons can function as a chemosensory neuron.

The Isolation of Genetic Loci Encoding Negative Regulators Antagonizing Bone Morphogenetic Protein Signaling Pathway via a Suppressor Screen with sma-6 Mutants

Advisor : CHOW King Lau / LIFS
Student : XUE Bai / BIOL
(UROP1000, Summer 2011)

Caenorhabditis elegans (C. elegans) is often chosen as a model genetic organism, chiefly for their hermaphroditic reproductive mode and rapid generation time, making it suitable for the isolation and characterization of genetic mutants. In this project, a specific strain of *sma-6* (CB1482 *sma-6(e1482)* II) was used, because it is related with TGF-beta pathway, in which *sma-6* allelel encodes a mild loss-of-function serine / threonine protein kinase that is orthologous to type I TGF-beta receptors. Mutant animals have a mild reduction of body length. The objective of this project is to isolate any mutant after EMS (ethyl methane sulfonate), mutagenesis, especially the ones with change in body length phenotype. EMS is a mutagen that produces random mutations in the genome by nucleotide substitution. We target specifically for mutants that have alteration of body length in this genetic background to isolate potential enhancer mutations and preferably suppressor mutations. Those mutants may act in the same genetic pathway as facilitator or antagonist molecules.

After a month of screening, some putative mutants with extended body length were isolated. On the basis of a change of body length, the next phase is to map the gene by genetic linkage and molecular mapping procedures. We hope to confirm the exact location of the mutation on specific chromosome and eventually elucidate its molecular identity to understand how the TGF beta pathway is being modulated.

Mechanosensitive Ion Channels in Human Embryonic and Induced Pluripotent Stem Cells

Advisor : HUANG Pingbo / LIFS
Student : LIN Qiaojin / BIOL
(UROP1100, Spring 2011)

This project mainly focuses on investigating mechanosensitivity of ion channels by applying patch-clamp technique. Mechanosensitivity has been found in mechanosensitive ion channels, which can be stimulated by touch, hearing and balance. Scientific research suggests these channels play important roles in osmotic homeostasis and cardiovascular regulation.

During the process, I gained lab skills in handling mammalian cells, and I had an opportunity to have a taste in doing scientific research. In the next phase, I will continue with the patch clamp experiment on T84 cells, with an aim to record steadier channel activity.

Mechanosensitive Ion Channels in Human Embryonic and Induced Pluripotent Stem Cells

Advisor : HUANG Pingbo / LIFS
Student : LIN Qiaojin / BIOL
(UROP1200, Summer 2011)

This is the second semester for me to participate in this project, and I have learnt much more in research techniques. I have been mainly working with T84 cell line, which is an excellent model system for studying electrolyte transport processes and their regulation by peptide hormones and neurotransmitters. Another part of my project is the cloning of shRNA, which is a small fragment of RNA that makes a tight hairpin shape, and it shows the ability to silence gene expression applying RNA interference mechanism. I am planning to continue in this project in the Fall semester, and I look forward to getting hands-on practice on Ussing chamber, and to further develop my molecular cloning technique.

The Effect of Adhesion on Cell Polarization and Cloning of shRNA

Advisor : HUANG Pingbo / LIFS
Student : MOK Ka Yi / MBMS
(UROP1000, Summer 2011)

Several studies have been done on investigating the effect of adhesion on cell polarization. Inverted culture on dissociated mouse hippocampal neurons was proven to have improved neuronal culture condition. Hippocampal neurons undergo polarization and forms dendritic spines in inverted culture. Nowadays, shRNA was commonly used to knockdown the target gene, and it is an effective and stable system to investigate the loss of function of the target gene.

This project consists of two parts. In Part A, the mechanosensitive response of 293T cell line and Calu-3 cell line other than neuron cell are investigated. In Part B, cloning of shRNA is done to knockdown the tumor suppressor gene.

Die-off Rate of Sewage-associated Bacteria in the Marine Environment of Hong Kong

Advisor : LAU Stanley C K / LIFS
Student : TAI Man Yi / BIOL
(UROP1100, Spring 2011)

The quality of recreational seawater depends on the number of pathogenic bacteria present. The chances that beach goers contract gastrointestianl diseases are directly proportional to the amount pathpgenic bacteria present in seawater. Sewage effluents are an imporat source of pathogenic bacteria. This project aims to find out the relationship between spatial and seasonal factors and the die-off rate of sewage-associated bacteria, and to suggest ways to modify the monitoring method of seawater in Hong Kong.

Decay Rate of Sewage-associated Bacteria in the Marine Environment of Hong Kong

Advisor : LAU Stanley C K / LIFS
Student : WONG Klaine / BIOL
(UROP1100, Spring 2011)

Enterococci is used as an indicator of seawater quality in many countries such as the US and Singapore. On the contrary, Hong Kong relies on *Escherichia coli*. This project investigated the die-off rates of enterococci in the marine environment of Hong Kong. The aim was to evaluate if enterococci would be a suitable pollution indicator for the marine environment of Hong Kong.

Water Quality Survey for Hong Kong's Marine Fish Farming Zone

Advisor : LIU Hongbin / LIFS
Co-Advisor : SHEK Lok Lun / LIFS
Students : CHANG Pin-yu / BICH
(UROP1000, Summer 2011)
IP Ka Yan / BIOL
(UROP1000, Summer 2011)
LI Nick / BIOL
(UROP1100 & 1200, Fall 2010 & Spring 2011)
WONG Man Sze / BICH
(UROP1100, Fall 2010)

Fish provides a high quality protein diet, and fish farming has been one of the fastest growing sectors among the world's food production industry. However, due to serious overfishing, the demand for fish from fish farming becomes larger and larger. Keeping fish farming as a sustainable resource is one of the most critical issues faced by the world today. The fishery industry contributes significantly to Hong Kong's economy. A pertinent part of this development requires that one must be aware of the changes in the water quality. Therefore, monitoring water quality is extremely important. The main purpose of this project is to measure the water quality in Hong Kong waters and especially in the fish farming location. Monthly survey is done to obtain samples from different fish farming zones to monitor the water quality in each location and to observe spatial and temporal variability. This project is conducted in association with AFCD (Agriculture, Fisheries and Conservation Department).

In-depth Characterization of Novel Cell Cycle Regulators in Cancer Cells

Advisor : POON Randy Y C / LIFS
Student : LI Zhuo / MBMS
(UROP1000, Summer 2011)

Polo-like kinase 1 (PLK 1) is essential for checkpoint recovery and activation of key mitotic enzymes; however, its own activation mechanism has remained elusive. Recent findings show that Bora, a G2-M expressed protein, facilitates PLK1 activation by the oncogenic kinase Aurora A in G2. During mitosis, PLK 1- and β-TrCP-dependent Bora degradation promotes Aurora A localization to the centrosome and/or spindle.

This project aims to study the role of Bora and its associated proteins (e.g. Aurora A, PLK) in cell cycle control, more specifically, miototic exit. We are particularly interested in elucidating in the potential role and consequence of Bora phosphorylation by Aurora A. Bora expression throughout the cell cycle is first examined, and the effect on siBora treated htTA1 cells in the presence of hydroxyurea, RO3306 and nocodazole is also tested. Three clones of GST-Aurora A (C2260), GST-PLK1 (C2261) and F3C-PLK1 (C2262) are constructed, and GST-fused proteins are purified for *in vitro* kinase assay. A clone of Bora silent mutation is currently being constructed to establish a stable cell line for later rescue experiments.

Characterization of Novel Cell Cycle Regulators in Cancer Cells

Advisor : POON Randy Y C / LIFS
Student : ZHANG Junyi / MBMS
(UROP1000, Summer 2011)

Protein kinases, by phosphorylating their specific substrates, could facilitate a wide range of cellular process, such as phosphorylation-mediated enzyme activation/deactivation, cellular signal transduction, etc. Mitosis, on the other hand, involves a profound series of changes in cells that can lead to duplication of entire chromosomal DNA and eventually double in cell numbers. Under physiological condition, lots of changes during cell cycle are associated with protein kinase networks or kinome. Preliminary genome wide screening in mouse model shows that knocking down certain kinases may have lengthened mitosis. To further confirm whether human homolog can have similar effects, knockdown experiments via siRNAs are done in different mammalian cell lines.

Standardization of Traditional Chinese Medicine, Clematidis Radix et Rhizoma (Wei Ling Xian) and the Construction of the Proposal of Toxic Chinese Medicine

Advisor : TSIM Karl W K / LIFS
Student : KWAN Chung Tang / BICH
(UROP1000, Summer 2011)

This project focuses on a Chinese herb, *Clematis chinensis* Osbeck in the family of Ranunculaceae, known as Clematidis Radix et Rhizoma (威靈仙). The root and the rhizome of *Clematis chinensis* Osbeck were dried and used as medicinal material. In traditional Chinese medicine theory, Clematidis Radix et Rhizoma has the functions of dispelling wind and dampness, restoring menstrual flow and relieving pain. The objective of this project is to use different methods to standardize Clematidis Radix et Rhizoma. By using Thin Layer Chromatography (TLC) and High Performance Liquid Chromatography (HPLC) for quantitative and qualitative analysis, we can know more about the characteristics of the Chinese medicine. Another scope of my work in this project is to take part in constructing the proposal of toxic Chinese medicine.

Standardization of Traditional Chinese Medicines

Advisor : TSIM Karl W K / LIFS
Student : LEUNG Wing Tung / BICH
(UROP1000, Summer 2011)

Aflatoxin, a kind of fungus poison called mycotoxin, is a toxic secondary metabolite of fungus, and usually exists as molds. There are several types of aflatoxin, and the most common ones are AFB1, AFB2 (emits blue florescence under UV) and AFG1, AFG2 (emits green florescence under UV). Aflatoxin is usually associated with food such as nuts, dairy products, spices, and Chinese medicines under improper conditions such as high humidity. As Chinese medicines are getting popular in modern medical era, it is important to ensure the safety of Chinese medicine consumption. In this project, a Chinese herbal product, Juan Bai (Selaginellae Herba), is tested for the presence of aflatoxin by using High Performance Liquid Chromatography (HPLC).

Standardization of Traditional Chinese Medicines (Wei Ling Xian)

Advisor : TSIM Karl W K / LIFS
Student : LIU Yuen Hang / MBMS
(UROP1000, Summer 2011)

Different sets of experiment were conducted in the laboratory, with different standardization methods of Traditional Chinese Medicine (TCM). During the project period, I was trained with various types of column chromatography, thin layer chromatography (TLC), high performance liquid chromatography (HPLC) to extract and determine ash and chemical compounds of the studied herb. The major focus of this project is the isolation and determination of chemical compounds in Wei Ling Xian (Clematidis Radix et Rhizoma, 威靈仙) for further study in drug development.

Construction of a $P2Y_1$ Since Site Mutant (ΔCys^{42}) for the Mechanism Study of $P2Y_1$ Homo-dimerization in HEK293 Cell

Advisor : TSIM Karl W K / LIFS
Student : WONG Man Sze / BICH
(UROP1100, Summer 2011)

The purinergic receptors P2Y play critical roles in fine-tuning the neural transmission by regulating the postsynaptic cellular signaling. In the human brain, the subtype $P2Y_1$ receptor is the most widely expressed form. A few years ago, our group discovered the homodimer of $P2Y_1$ receptor in HEK293T cells. However, the dimerization mechanism and the cellular signaling regulation remained unclear. From literature review and our preliminary results, we proposed that the Cysteine-Cysteine disulfide bridges should be involved in the mechanism of $P2Y_1$ dimerization. Owing to this, a single site mutant (ΔCys^{42}) of human $P2Y_1$ receptor is constructed, from which it serves as a probe for future study of the functional role and mechanism of $P2Y_1$ receptor dimerization.

A New Way for Characterization of Chinese Medicine

Advisor : TSIM Karl W K / LIFS
Student : YAU Ka Ho / CHEM
(UROP1100, Fall 2010)

Health keeping is more than the absence of diseases. The philosophy of traditional Chinese Medicine has its unique capacity of harmonization and enhancement. Chinese medicine is an ancient system of health care that underwent continuous development over centuries, as the causes of illness afflicting mankind evolved over the same period. In order to understand the guiding principles behind Chinese medicine, characterization of their chemical components become increasingly important. In this project, the first part focused on the properties of Chinese medicine, such as quality and purity. Hence determinations of ash and water extractives were done. The second part of the project focused on the determination of organochlorine pesticides. Different analytical methods such as GC-ECD, GPC and SPE were used to determine the organochlorine pesticides in the studied samples of Chinese medicines.

Mapping the Interaction Domains and Interaction Partners of MCM10 in Pre-replication Complex Assembly

Advisor   : TYE Bik Kwoon YEUNG / LIFS
Co-Advisor   : LIANG Chun / LIFS
Student   : ZHU Lin / BICH
(UROP1000, Summer 2011)

In every cell division, each cell must replicate its genome and pass it to its daughter cells. Generally, the replication of the genome can be divided into two stages. The first stage is known as replication licensing, a multi-protein complex is loaded onto specific sites in the genome to form the pre-replication complex (pre-RC). The second stage begins after the loading of pre-RC in G_1, when two protein kinases, CDK and DDK, phosphorylate components of the pre-RC to activate the pre-RC. Of the many proteins assembled in pre-RC, MCM10 plays a critical role in coordinating this transition, and it is the focus of this project.

Study of Blood Cell Development using Zebrafish Model

Advisor : WEN Zilong / LIFS
Student : LIAO Yingyue / BICH
(UROP1100 & 1200, Spring 2011 & Summer 2011)

Microglia is a type of blood cell existing in the brain and spinal cord and serves the function as macrophages. Microglia is important because it scavenge damaged or dead cells and infectious agents, and therefore acts as the primary immune defense in the central nervous system. Despite its critical role, much of the background of Microglia is still unknown.

Zebrafish is often used as a powerful system for developmental study such as Microglia, and Zebrafish plays a rather essential role in scientific research as a vertebrate model organism. In this project, Zebrafish is used as a model to investigate the effect of Microglia dysfunction in the brains of mutant fish.

Study of Blood Cell Development using Zebrafish Model

Advisor : WEN Zilong / LIFS
Student : LU Wei / BICH
(UROP1100 & 1200, Spring 2011 & Summer 2011)

Zebrafish has proven to be an excellent model organism to study blood cell development, as its blood system shares many similarities with mammalian models and humans. In this project, Zebrafish is used for studying inflammatory response and immunity. There have been several transgenic strains of Zebrafish which mark neutrophils and macrophages respectively with fluorescence, enabling direct visualization of these cells in the transparent Zebrafish embryos or larvae. Thus, detailed analysis can be performed to study their cellular behavior and interactions in the immune response cause by injury or infection.

G Proteins and their Regulators in Cancer Biology

Advisor : WONG Yung Hou / LIFS
Student : CHAK Wing Po / BICH
(UROP1000, Summer 2011)

Guanine nucleotide-binding proteins (G proteins) are GTPases serving as signal transmitters. Cancer can be regarded as uncontrolled cell growth with enhanced cell proliferation and reduced apoptosis caused by changes in cellular signaling pathways. G protein signaling, intricately associated with cell survival and proliferation, has been found to be involved in cancerous tissues and their activation in metastatic sites. Several studies also found the contribution of altered expression and activity of G proteins in tumorigenesis. Undoubtedly, G protein signaling plays an important role in cancer biology.

G Proteins and their Regulators in Cancer Biology

Advisor : WONG Yung Hou / LIFS
Student : CHAN Sin Man / BICH
(UROP1000, Summer 2011)

Fragile Histidine Triad gene (FHIT) is a tumor suppressor gene. It is located in the human chromosome 3p14.2 and it encompasses the most active common fragile site FRA3B. It is believe that this gene is altered in cancer simply because of the fragility of this active site. The protein product of FHIT is a member of a family of protein that binds nucleotide and catalyzes the corresponding hydrolysis. The residue His96 of FHIT is essential for it hydrolytic activity and it has been reported that the hydrolytic activity of FHIT is lost when the His96 is replaced by Asn. However, this enzymatically inactive mutant is still capable of inducing caspase-dependent apoptosis in cancer cells. This finding suggests that they hydrolytic function of FHIT is not necessary for its tumor-suppressive function, but the binding of substrate AP_3A is essential.

Space Orbit Design

Advisor   : *CHAN Kwing Lam / MATH*
Co-Advisor   : *WONG Michael K Y / PHYS*
Student   : *DY Chun Yin / MATH-AM*
                     (UROP1000, Summer 2011)

This paper includes some basic knowledge about planetary motion of an object, how an object in space can be transferred from one orbit to another, and it also provide some ideas on things to be considered in designing the orbit and how to obtain a better orbit.

What does Chang'E Data Tell Us? Lunar Study based on Data obtained by The Chang'E Spacecraft

Advisor   : *CHAN Kwing Lam / MATH*
Co-Advisor   : *CHENG Siu Wing / CSE*
Student   : *GAO Jinghan / MAEC*
                     (UROP1100, Summer 2011)

This project uses the laser altimeter data obtained from the Chang'E 1 to study the distribution and nature of impact craters on the moon. We study the lunar craters mainly for their important implications on the early evolution of the moon. Our first target is to develop a whole moon crater map using the data obtained from Chang'E 1, through data insertion, image description and highlighting.

A Report on Study of Lunar Craters

Advisor   : *CHAN Kwing Lam / MATH*
Co-Advisor   : *CHENG Siu Wing / CSE*
Student   : *LUO Siyi / MAEC*
                     (UROP1100, Summer 2011)

Chang'E 1 was China's first lunar probe launched on October 4, 2007. One month after its launch, Chang'E 1 sent information on the moon's surface back to earth. The purpose of this project is to make use of the laser altimeter data to study the moon craters. The goal is to visualize the landscape around several craters by means of Visual Basic and MATLAB programming, so as to recognize and study the pattern of the moon craters.

Space Orbit Design

Advisor   : CHAN Kwing Lam / MATH
Co-Advisor   : WONG Michael K Y / PHYS
Student   : SHIU Fu Hong / PHYS-PP
                             (UROP1000, Summer 2011)

Mars is the closest external planet from Earth, and therefore, launching a spacecraft to Mars has been an important mission for many countries. However, the orbit of Mars is different from that of Earth very much, so choosing the mechanics model, designing the orbit, and guiding the spacecraft are major problems to be resolved. Using Heliocentric Ecliptic Inertial Reference Frame, treating the spacecraft, planets, and asteroids as point masses, and based on the initial conditions provided, an elementary orbit is designed for a lander, which is carried by the spacecraft initially, travelling from Earth to Mars. The launching time and landing time are restricted.

Space Orbit Design

Advisor   : CHAN Kwing Lam / MATH
Co-Advisor   : WONG Michael K Y / PHYS
Student   : WONG King Yin Christian / PHYS-PM
                             (UROP1000, Summer 2011)

This paper is related to the design of space orbits, under the conditions given by the second competition of space orbit design launched by the Chinese Society of Theoretical and Applied Mechanics. Approaches of designing an orbit of a spacecraft from Earth to Mars are discussed.

A Preliminary Study of Space Orbit Physics and Its Design

Advisor   : CHAN Kwing Lam / MATH
Co-Advisor   : WONG Michael K Y / PHYS
Student   : ZHAI Xiaomeng / MECH
                             (UROP1100, Summer 2011)

The fundamental physics governing space orbits is reviewed, and preliminary transfer orbits connecting celestial bodies are studied in this project. The study reveals relationships between orbit geometry and orbit performance, such as transfer time and fuel consumption. Based on these findings, I have gained some insights into how an optimized overall mission orbit should be designed. The discoveries are summarized and certain directions for future endeavor are proposed.

Report on Lunar Crater Project

> *Advisor   : CHAN Kwing Lam / MATH*
> *Co-Advisor   : CHENG Siu Wing / CSE*
> *Student   : ZHOU Rongrong / MAEC*
> *(UROP1100, Summer 2011)*

The ultimate target of our project is to identify and categorize the crater patterns on the moon with two sets of data: altimeter readings and photographic images. The goal is to complete the downloading of the 11-month CE data, test the data accuracy with principal crater plotting and preliminary processing. In this project, I am responsible for the study of three craters, namely, Copernicus, Sklodowska and Coriolis.

The Evolution of Recombination

> *Advisor : CHASNOV Jeffrey R / MATH*
> *Student : YE Xiaofeng / MATH-AM*
> *(UROP1100, Spring 2011)*

Selection is assumed to happen as a haploid and the genome contains $L + 1$ diallelic loci, with L fitness loci and one recombination modifier locus. It is also assumed that the modifier gene has no impact on fitness, but changes the recombination rates of the fitness loci. In general, the modifier gene doesn't need to be near the fitness loci so the recombination rate between the modifier locus and the fitness loci is assumed to be a constant R. The alleles on the modifier locus are denoted by A and a. When both haplotypes have allele a, the recombination rate between the fitness loci is $r = r_1$. If only one of the haplotypes has allele A, the rate is $r = r_2$, and if both haplotypes have allele A, the rate is $r = r_3$. The case of two fitness loci under the Levene model for frequency-dependent selection is illustrated in this project.

Efficient Numerical Methods for Dynamic Interface

> *Advisor : LEUNG Shing Yu / MATH*
> *Student : HON Yu Sing / MATH-MP & PHYS-PM*
> *(UROP1100, Fall 2010)*

We propose new algorithms for modeling interface motions. The idea is to develop a new cell-based representation of the interface based on the "grid-based particle method for moving interface problems" co-developed by Dr. Shingyu Leung. The algorithm composes of three parts: initialization, motion and resampling. This part of the project concentrates on the first step in which we propose a new interface representation. The interface is represented and is tracked using numerous particles. These sampling particles are sampled based on cells close to them, i.e. each particle is associated to a cell near the interface. Local information including Interface velocity, arclength-element of the surface and other Lagrangian information on the interface can be found naturally, while integrals on the surface can now be approximated easily by summing up all contributions from each small segments of the interface.

Efficient Numerical Methods for Dynamic Interface

Advisor : LEUNG Shing Yu / MATH
Student : HON Yu Sing / MATH-MP & PHYS-PM
(UROP1200, Spring 2011)

This is a continuation of the previous project. We have made progress in the modified algorithm for tracking a dynamic interface. In this part of the project, we have added dynamics to the interface represented by the cell-based representation. In particular, progress has been made on modeling motions of a circular interface under a translational motion and also the motion in the normal direction.

Efficient Numerical Methods for Dynamic Interface

Advisor : LEUNG Shing Yu / MATH
Student : LAM Yat Hei / PHYS
(UROP1000, Summer 2011)

This project aims at exploring new numerical methods to compute the arclength of a curve in 2D and the surface area of an interface in 3D. We code in Visual C++ to develop flexible numerical approaches to find the arclength and surface areas of various simple objects including circle, square and ellipsoid.

Efficient Numerical Methods for Dynamic Interface

Advisor : LEUNG Shing Yu / MATH
Student : TSANG Chun Kong / MATH
(UROP1100, Fall 2010)

Modeling of an interface evolution is an important aspect in many fields in science and engineering, including multi-phase flow simulation, crystal growth simulation, and surface regularization in image processing. This project we develop and/or apply new numerical method to efficiently model interface motion.

Efficient Numerical Methods for Dynamic Interface

Advisor : LEUNG Shing Yu / MATH
Student : XU Weixiang / MAEC
        (UROP1100, Spring 2011)

This project aims to develop and/or apply new numerical method to efficiently model interface motion, and it provides a possible way to segment an object from its background in a digital image. The idea is to develop a semi-implicit scheme to minimize the popular Geodesic Active Contour (GAC) functional for image segmentation using the method of gradient descent. The resulting numerical approach can relax the typical stability condition for solving the PDE from dt=O(dx^2) to dt=O(dx).

Combinatorial Identities, Congruences and Computer Programming

Advisor   : XIONG Maosheng / MATH
Co-Advisor : LI Kin Yin / MATH
Students   : GAO Honghao / MATH-PMA
        (UROP1000, Summer 2011)
        LEE Ching Cheong / MATH-PM
        (UROP1000, Summer 2011)
        LING Wodan / MAEC
        (UROP1000, Summer 2011)
        SHI Nan / MATH-PMA
        (UROP1000, Summer 2011)
        WU Nan / MATH
        (UROP1000, Summer 2011)
        XU Minjie / MAEC
        (UROP1000, Summer 2011)

Congruence is an interesting topic in number theory, which usually involves modulo prime numbers, and supercongruence refers to congruence modulo higher prime powers. There are many such kinds of mysterious and elegant supercongruence results conjectured by intellectuals such as Rodriguez-Villegas, Beukers, van Hamme, etc. Recently, Zhi Wei Sun proved a number of new supercongruence results, and the focus of this project is to apply elementary theories on hyper-geometric series to verify and simplify some of the proofs, and to provide a starting point in obtaining more supercongruence results.

Minimum Size of Union

Advisor : YAN Min / MATH
Students : OU Yuanzhong / MAEC
(UROP1000, Summer 2011)
WANG Boli / ECOF
(UROP1000, Summer 2011)

During the research for an algebraic project, a related and interesting problem, namely, the "Minimum Size of Union" has been discovered and further analyzed. Given finite sets A_1, $A_2,..., A_n$ with respective numbers $a_1, a_2,..., a_n$ of elements, the union $A_1 \cup A_2 \cup ... \cup A_n$ can have as many as $a_1+a_2+...+a_n$ elements as few as max $\{a_1, a_2,..., a_n\}$ elements. The maximum is realized when the sets are pairwise disjoint. When the minimum is realized, chances are there are many nonempty intersections among the sets. In this project, we fix $k \leq n$ and study the bound on the size of the union under the additional assumption that the intersection of any k sets is empty. For $k = 2$, this is the trivial pairwise disjoint case. In a simplier version of the problem, the sets Ai are Lebesgue measurable subsets and the size of the subsets is the Lebesgue measure. The problem is simpler because any non-negative number is allowed to be the size, not just the non-negative integers.

Near-Field Scanning Optical Microscope

Advisor : DU Shengwang / PHYS
Student : HONG Lijia / PHYS-PM
(UROP1000, Summer 2011)

In this project, we have designed and fully developed a wide band integral phase-frequency locking controller for external cavity diode lasers at 780 nm and obtained a narrow laser line width below 1 MHz. Meanwhile, we also developed a Labview software for the near-field scanning optical microscope to control piezoelectric stage's motion and detect photoluminescence from ZnO nano wires.

405nm Laser System

Advisor : DU Shengwang / PHYS
Student : XU Huansu / PHYS-PM
(UROP1100, Summer 2011)

Laser diode has been playing an increasingly important role since the last two decades. It could be used in projectors, telecommunication, medical diagnostics as well as other electronic equipment. In this UROP project, I designed and developed a "low cost" narrow line width laser diode system at 405nm. I have learned the working principle of laser diode, grating, as well as current control and temperature control. Also, I have mastered the techniques of assembling apparatus, soldering electronic devices, setting up the system as well as designing experiments to modify the performance of the system. Most importantly, I have learned to know the essence of research and a good habit as an experimental physicist.

Quantum State Calculation of Two-dimensional Supramolecular Nanostructures

Advisor : LIN Nian / PHYS
Students : CUI Hang / PHYS
(UROP1000, Summer 2011)
YANG Ji / PHYS-PM & COMP
(UROP1000, Summer 2011)

When a periodic potential is imposed at the surface, it will modify the surface electron dispersion, and an energy gap will appear at the zone boundaries. Scanning tunneling microscopy can detect this phenomenon by measuring local density of states. Alternatively, a suitable MATLAB program can simulate this physical system by numerically solving the 2D Schrödinger equation. Hence, a practical solution would be designing a MATLAB program for the two dimensional hexagonal structure potential well. However, discrepancy occurs between the simulation results and the experimental datum in some cases. In this project, we first use different approaches to modify the MATLAB program and test it in one dimensional case, and then compare the results with existing simulations. We have verified the validity of the algorithm.

Organic Molecular Beam Deposition in Ultra-high Vacuum

Advisor   : *LIN Nian / PHYS*
Co-Advisor   : *TANG Benzhong / CHEM*
Students   : *HAO Xiaotian / PHYS-PP*
                        (UROP1100, Summer 2011)
                        MITSUI Atsushi / PHYS-PM
                        (UROP1000, Summer 2011)

Organic Molecular Beam Deposition is a widely used technique in preparing organic thin films. This project aims at investigating the thermal properties of various organic molecules by means of organic molecular beam deposition. A crucible is used to contain different molecules and then put in the Organic Molecular Beam Epitaxy (OMBE). A target is also placed in front of the crucible so that molecules should be found after evaporation in Ultra-high Vacuum. Through UV-Spectrum analysis, the evaporation temperature of various molecules has been obtained.

Quantum State Calculation of Two-dimensional Supramolecular Nanostructures

Advisor   : *LIN Nian / PHYS*
Students   : *KWOK King Wai / PHYS & MATH*
                        (UROP1100, Fall 2010)
                        ZHOU Tong / PHYS
                        (UROP1100, Fall 2010)

Surface electron dispersion is modified when a periodic potential is imposed at the surface, showing an energy gap at the zone boundaries. Scanning tunneling microscopy can detect this phenomenon by measuring local density of states, while a MATLAB program can simulate this physical phenomenon by numerically solving the Schrödinger equation in a periodic potential well, and optimizing the model of the real case. The proposed model fitted well in the experimental data in some cases, but discrepancy between experimental data and predicted values of the model occurred in other cases. In this project, the model is tested in a simpler one-dimensional case.

Kinetic Monte Carlo Simulation of Supramolecular Assembly

Advisor : LIN Nian / PHYS
Student : WANG Yixin / MATH
(UROP1000, Summer 2011)

Thin films are technologically important in many different aspects. Their production usually proceeds through nucleation and growth stages, which involve absorption, surface diffusion, chemical binding and other atomic processes at surfaces. This project studies the molecular network growth and the multi-component molecular growth based on Monte Carlo simulation. A new time-efficient algorithm using conditional probabilities to select the sites at which events occur is also proposed.

Monte Carlo Simulation of 2D Supramolecular Assembly

Advisor : LIN Nian / PHYS
Student : WU Sisi / PHYS
(UROP1100, Summer 2011)

This project uses kinetic Monte Carlo simulation to simulate the time evolution of processes, including atomic thin film growth, molecular network growth and multi-component molecular growth. It is found that different combination of parameters exerts great effect on the size cluster distribution statistics of the counting and bounded molecules distribution. Moreover, there is a remarkable distinction between bounded molecules counting and island size.

Analyzing Noises in the Scanning Tunneling Microscope

Advisor : LIN Nian / PHYS
Student : XIAO Jinfeng / PHYS
(UROP1000, Summer 2011)
XU Wenhao / PHYS
(UROP1000, Summer 2011)

In this project, the Scanning Tunneling Microscope (STM) is used to study the properties of shot noise, whose intensity is supposed to be irrelevant to frequency. In order to obtain shot noise, at least three other noises need to be filtered out: "sudden" systematic noise from STM, 1/f noise, and the unexplainable "going-up noise". Our results show that "sudden" systematic noise is successfully separated from the signal, but further work needs to be done in terms of the accuracy of the estimation of 1/f noise and "going-up noise".

Channel Capacity and Topology in Communication Science

Advisor : SZETO Kwok Yip / PHYS
Student : WANG Shuanglong / PHYS
(UROP1100, Summer 2011)

My project for this summer focuses on the channel capacity of digital communication. After deriving some formula about the channel capacity of the channel system, a program is constructed, which is able to calculate the overall channel capacity of a given topology. Then, the twist band topology is analyzed using the program. Finally, basic ideas about the channel capacity of a given topology are constructed for the purpose of further research.

Algebraic Analysis and Stability Study on Simple Networks in the Form of Chains and Rings

Advisor : SZETO Kwok Yip / PHYS
Student : WANG Zitao / PHYS-PM
(UROP1100, Summer 2011)

In this project, the algebraic graph theory point of view is adopted to analyze the symmetry of the networks. In particular, the automorphism groups and eigenvalue spectra of the networks are computed. In addition, a numerical study on the stability of the networks is done to verify the various conclusions of R. M. May, thus extending the scope of his conclusion from random topology to fixed topology. We found that the stability of the chains and rings are dominated by the index of the individual systems.

Random Walk on Complex Network and Application to Numerical Simulation for Statistical Physics

Advisor : SZETO Kwok Yip / PHYS
Student : WU Degang / PHYS-PP
(UROP1100, Fall 2010)

Wang-Landau (WL) algorithm is an important improvement for the famous Metropolis algorithm, which is widely used as a numerical simulation algorithm for statistical physics. Despite the improvement, WL simulation can still be daunting, especially for large systems or high requirement for resolution. In this project, we demonstrated that it is possible to combine random walk and WL algorithm to produce WL algorithm with multiple walkers, which will be faster than the single walker WL algorithm, if the walkers are processed in parallel by different CPU cores.

Random Walk on Complex Network and Application to Numerical Simulation for Statistical Physics

Advisor : SZETO Kwok Yip / PHYS
Student : WU Degang / PHYS-PP
(UROP1200, Summer 2011)

Parrondo's paradox, also called Parrondo's game, refers to situation where two losing games can combine to form a winning game. Parrondo's game consists of game A and game, and the latter has a parameter M, which is often a fixed number. We extend the game by allowing M to be uncertain, i.e., M can be one of two possible values, according to a distribution. We found that the extended game has some interesting properties that are not present in the original game, and some of such properties are studied in this project.

Game Theory on Networks: Asymmetric Iterated Prisoner's Dilemma of Two Companies with Partial Imitation Rule

Advisor : SZETO Kwok Yip / PHYS
Student : ZHANG Liangsheng / PHYS-PP
(UROP1100, Fall 2010)

The asymmetric case of two companies Iterated Prisoner's Dilemma (PID) is characterized by three different payoff matrices under one-step memory partial imitation rule (pIR), on a fully connected network is studied through the replicate equiation approach. The generalization of replicate equations from one-company case is proven to be self-consistent and results drawn from them are compared with simluation results, whose agreement is acceptable. A stationary-point like phenomenon is observed and understood through replicate equiations, which leads to the approximate reduction of asymmetric case to the symmetric case, and further equivalent to one-company case. The approximation is acceptable and hence the phase phenomenon of asymmetric case case be predicted from symmetric case.

Magnetic Field Tuning of Luminescence Magnetic Particles

Advisor : WONG Kam Sing / PHYS
Student : NG Ka Long Gary / PHYS-PM
(UROP1000, Summer 2011)

In photophysics, there are radioactive and radiationless processes, and the focus of this project is on radioactive process. When an atom is excited by laser light, it will be excited to a high energy state. After a short period of time (typical to the order of nanosecond), it will return to a low energy state and emit light. This process is called photoluminescence (PL). The wavelength of the emitted light can be different from that of the excited light. Our experiment uses magnetic fluorescent silica nanoparticles (MFSNPs) which are superparamagnetic and contains iron, but the nanoparticles themselves do not emit light. The organic molecules attached to these nanoparticles are responsible for the light emission, and therefore, it is suspected that properties of MFSNPs depend on the applied magnetic field. In this experiment, we investigate the dependence of PL spectrum and time-resolved PL on the strength of magnetic field under room temperature and low temperature.

Wireless Sensor Networks

Advisor : WONG Michael K Y / PHYS
Student : LI Sai Lung / MATH & PHYS
(UROP1000, Summer 2011)

Wireless sensor networks are frequently used in our daily lives. For instance, they are used in detecting air pollution, forest fires and even the Greenhouse Effect. In order to prolong the lifespan of the entire system and maintain acceptable level of service, the energy supply should be minimized. The focus of this project is to explore methods that can minimize energy consumption of wireless senor networks under constraints.

Energy Optimization in Wireless Sensor Network

Advisor : WONG Michael K Y / PHYS
Student : YE Piao / APHYS-MS
(UROP1000, Summer 2011)

A sensor is a device that converts a physical quantity (such as heat, light, sound, pressure or magnetism) to a signal, and transmits the resulting impulse to upstream observers or controllers. The developing technology of designing and producing sensors and the increasing demand for using sensors in large-scale applications have made wireless sensor network a popular methodology in many industries. One major concern is that wireless sensor network is constrained by energy consumption in battery-powered nodes. Since most sensor networks are applied in remote, vast areas, they must have as long life span as possible. My work in this project involves designing a computer simulation program aimed at determining the optimal state of energy consumption in simple networks.

Manufacture of Photoic Crystals and their Spectrum

Advisor : YANG Zhi Yu / PHYS
Student : CHEN Junxin / PHYS
(UROP1100, Summer 2011)

Photonic crystal is a kind of crystal with some special photonic properties, and one of the most significant properties is the full gap of photonic band, which can increase the efficiency of instruments such as laser generator. The aim of this project is to explore possible ways to manufacture full gap photonic crystal. The samples made by exposing AgI solution with opals directly in the Xe-light, or tested with adding hydroquinone as redactor. However, no full gap or partial gap has yet been found. Another method is exposing AgI colloid in the Xe-light and dropping the remaining colloid on the opals is still being testing, and there have yet been a positive result. Further work will be continued in the next semester.

Fabrication and Characterization of Three Dimensional True Gap Photonic Crystals in the Visible Light Wavelength Range

Advisor : YANG Zhi Yu / PHYS
Student : LUO Yunqiu / PHYS-PP
(UROP1100, Fall 2010)

In this semester, main methods are explored for the fabrication of silica based true gap photonic crystals. After testing, it is found that the Stober method is the best way of synthesizing silica nanoparticles, and N-(2-Aminoethyl)-3-Aminopropyl Silanetriol (NAOS) is a good material for bonding silver with silica nanoparticles surface. More work will be done in controlling the size and amount of coated silver particles, and new methods will be explored and developed.

Photonic Crystals

Advisor : YANG Zhi Yu / PHYS
Student : LUO Yunqiu / PHYS-PP
(UROP1200, Spring 2011)

Following the work done in previous semester, I have made progress in the approach of silver nanoparticles coating, and the combination method of annealing and latent of image in photography. Although there have been some drawbacks in transmission spectra of the combination method, the satisfactory improvement in reflection spectra is quite promising. Therefore, we will continue to focus on this method with variation of different experimental parameters.

Photonic Crystals

Advisor : YANG Zhi Yu / PHYS
Student : LUO Yunqiu / PHYS-PP
(UROP1300, Summer 2011)

To conclude the work done on methods of silver coating on silica opals, althought the combination method of latent image in photography and homemade silver nanoparticles seems systematic and promising in design, it fail to demostrate good spectra result. Another method, the colloidal silver iodide annealing, is relatively simple and it shows the best improvement on the partial gap so far.
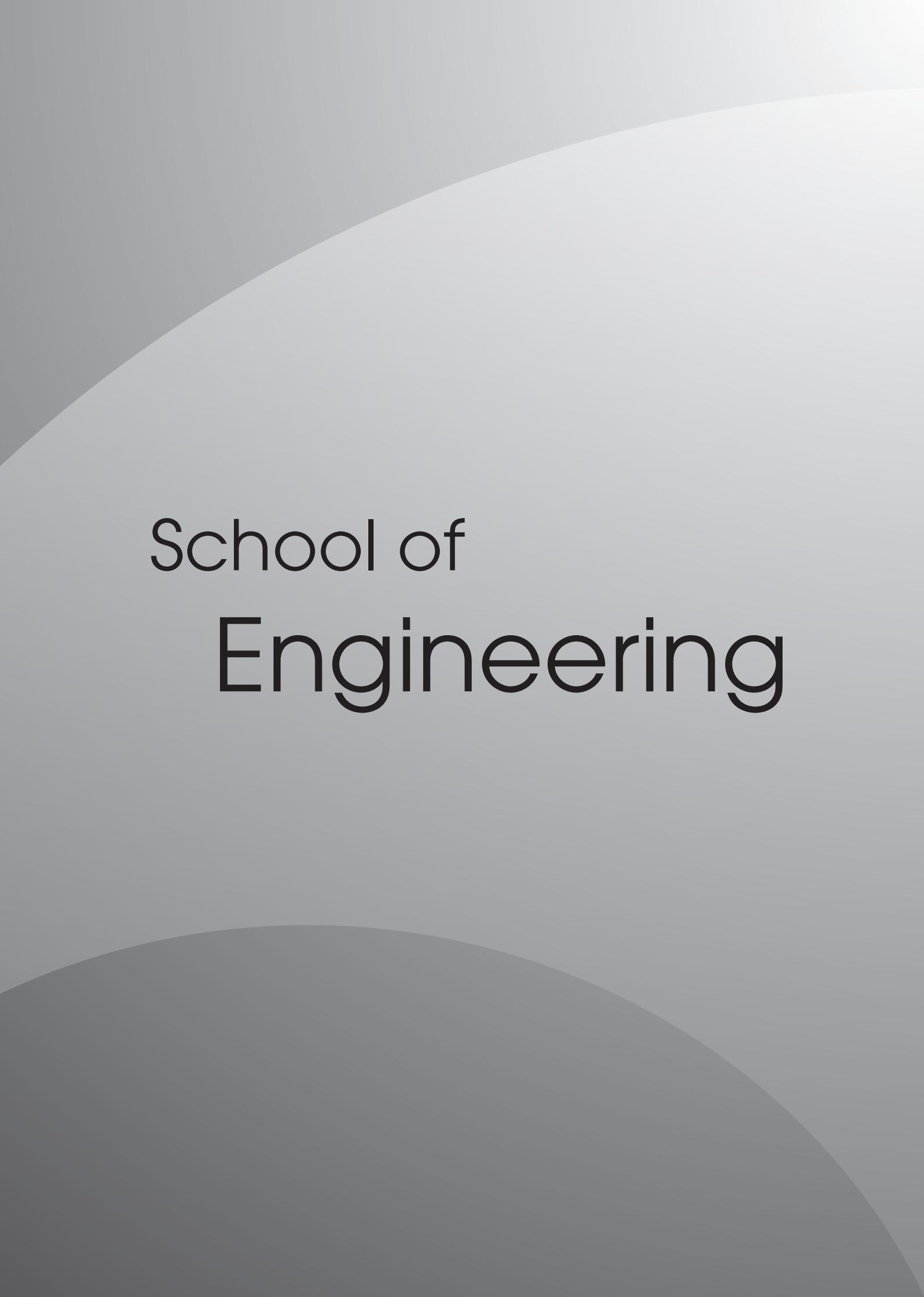
School of
Engineering

Self-assembling Peptide Hydrogel as Enzyme-sensitive Protein Release Depot

Advisor : CHAU Ying / CBME
Student : FENG Teng / CBPE
(UROP1100, Fall 2010)

Self-assembling peptides can form hydrogel under physiological conditions, and have promising potential and applications in tissue engineering and drug delivery. In recent decades, researchers have found and synthesized many different self-assembling peptides and characterized their structures. Some self-assembling peptides themselves are sensitive to specific enzymes, and some others can be degraded after modifications such as inserting an enzyme cleavable sequence. In this project, $(IEGR)_4$, a short peptide sequence, is tested to see if it can form hydrogel under physiological condition. The self-assembling and gelling capabilities of this peptide are studied by dynamical mechanical analysis and atomic force microscopy. Degree of enzyme degradation by Factor Xa is studied by high-pressure liquid chromatography.

Synthesis of Mesoporous Carbon as Anodes Materials for Lithium Ion Batteries

Advisor : CHEN Guohua / CBME
Student : XU Lang / CENG
(UROP1000, Summer 2011)

Mesoporous carbon serves as a good alternative to the anode material for lithium ion batteries. Ordered mesoporous carbon CMK-3 was synthesized using SBA-15 silica as the template and sucrose as the carbon precursor. Characterizations were done for the synthesized samples using nitrogen physisorption, XRD and TEM. The synthesized CMK-3 was assembled into coin cells and their performance was tested.

Techno-economic Analysis of Hydrogen Production

Advisor : LAM Koon Fung / CBME
Student : LEI Ho Man / CEEV
(UROP1000, Summer 2011)

Distributed hydrogen economy is a promising topic in the transport sector. However, as hydrogen can be produced from various materials by many different processes. This project focuses on analyzing the feasibility of distributed hydrogen production in the world, in terms of availability of raw materials, technology and microeconomics. Finally, the macroeconomic is then assessed on the global impact of distributed hydrogen production.

Techno-economic Analysis of Hydrogen Production from Natural Gas

Advisor : LAM Koon Fung / CBME
Student : LUK Ho Ting / CENG
(UROP1000, Summer 2011)

It is well established that hydrogen has the potential to make signification contributions to the world's energy production. However, there has been a wide lack of agreement on the nascent stage of using distributed production for hydrogen as fuel in the vehicles industry. This work aims to establish the best pathway of hydrogen production from natural gas by performing technological and economic analysis. Additional economic sensitivity analysis has also been constructed to evaluate the impact of variables such as natural gas feedstock price, capital of investment and operating capacity factor on the overall hydrogen production cost.

Techno-economic Analysis of Hydrogen Production from Biomass

Advisor : LAM Koon Fung / CBME
Student : NG Wai Yee / CENG
(UROP1000, Summer 2011)

This project aims at analyzing the feasibility of producing hydrogen at gas station from biomass. From the technical and economic analysis, it is suggested that biomass can be firstly converted into an intermediate chemical or mixture in liquid form, followed by transporting to the gas stations. Hydrogen is finally produced from the intermediate compounds on demand. It is found that bio-oil is the best intermediate chemical, from the feasibility, economic competitiveness and investment return perspectives.

Simulations of Separation Processes for Propylene Glycol-water Mixture

Advisor : LAM Koon Fung / CBME
Student : TSUI Tsz Cheung / CENG
(UROP1000, Summer 2011)

This project targets to design and optimize the separation of propylene glycol (PG) from PG-water mixture, and to find out an optimum method with the lowest total energy by computer simulation using ASPEN PLUS. Three methods, namely: Flash-drum, Reflux-distillation, and Hybrid-process are studied and simulated to determine the optimum method, with results in favor of the Hybrid-process method.

Pump Formulation for Nano-particles

Advisor   : YEUNG King Lun / CBME
Co-Advisor   : LUI Yat Chuen / CBME
Student   : FU Xiayi / CHEM
                    (UROP1000, Summer 2011)

Nano-particles is extensively studied in many fields, such as pharmacy and cosmetics. With properties such as prolonged and controlled release of actives, protection of unstable chemical, targeted drug delivery and odor shielding, the production of nano-particles is of increasing importance in modern industry. By using different coating polymers, nano-capsules with different sizes and properties can be prepared. In this project, nano-particles encapsulating chlorine dioxide (CIO_2) are prepared from preformed polymers; a water-in-oil-in-water (w/o/w) double emulsion with "release-killing" property is then formed. Copper sulfate is then added into the double emulsion mixture to obtain a "contact-killing" property. Active triblock copolymers of polyoxyethylene-polyoxypropylene (i.e. Pluronic P123 and F127) are used as coating materials in the forming of nano-particles, which prevents activated CIO_2 from degradation, allows prolonged and controlled release of CIO_2 and blocks the irritant odor at the same time.

Heavy Metal Adsorption from Seawater

Advisor   : YEUNG King Lun / CBME
Co-Advisor   : CHEN Xinqing / CBME
Student   : HE Naien / CBPE
                    (UROP1100, Spring 2011)

Both copper and chromium have been identified by the U.S. Environmental Protection Agency (EPA) as pollutants because of their toxic impact to the environment. In an effort to find a cheap and effective adsorbent, Zeolites, which has cage-like microporous structure with exchangeable counter cations, is found to be very effective. However, the amount of molecules that can be absorbed is limited by the pore diameter and the length of the diffusion path. As an alternative, Mesoporous silicates have larger pore volume and diameter, higher surface area and regular channel type structures. Another adjustment that can be done is to introduce amino group in mesoporous silicates. In this project, a series of experiments are conducted to verify the effectiveness of amino modified and metal grafted MCM-41 in seawater, along with the pH effect and adsorption isotherm, in order to find out the performance of adsorbent in real seawater environment.

Heavy Metal Adsorption from Seawater

> Advisor   : YEUNG King Lun / CBME
> Co-Advisor : CHEN Xinqing / CBME
> Student   : HE Naien / CBPE
>   (UROP1200, Summer 2011)

To continue my work from the previous semester, I prepare MCM-41 to be grafted using mono-, di- and tri-amino-organoalkoxysilanes with different loading. The amino-functionalized MCM-41 adsorb different loading of Fe^{3+}. All the modified MCM-41 have gone through XRD and EA in order to determine their structure and textural properties. Their performance is measured by the adsorption of Cu^{2+} and Cr^{6+}, both in simple solution and binary solution.

Heavy Metal Adsorption from Seawater

> Advisor   : YEUNG King Lun / CBME
> Co-Advisor : CHEN Xinqing / CBME
> Student   : HO Hanson / CENG
>   (UROP1000, Summer 2011)

The main focus of this summer's project is on the effectiveness of the adsorption of Cadmium (Cd) under different types of water, especially on seawater as it is often used in real-life applications for treatment of seawater. The isotherm study on the effectiveness of the adsorption power of Cadmium at pH 5 and the effectiveness of the adsorption power at different pH (2 to 5) are performed, both with the di-amino adsorbent (NN-MCM41). The samples are analyzed by the Inductively Coupled Plasma (ICP-AES).

Smart Antimicrobial Coating for Filter Media

> Advisor   : YEUNG King Lun / CBME
> Co-Advisor : LEUNG Hong Hang / CBME
> Student   : LAM Tsz Ying Gene / CBPE
>   (UROP1000, Summer 2011)

Since the epidemic outbreak of SARS in 2003 and the pandemic outbreak of Swine Flu in 2009, there has been an increasing awareness on the role of inhalation of fine particles, ranging from approximately 0.1 to 100 μm in disease transmission. It is important for intensive care providers to be prepared for large-scale airborne epidemic that may cause mass casualty from respiratory failure, and to take protective measures. In this project, the focus is on the filter media that are used in air-purifiers and respirators, and to examine the effect and safety of smart antimicrobial coating on the N95 FFR.

Effect of Smart Antimicrobial Coating on Postharvest Life and Quality of Strawberries (Fragaria x Ananassa)

Advisor : *YEUNG King Lun / CBME*
Co-Advisor : *LEUNG Hong Hang / CBME*
Student : *LIU King Nok / CEEV*
(UROP1000, Summer 2011)

A smart multi-level antimicrobial coating prepared from polymer-encapsulated chlorine dioxide (ClO_2), water-in-oil-in-water (w/o/w) double emulsion is used to extend the shelf-life without affecting the quality of strawberries (Fragaria x Ananassa). The effectiveness of the treatment is assessed by evaluating its impact on fungal decay incidence, weight loss and color. From the results, it can be concluded that the antimicrobial coating can lengthen the shelf life of strawberries and improve their color without affecting their weight.

Preparation of HX and HY Confined Nafion Composite Memberanes for Self-humidifying Fuel Cells

Advisor : *YEUNG King Lun / CBME*
Co-Advisor : *HAN Wei / CBME*
Student : *RAYMOND Gabriel Amit / CENG*
(UROP1000, Summer 2011)

Preparation of HX and HY-Nafion composite memberanes is attempted by employing a procedure consists of SSM seeding, followed by hydrothermal treatment in a synthesis solution. The initial results, such as SEM images, show very little growth on the SSMs. Subsequent modifications to several parameters, such as composition of the synthesis solution, position of the SSM in said solution, and hydrothermal treatment time and temperature yield much better results.

Preparation of Confined Nafion-zeolite Composite Membrane for Self-humidifying Polymer Electrolyte Fuel Cells

Advisor : *YEUNG King Lun / CBME*
Co-Advisor : *HAN Wei / CBME*
Student : *SIU Ching Han / CEEV*
(UROP1000, Summer 2011)

In this project, we attempt to prepare the confined Nafion-zeolite (HX & HY) composite membranes for self-humidifying proton exchange membrane fuel cell. The design of composite membrane is based on the consideration of improving the proton conductivity of electrolyte membrane by HX and HY. Also, HX and HY have large pore size, which may benefit the functionalization of the membrane. The zeolite layers of NaX, NaY, NaX/Silicalite-1 and NaY/Silicalite-1 on SSM are prepared by seeding and secondary regrowth method.

Reformation of Antimicrobial Coating – Adhesion and Durability Study

Advisor : YEUNG King Lun / CBME
Co-Advisor : LEUNG Hong Hang / CBME
Student : WONG Ho Yee / CENG
(UROP1000, Summer 2011)

The objective of this project is to investigate the effect of polyethylenimine, polyvinylpyrrolidone and polyacrylamide in the adhesiveness of the encapsulated CIO_2 to glass slides. Polyethylenimine and polyvinylpyrrolidone are mixed with encapsulated CIO_2 in different ratios separately. The mixture with polyethylenimine and encapsulated COI_2 gives a color of blue. After let dry for hours, the coating of mixture stays in a paste of gel and cannot dry completely. Glass slides coated with the mixture of polyvinylpyrrolidone and encapsulated CIO_2 can dry within 30 minutes. This shows that polyvinylpyrrolidone can be used to improve the encapsulated COI_2 for a better adhesiveness to glass slides.

Smart Antimicrobial Coating for Porous Media

Advisor : YEUNG King Lun / CBME
Co-Advisor : LEUNG Hong Hang / CBME
Student : YIP Shuk Ching / CEEV
(UROP1000, Summer 2011)

The aim of this project is to assess the persistency and durability of smart antimicrobial coating. The coating is applied to seven types of fabric and tested for its ability to intervene against three types of bacteria (*MRSA*, *S.aureus* and *E.coli)* and mold (*Cladosporium*). The results show that seven coated fabrics have prolonged bactericidal effect over a period of 28 days. Also, iodometric titration is carried out to evaluate the chlorine dioxide remaining in the coated fabrics. The results indicate that chlorine dioxide remains after the coated fabrics are dried for 28 days.

Dye-sensitized Solar Cell

Advisor : YEUNG King Lun / CBME
Co-Advisor : HAN Wei / CBME
Student : ZHANG Xinyuan / CENG
(UROP1000, Summer 2011)

Different phases of titanium oxide are incorporated to make dye-sensitized solar cell (DSSC). The titanium dioxide layer is prepared by doctor blade technique with Degussa p-25, Aldrich anatase, rutile made from thermal treatment method and nanotubes from p-25 prepared at 180°C for 30 minutes and 90 minutes, and at 195°C for 90 minutes. Standard dye $C_{58}H_{86}N_8O_8RuS_2$ (N719) is used. Performance and light to electricity conversion rates are compared among dye-sensitized solar cells prepared by different phases of titanium dioxide.

Cement-based Piezoelectric Sensor and Its Application

Advisor : LI Zongjin / CIVL
Student : YANG Zijiang / CIVL
(UROP1000, Summer 2011)

In order to meet the requirements of smart building in civil engineering, new smart materials are introduced into building construction for monitoring. Cement-based piezoelectric material has been developed as such a smart material. It exhibits good compatibility with the concrete and high sensitivity towards the mechanical deflection and acoustic emission. In this project, Portland cement and Lead Zirconate Titanate (PTZ) power are used to make a sensor, because of their high piezoelectric factor and coupling effect. The property and performance of cement-based piezoelectric sensor are discussed and evaluated.

Water Purification Units for Low-income or Developing Countries and Regions

Advisor : SHANG Chii / CIVL
Students : CHENG Wei / CIVL
(UROP1100 & 1000, Spring 2011 & Summer 2011)
LING Li / CHEM
(UROP1100 & 1200, Fall 2010 & Spring 2011;
UROP1000, Summer 2011)

In many developing countries, lack of access to clean potable water is a major issue. Conventional water treatment methods require huge energy input as well as advanced chemicals. Solar heating has been in use in many places to provide hot water supply, as the energy source is free and in large quantity. This process involves evaporation of water using solar energy and condensation of the vapor as pure water. However, one of the drawbacks is that this method limits the amount of daily treated water. Tests are carried out to simulate the real life situation of a traditional water evaporation treatment unit and modifications are suggested to increase its efficiency.

Innovative Iron-based Process for Odor Control in Storm Water Drain in Tidal Areas

Advisor : SHANG Chii / CIVL
Student : SU Qida / CIVL
(UROP1000, Summer 2011)

Odor nuisance from box culverts has long been recognized by the public as a problem in Hong Kong. Organic matters, tidal seawater and sulfate-reducing bacteria are the three factors which cause odor nuisance. Using chemical oxidants such as oxygen, chlorine and ferric salts are useful for suppressing the odor; however, some of these chemicals are toxic, expensive, and may have low solubility in water and high energy requirement. Therefore, an innovative, low-cost and long-lasting granular iron-based technology is needed to resolve the odor nuisance. The objective of this study is to develop a technology using granular ferric hydroxide (GFH) for sulfide control. In detail, it needs to be proved that GFH can help remove the sulfide in sediment and can be reused.

Set-up Effect of Displacement Pile in Sand

Advisor : WANG Yu-Hsing / CIVL
Student : LI Ngan Fei / CIVL
(UROP1000, Summer 2011)

The capacity of displacement piles in sand has been found to increase with time elapsed since the end of driving. Such an increase in pile capacity is known as pile setup and is not due to the dissipation of excess pore water pressure induced by pile installation. Similar findings are reported around the world. However, this extra pile capacity, which may lead to significant savings in construction cost and time, has not been taken into account in the pile design because there is still no conclusion for the associated underlying mechanisms. In order to have a better understanding about the cause of pile setup, further investigations are carried out in this study. This study begins with a comprehensive literature review and then proposes an experiment using the techniques of tomography images to characterize the process of pile setup.

The Application of Time-lapse Resistivity Mapping: Soil Resistivity Changes with Water Content

Advisor : WANG Yu-Hsing / CIVL
Student : LI Wu / CIVL
(UROP1000, Summer 2011)

Slope stability issues are intimately related to how the water front saturates the slope soil and then decreases the associated effective stress (strength) at the sliding surface. Since the soil resistivity is significantly affected by the water content, the time-lapse resistivity mapping on slope can be an effective technique to monitor the associated water front movement along a slope. The capacitively-coupled resistivity meter, OhmMapper, is used for such a purpose in this study. The preliminary testing results on a natural slope have proved the feasibility of this methodology. Distinct differences in the resistivity mapping on the slope can be measured before and after a rainfall event.

DEM Simulations on Biaxial Tests of Dense and Loose Sand

Advisor : WANG Yu-Hsing / CIVL
Student : TAM Pak On / CIVL
(UROP1000, Summer 2011)

Distinct Element Method (DEM), a computer-aided numerical simulation method that considers every individual particle, is being used in the study of geotechnical problems both in research and industry. With the use of software PCF2D, which performs two-dimensional simulation, "disks" of specific parameters such as density, radius and friction coefficient can be generated and resembled as soil particle packing. "Walls" can also be generated and resembled as the boundary conditions of the generated soil sample. In this project, DEM simulations are used to model the biaxial tests on dense and loose soil samples. The simulation results show a good agreement with the experimental observations.

Risk Assessment for Rainfall-induced Landslides in Yin Chang Gou Ravine near Yingxiu

Advisor :   ZHANG Li Min / CIVL
Students :   HUANG Junjie / CIVL
(UROP1000, Summer 2011)
WEI Jiaying / CIEV
(UROP1000, Summer 2011)
YEUNG Ying Tung / CIVL
(UROP1000, Summer 2011)

This project presents an assessment of risks of loose soil deposits in the Ying Chang Gou area after the 2008 Wenchuan earthquake, particularly along the Provincial Road 303. A GIS platform is used to identify those loose deposits formed on the steep terrains during the earthquake. Besides, the stability of these deposits under different rainfall conditions is evaluated and the safety status is analyzed. The failure mode of these loose deposits is assumed to be shallow-seated for simplicity, therefore, these deposits can be considered as infinite slopes. After that, the run-out distances of any failed deposits and the vulnerability can be estimated, and the risks to passengers travelling on the road are assessed. Strategies are also suggested to reduce the risks.

Data Streaming for Android Platform

Advisor : CHAN Gary S H / CSE
Student : AU Ka Wai / CPGBM
    (UROP1000, Summer 2011)

Smartphones are becoming more and more accessible in the world, and streaming technologies and being applied on phones such as Android or iPhones, improving user experience and convenience to a higher level. With the emerging cloud computing technology, resources are distributed on the internet through Content Delivery Networks, and as a result, data streaming technologies is becoming more important in the next development stage of Smartphone usages on the internet. This project aims at creating an Android Client Application to retrieve streaming data of stock quotes, with the root data server incorporated with the Fastmesh system.

Wireless Mesh and Networking

Advisor : CHAN Gary S H / CSE
Student : CHANDRASEGARAN Kannan S / CPEG
    (UROP1100, Fall 2010)

Networking is a complex topic as it refers to many different things. Communication between any two devices requires some form of networking to establish connectivity. The issue becomes very complex when it comes to establishing connectivity for a great number of devices over great distances. The need to manage this complexity arises in the OSI model of networking.

Wireless Mesh and Networking

Advisor : CHAN Gary S H / CSE
Student : CHEN Lixi / ELEC
    (UROP1100, Spring 2011)

This is a study on recent advances and open research issues in wireless mesh networks (WMN). System architectures and applications of WMNs are described, followed by discussion of critical factors influencing protocol design. Theoretical network capacity and the state-of-the-art protocols for WMNs are explored with an objective to highlight a number of open research issues. Testbeds, industrial practice, and current standard activities related to WMNs are also discussed.

P2P Streaming Monitor using Global Network Positioning (GNP) System

Advisor : CHAN Gary S H / CSE
Student : CHIU Sin Wang / CPGBM
(UROP1100, Fall 2010)

As P2P network architecture is becoming more and more popular, more research is done on P2P streaming. To acquire more in-depth knowledge on P2P streaming, we need to know about the topology of the network in order to optimize the streaming. In order to achieve this, we need a system that can monitor the network and facilitate the streaming. It is proposed that the Global Network Positioning (GNP) system is implemented as a monitor system.

P2P Streaming Monitor with Population-time Graph and Topology Implementation

Advisor : CHAN Gary S H / CSE
Student : CHIU Sin Wang / CPGBM
(UROP1200, Spring 2011)

To continue my work in the previous semester on P2P stream monitor system and the investigation on the Global Network Positioning (GNP) system, an algorithm with population-time graph and topology function is implemented. It is found that this system can be used with the VMesh or FastMesh logging database with minimum setup, which enhances the development and research on the P2P streaming system.

Peer-to-peer Streaming

Advisor : CHAN Gary S H / CSE
Student : LAM Yuen Hei / COGBM
(UROP1100, Fall 2010)

This project aims at testing and improving FastMesh and SIM, including testing of the SIM player, modifying the RP for FashMesh, fixing a problem of super node and fixing a bug of substream.

Peer-to-peer Streaming

Advisor : CHAN Gary S H / CSE
Student : LAM Yuen Hei / COGBM
(UROP1200, Spring 2011)

To continue the work from previous semester, I have completed several tasks aiming at improving the stability of SIM, including the setting up of delay hiding server, modifying current joining scheme, implementing a gossip algorithm for peer list exchange, storing substream root path and developing a logging system.

An Investigation to Simplex Minimization Algorithm

Advisor : CHAN Gary S H / CSE
Student : SIU Sing Yu / CPGBM
(UROP1100, Summer 2011)

Peer-to-peer model of transferring information through the internet is popular due to its scalable nature. It also leads to the demand for a user-friendly interface to monitor the situation of the peer-to-peer network. A prototype of the monitoring system is developed to provide graphical interpretation of the networking condition called Global Network Positioning (GNP. This project aims to test and evaluate the algorithm used for plotting the GNP Graph and tries to make improvement.

Wireless Mesh Network

Advisor : CHAN Gary S H / CSE
Student : WANG Siqi / CPEG
(UROP1100, Fall 2010)

This is a report of my UROP experience during this semester. I have done a lot of self-study on the fundamental concepts on networking and wireless mesh network, and I have gained hands-on experience in testing wireless mesh network, as well as programming work on the address server, which is a separate server in charge of assigning subnet address to each wireless router in the network.

Wireless Mesh and Networking

Advisor :   CHAN Gary S H / CSE
Students :   ZHENG Zichen / CPEG-HR
(UROP1100 & UROP1000, Spring 2011 & Summer 2011)
ZHONG Jing / ELEC
(UROP1100 & UROP1000, Spring 2011 & Summer 2011)

This project is conducted with the LAviNet team and focuses on wireless mesh network (WMN). In the first semester, we learn the basic principles and knowledge about WMN and study about routing and chancel assignment, with some hands-on experience in the coding of GoAhead Web server to build a user configuration webpage. In the next semester, we continue our work in maintaining and enhancing the functionality of the web server by adding and modifying the source code. We have made the server able to carry out multi-functions such as configuring three different interfaces, adding and deleting users, supporting file uploading, etc.

Spreadsheet Error Detection

Advisor : CHEUNG Shing Chi / CSE
Student : LI Ching Ki / COMP
(UROP1000, Summer 2011)

This project involves the design of spreadsheet tasks of copy and paste. Studies show that over 90% of spreadsheets contain errors, and most errors are likely to contact copy and paste faults. As nowadays spreadsheets are mostly developed by end-users instead of professional programmers, operational risks indeed exist anywhere in the spreadsheet. The test cases designed in this project can be used for static analysis to detect certain type of change-induced faults. The tool is implemented in MS 2010, which is one of the most commonly used spreadsheet software.

Spreadsheet Error Detection

Advisor : CHEUNG Shing Chi / CSE
Student : LI Pui Ping / ACCT & ECON
(UROP1000, Summer 2011)

This project focuses on the research on spreadsheet reuse errors and copy and paste errors for end-users. Without proper debugging of a spreadsheet by programming experts, errors are disguised until the next user discovers them, which is known as reuse errors. Real-life examples are used to depict the problems and find out ways to reduce the probability of causing errors and to invent efficient debugging programs.

The Organization Structure of MapReduce and Hadoop

Advisor : GU Lin / CSE
Student : CHEN Ximing / ELEC-HR
(UROP1000, Summer 2011)

As the name implies, cloud is something "illusional", and Cloud Computing is not a method based on computer hardware. It is basically a parallelized computational method based on computer networks. In this project, the background of Cloud Computing is studied, and research is done on the advantages and disadvantages of Cloud Computing. Two major implementation models in Cloud Computing, namely MapReduce and Hadoop, are studied and assessed.

Distributive Name Service

Advisor : GU Lin / CSE
Student : LI Zhaohua / COMP
(UROP1100, Fall 2010)

Name service is a common core for various kinds of software. It supports storing attribute and value pairs as well as retrieving information when given the name of any entry. Clients can write data into the database of the name service server and read what they have written, or they can communicate with other clients by writing and reading from a specific entry with an agreed name. This project focuses on the design of the distributive name service and the related implementation work.

An Introduction of the Hadoop System: HDFS and Hadoop MapReduce

Advisor : GU Lin / CSE
Student : LU Xietong / ELEC-HR
(UROP1000, Summer 2011)

Hadoop is a software framework which supports data-intensive distributed applications developed by Apache. Its main function is to enable applications to work with massive amount of data. The Hadoop system consists of Hadoop Distributed File System (HDFS) and Hadoop MapReduce. In this project, the architecture of HFDS and the setup and implementation procedures are studied.

Distributed Computing Systems and Distributed Sorting

Advisor : GU Lin / CSE
Student : WANG Siqi / CPEG
(UROP1100, Summer 2011)

With the rise of information technology and the internet, the volume of data stored electronically has greatly expanded. The capability of systems to process data on a large scale has becoming increasingly important. As a result, many distributed computing platforms are developed to deal with such need. This work is mainly about the study of distributed computing system and the sorting algorithm used in the system. Sorting experiments based on Hadoop are done to collect data for the improvement of the efficiency of distributed sorting.

SNAS: A Sensor Network-based Data Center Authentication System

> *Advisor : GU Lin / CSE*
> *Student : YANG Shuo / CPEG-HR*
> *(UROP1100 & 1200, Spring 2011 & Summer 2011)*

SNAS is a sensor network based security system designed for secure data center management. SNAS forms a sensor network within a data center by attaching sensor network motes to the data center rack servers and the working station of the administrator. The data center manager can manage the servers through the sensor network. This system eliminates some of the security problems present in the current LAN network-based data center management system. Result of experimental implementation shows that SNAS provides good physical authentication function while introduces short delay to the management process.

Google Android Platform and Application Development

> *Advisor :   MUPPALA K R Jogesh / CSE*
> *Students :   CHANDRASEGARAN Kannan S / CPEG*
> *(UROP1000, Summer 2011)*
> *LI Tao / COMP*
> *(UROP1000, Summer 2011)*
> *ZHANG Yaofeng / COMP*
> *(UROP1000, Summer 2011)*
> *ZHAO Guanlun / COMP*
> *(UROP1000, Summer 2011)*

Android is currently one of the most popular mobile platforms. This project investigates the development of an Android application. A brief history of Android platform is studied, and our team then focuses on the purpose and functionality of an Android application we have developed for Médecins Sans Frontières (MSF). By developing the application, our team explores the features, application development and platform development issues within Android.

"Where To": A Collaborative Andriod Application Providing an Online Google Map with Audible Cantonese Location Pronounciation for Expats and Tourists in Hong Kong

Advisor : MUPPALA K R Jogesh / CSE
Student : CHEUNG Ka Chun / COMP
(UROP1100, Summer 2011)

Hong Kong has hundreds of different locations which have names that are difficult for foreigners to pronounce and remember. Foreigners often have trouble communicating to locals, especially taxi drivers, about where they want to go, such as tourist attractions or popular sites. In this Android application, users can select the text language and when users tap on a location on the Google map of Hong Kong, the system displays the address in three different languages/dialects (English, Cantonese and Putonghua). The users can also listen to the pronunciation in the language/dialect of their choice.

An Evaluation Framework for Search Engine Personalization

Advisor : NG Wilfred Siu Hung / CSE
Student : JIANG Yuxiang / COMP
(UROP1000, Summer 2011)

Many factors need to be considered when evaluating web search engines. We propose that the user's search intent should also be considered as an important factor in the evaluation. After determining the user's search intent by analyzing the search queries, the search engine can return more personalized search results. In this project, search sessions are manually analyzed to figure out their search intents, and those search intents are then used in our personalized search engine. We compare three types of search engines (Google, Apache Lucene and our personalize search engine) against our reference rankings created manually.

Mining Generalized Order-Preserving Submatrices in Gene Expression Data

Advisor : NG Wilfred Siu Hung / CSE
Student : LI Yuliang / COMP
(UROP1100 & 1200, Fall 2010 & Summer 2011)

To address the noisy nature of gene expression data, microarray experiments are usually conducted for multiple times. We propose to model the expression level as continuous distributions in order to facilitate effective pattern mining from the data. In this project, the two gene expression matrix are defined according to uniform and normal distributions and they are called the *UniDist matrix* and the *NormDist matrix*. Based on these two new matrices, we formalize a novel probabilistic OPSM (POPSM) model, which adopts a new probabilistic support measure to evaluate the extend to which a row belongs to a POPSM pattern. Our empirical studies show that our proposed POPSM model better captures the characteristics of the expression levels of strongly associated genes and greatly promotes the discovery of patterns with high biological significance.

An Evaluation Framework for Search Engine Personalization

Advisor : NG Wilfred Siu Hung / CSE
Student : WANG Heng / COMP
(UROP1000, Summer 2011)

In recent years, search engine personalization is one of the hot topics in the industry. It is usually regarded as Search 4.0, aiming at providing customized results for different users. However, due to a lack of evaluation benchmark, evaluating new approaches of search engine personalization is time-consuming and requires human judgment. This project targets at creating such a benchmark that can be used as a test bed for new approaches to search engine personalization.

RFID Data Processing and Research on Graph

Advisor : NG Wilfred Siu Hung / CSE
Student : ZHANG Zhijun / COMP
(UROP1000, Summer 2011)

RFID has become a popular topic, and how to mine data using RFID and how to process the data for more information are worth further studying. At the same time, as RFID data can be easily and conveniently processed using graph data processing skills, graph data, including exact graphs and uncertain graphs are studied in this project. Several algorithms are tested to determine their efficiency in mining useful data from the RFID results.

Word Pyramid

Advisor : QU Huamin / CSE
Student : CHENG Hao / ELEC
(UROP1000, Summer 2011)

In the internet era with an explosion of data and information, the amount of new documents, research papers and new data are increasing at an extraordinary speed. Millions of new data are in the media every day, every second, and people are no longer able to analyze all the articles by themselves. People need tools to help them process extremely large quantity of data and one possible solution is Text Visualization. Different algorithms can be used to decide which type of information is worth reading or noticing. There already exist many kinds of tools for this purpose, such as Word Clouds, Tree Clouds and Wordle. In this project, I propose a new plot called Word Pyramid, and it not only shows the keywords in a huge data set, but also allows people to see how much "larger" one word is compared to the other. By using this plot, people can understand the data in a more detailed way.

Light Carving: Rich Object Scanning on a Budget

Advisor : TANG Chi Keung / CSE
Student : CHEN Qifeng / COSC & MATH-GM
(UROP1100, Spring 2011)

This project is motivated by the image-stitching project which merges two images or normal maps by BRDF information. A confident value is assigned to each pixel in both maps for merging. In general, the closer a pixel is to the boundary of an object, the less confident value it should have. We work on rendering an accurate 3D model using normal maps, the BRDF estimation and a good rough shape.

Three Dimensional Reconstruction from Photos

Advisor : TANG Chi Keung / CSE
Students : LI Dingzeyu / CPEG
(UROP1100 & 1200, Fall 2010 & Spring 2011)
WU Hao / COMP
(UROP1100 & 1200, Fall 2010 & Spring 2011)

We are interested in studying the whole process from the extraction of key points to the automated matching between all possible feature pairs for large-scale vision reconstruction. By applying different techniques to extract desired key points, we are able to compute the descriptors, and thus perform the matching, which is a crucial step for 3D reconstruction. In this project, we first review relevant literature on the state-of-the-art techniques in computing image key points and their descriptors. Next, we implement a human interactive system, with different implementation of key point extraction from an N-image dataset (N > 2), and automated computation of the descriptors and the matching of key points.

Implementation of Intelligent Scissors and Active Shape Model

Advisor : TANG Chi Keung / CSE
Student : ZHANG Yusi / CPEG
(UROP1100, Summer 2011)

This project focuses on a common tool for artificially grasping objects from computer images, knows as the intelligent scissors, as well as one of the common detection models known as the active shape model. To implement the project, I use Qt SDK, an IDE intended for C++ programmers to easily work out UI-based user-friendly projects, which is based on a cross-platform UI library called Qt. I have successfully completed the normal function of an easy intelligent scissors, but more work needs to be done in the algorithm of the ASM model in locating specific object in an image.

Meaningful Statistical Machine Translation

Advisor :   WU Dekai / CSE
Students : CHEUNG Wai Ting / CPEG
            (UROP1100, Fall 2010)
            YANG Shuo / CPEG-HR
            (UROP1100, Fall 2010)

Machine translation is currently one of the most heavily researched areas of computer science. This project seeks to develop the next generation of machine learning systems that automatically learn Chinese and English well enough to translate between them. In order to break the current performance barriers, it will be necessary for machines to learn not just the syntax of English and Chinese, but the contextual meaning of the components within the sentences.

Website for Semantic Annotation Experiment Register System

Advisor : WU Dekai / CSE
Student : HON Kwun Wing / COMP
           (UROP1100, Summer 2011)

This project involves designing a website for semantic annotation experiment, specifically on the register system. As the experiment may be published and may need to gather information from users to evaluate the result of the machine transaction, the website should be designed to be able to classify different groups of users and allocate different sets of data and output for evaluation. Therefore, the website should have a register system which indicates which page(s) or file(s) a user can view or select.

Intelligent Multitouch Controllers for Computer Music Instruments

Advisor : WU Dekai / CSE
Student : WONG Lok Hang / ECON
           (UROP1100, Spring 2011)

This project seeks to develop the next generation of human-controlled electronic music instruments. Human interfaces to musical instruments are revolutionized by the appearance of inexpensive, hand-held high-resolution multitouch displays (such as those of the iPad and iPhone). However, translating the raw multitouch input stream into meaningful music control events is not easy, and the current software is extremely primitive. The human interface design should maximize the musician's expressive power as well as the learnability and playability. A possible solution is merging AI and pattern recognition techniques to analyze the incoming multitouch input stream and adaptively translate them into meaningful music control events.

Sparse Matrix Completion

Advisor : YEUNG Dit Yan / CSE
Student : SONG Shuang / MATH-AM & COMP
(UROP1100, Summer 2011)

Matrix factorization is an effective way to carry out prediction in sparse matrices. In a specific application, namely predicting users' preference in movies, we use this method and try to make improvements by using extra information of users and movies. Algorithms are used to compute the similarity of users and movies and amplify their relation. It is reasonable for us to believe that users of the same gender may be influenced by the same type of features, and movies of the same type may have similar values in the same features. Therefore, this extra information may be used to emphasize the similarity between the behavior of similar users and the similarity between features of similar movies.

A Systolic Architecture Using Embedded Logic Dynamic Latch

> *Advisor :   BERMAK Amine / ECE*
> *Students :   LIAN Yuwen / ELEC*
> *(UROP1000, Summer 2011)*
> *YU Jiqiu / ELEC-HR*
> *(UROP1000, Summer 2011)*

Systolic architectures are widely used in VLSI signal processing architectures. Most of the previous design are based on area-consuming static logic. Our project aims to integrate the dynamic latches into the systolic architecture to implement a systolic serial-parallel multiplier. The systolic architecture we use in this project is a trade-off in time and area between serial multiplier and parallel multiplier. Embedding the dynamic latches into the logic will effectively reduce the energy and improve the speed of the circuit. The objective of our project is to implement a systolic architecture using dynamic latches and to simulate the circuit and design the final layout.

Online Device Simulation Platform

> *Advisor : CHAN Man Sun / ECE*
> *Student : LUO Yanjin / ELEC*
> *(UROP1100, Summer 2011)*

In this project, an online platform is built to allow users to enter simulation parameters through the internet. Then, the server uses the parameters to calculate and return back to the user interface in graphs. The server acts as the calculation tool, circuit simulation tool and the plotting tool, so it can be more user-friendly instead of having to use different tools in different workstations.

Nanomaterial-based Novel Solar Cells

> *Advisor : FAN Zhiyong / ECE*
> *Student : ARCROSSITO Diaz / PHYS-PP*
> *(UROP1000, Summer 2011)*

Introduction of nano-structured materials into photovoltaic device has been shown to have potential in improving efficiency. Through experiment, light absorption enhancement is shown for nano-structured aluminum. Using this material, it is expected that the thin film device produced will have improved efficiency.

Optical Property Investigation of Nano/micro-structures

Advisor : FAN Zhiyong / ECE
Student : HAN Zhuofei / ELEC-EP
(UROP1000, Summer 2011)

Nano-channel-array materials, which have fine, uniform channels of nanometer dimension, have the advantage of a large surface/interface area ratio. As a result, these structures have the potential to show excellent optical properties that can be used in technologies such as solar cells. In this project, the optical property of nano-structure is discovered by observing various trends.

3D Display

Advisor : KWOK Hoi Sing / ECE
Student : KEUNG Ka Ho / CPGBM
(UROP1100, Summer 2011)

3D display is a device that can make a perception of 3D to viewers. This delightful technology has become a top topic in recent years. After several rounds of evolution and development, 3D technology is no longer too expensive to be applied to electronic devices and it is now being used widely in the entertainment industry such as making movies and games.

New Solar Cell Materials for the Future

Advisor : KWOK Hoi Sing / ECE
Student : WONG Kin Ham / ELEC
(UROP1000, Summer 2011)

Photovoltaics (PV) is the most promising renewable energy source that can meet the global energy demand while it does not emit greenhouse gas (CO_2) to the atmosphere. The longest history of photovoltaics technology is based on silicon as a semiconductor. While the non-silicon-based photovoltaics technology uses extremely thin layers of metal compounds as semiconductors, this is a relatively new technology, and both technologies have different drawbacks. In this project, CIGS and amorphous silicon are taken as examples for study, and a new material (Cu_2O) is investigated.

Automatic Balance Control System for Quad-copter

Advisor : LI Zexiang / ECE
Student : CHE Feng Yu / ELEC-HR
(UROP1000, Summer 2011)

Unmanned aerial vehicle is always a hot topic for researchers. Nowadays, as quad-copter is more flexible and portable, it becomes more and more popular to be used for UAV research. The first problem to be solved though is how to stabilize the quad-copter. In this project, we use the quad-copter Xarcraft-X600 as the focus of the study. First, we build a failure proof testing bed, and then we design and test the automatic balance control system of the quad-copter.

High-performance Vision-based Motion Estimator for Mobile Robot

Advisor : LI Zexiang / ECE
Student : XU Yang / ELEC-HR
(UROP1000, Summer 2011)

Vision-based motion estimation is a newly developed technology that incorporates the video captured by a camera on a vehicle or robot to measure the motion, which is significant for navigation. This technology can be widely used in navigating all kinds of unmanned vehicles in the future. In this project, I help setup the platform of vision-based motion estimation system and implement a real-time algorithm on the platform to achieve optimal performance.

Design and Characterization of an Area-efficient Low Power CMOS Voltage Reference

Advisor : MOK Philip K T / ECE
Student : LI Shaolan / ELEC-HR
(UROP1100 & 1200, Spring 2011 & Summer 2011)

Voltage reference is an essential building block in analog electronics. All the switching and linear regulators use this reference as part of the control loop to regulate the output voltage of a power converter to an accurate value. For the reason, voltage reference needs to generate an almost constant voltage that is independent of process, temperature and supply voltage variations. As the technology keeps scaling down, components are integrated more compactly. This project focuses on designing and characterizing an area-efficient low power CMOS voltage reference in 0.35μm CMOS technology. Equipment is setup to measure the performance of the reference design and a proposed design. Several parameters of the voltage references are measured, compared and characterized.

Opto-Mechanical Oscillator with Directional Phonon Emission for Aerosol Microparticles Sensing

Advisor : POON Andrew W O / ECE
Student : LEENE Lieuwe Berend / ELEC
  (UROP1100, Fall 2010)

With current interests directed towards atmospheric monitoring, we explore the potential of an opto-mechanical device with directional phonon emission for the application of aerosol micro particle sensing. We demonstrate system that employs the quartz crystal tuning fork for directional phonon emission and has the capacity to detect aerosol particles as proof of concept.

PageRank of Scholars

Advisor : QIU Li / ECE
Student : MA Fangchang / ELEC-HR
  (UROP1000, Summer 2011)

PageRank, the heart of Google search engine, is a link analysis algorithm developed by Larry Page, and eigenfactor.org uses a similar approach to rank academic journals. In this project, we use the same algorithm to rank all papers and scholars in a particular technical area, where the link is taken as the paper citation. It ranks the papers according to their importance and popularity.

Location-based Building Recognition and Social Events Recommendation Using Smartphones and Social Networks

Advisor : SHE James / ECE
Student : AARON Sheshan Ryan / ELEC
  (UROP1000, Summer 2011)

In many situations, someone travels to a new place (e.g., HKUST campus), may not be familiar with the environment. It would be very difficult for a person to engage with any social event without knowing the environment first, as well as the time or related information about the social event. It would be interesting to have a Smartphone application, which can feed real-time information for a person to be familiar with the environment, direction and associated details about any social event that matches the person's interest along the journey.

Location-based Building Recognition And Social Events Recommendation Using Smartphones and Social Networks

Advisor : SHE James / ECE
Student : LIANG Diyu / CPGBM
(UROP1000, Summer 2011)

Combining geo-location with social network is now the trend in creating a cyber-physical world. A new way in locating people is needed as traditional location technologies get frustrated at complicated indoor environment. Near Field Communication (NFC) provides a low-cost but effective way of obtaining location and interacting with existing social networks.

Learning Visually Guided SensoriMotor Behavior

Advisor : SHI Bertram E / ECE
Student : SONG Shuran / ELEC-HR
(UROP1000, Summer 2011)

In this project, as face tracking system is built for face detection for a camera, and the aim is to keep the target face always on the center of the image. We perform simple analysis and evaluation of the system for further improvement.

Learning Visually Guided SensoriMotor Behavior

Advisor : SHI Bertram E / ECE
Student : YE Jiaxin / ELEC
(UROP1000, Summer 2011)

In this project, we aim to use the MCT detector to detect the location of the face and then send the data back to the control system, so that the control system can use Pan-tilt Unit (PTU) to turn the camera towards the face. I help in identifying the mathematical model to the control system. With the geometric model, we can successfully finish the movement of the control system in one step.

Capture the Flag

Advisor :   SHI Ling / ECE
Students : CAI Hong / ELEC-HR
            (UROP1000, Summer 2011)
            LU Yongxi / ELEC-HR
            (UROP1000, Summer 2011)
            TU Jia / CPEG-HR
            (UROP1000, Summer 2011)
            WANG Yongduo / ELEC
            (UROP1000, Summer 2011)

"Capture the flag" is a game that involves the interaction between semi-autonomous mobile robots and human players. Under certain rules, a number of mobile robots are divided into two teams and they compete against their opponents to capture a virtual flag of the other team. The robots are remotely controlled by human players, and the players are provided with graphical user interface (GUI) which informs them of the current location of their robot on the game field to facilitate manipulation. In this project, the game consists of several essential modules, which are the controller module, the AI module, the server module and the client module. A set of game rules is determined, and the technical modules will be tested based on the rules.

Mobility Pattern Tracking Using GPS, Wi-Fi and Cell ID

Advisor   : WONG Albert K S / ECE
Co-Advisor   : WOO Kam Tim / ECE
Student   : WANG Xiaoli / ELEC-HR
                   (UROP1000, Summer 2011)

Tracking the mobility pattern of children and elderly is a potentially useful application, as it provides a way for parents and care givers to know location of the children and elderly under their care. Assisted GPS (AGPS) and Wi-Fi can be used to precisely calculate the location, but it consumers a lot of energy. On the other hand, Cell ID and WiFi signal can allow the determination of location with much less energy and at a lower cost. This project is an experiment on an energy-efficient cellular and AGPS/Cellular/Wi-Fi tracking algorithm based on the knowledge of a person's mobility history. The algorithm makes use of the concept of crucial location (CL) and personal common location (PCL) to construct a person's mobility map, where CL is a point where multiple paths intersect and PCL is the area where a user spend most of his/her time. AGPS location fixes are scheduled based on a person's predicted movement along this mobility map. A conference paper has been submitted based on this work.

Counting Step Function Based on eZ430-Chronos

> *Advisor*   *: WONG Albert K S / ECE*
> *Co-Advisor*   *: WOO Kam Tim / ECE*
> *Student*   *: YU Fei / ELEC-HR*
>   *(UROP1000, Summer 2011)*

This study is to develop a step-counting function using the Texas Instruments eZ430-Chronos watch platform, which provides three dimensional acceleration readings from its built-in accelerometer. We have successfully set up the environment and programmed the MCU to record the acceleration readings on its own and save these readings to flash memory for access later. Program for the actual step-counting algorithm is to be completed.

Modeling, Fabrication and Characterization of Solar Cell

> *Advisor : WONG Man / ECE*
> *Student : WEN Ximiao / ELEC-HR*
>   *(UROP1100, Summer 2011)*

This project focuses on developing a computer program which is capable of extracting solar cell model parameters, based on the knowledge of current-voltage data of a solar cell, and simulating the effects caused by modifications of these parameters to the solar cell electric behavior. The aim is to build a new module, which can simulate the distributed model of solar cell, and predict the number of stages that can make the simulation converge.

Building a Helicopter Robot

> *Advisor :*   *WOO Kam Tim / ECE*
> *Students :*   *CHU Pak Him / ELEC*
>   *(UROP1000, Summer 2011)*
>   *LEE Ho Sum / MECH*
>   *(UROP1000, Summer 2011)*
>   *LIN Ka Sing / ELEC*
>   *(UROP1000, Summer 2011)*
>   *NGAN Ka Chai / ELEC*
>   *(UROP1000, Summer 2011)*
>   *TANG Wang Hin / MECH*
>   *(UROP1000, Summer 2011)*
>   *WONG Ka Kin / MECH*
>   *(UROP1000, Summer 2011)*

The objective of our team in this project is to build a helicopter. Normally, a helicopter has two propellers on the axis of the motor. However, we want to design a remotely operated helicopter in a different way. We compare different methods of mechanical design and mathematical theories in the movement of helicopters, and the availability of materials in Hong Kong. Testing is done on different designs for further improvement in the future.

Building a Servo Robot System

Advisor : WOO Kam Tim / ECE
Student : LEUNG Chun Yin / COMP
(UROP1100, Spring 2011)

In order to perform research on human robots, a servo robot is needed for platform testing, motion testing and algorithm selection, In this project, the goal is to build a servo robot that is compatible with the standard for Robocup Competition, so that the Robotics team can continue to develop the technique required for the game.

Capillary Electrophoresis

Advisor : YOBAS Levent / ECE
Student : JIN Ming / ELEC-HR
(UROP1100, Fall 2010)

This project is a study of capillary electrophoresis. I have reviewed past research conducted in this area to learn about the basic principles and knowledge in electrophoresis and electro osmotic flow. Also, I have learnt about the preparation of chemicals and instruments and conducted experiments in the testing of fabrication methods and models.

Micropump based on a Smart Material

Advisor   : YOBAS Levent / ECE
Co-Advisor   : WEN Weijia / PHYS
Student   : LO Hon Pan / ELEC
(UROP1100, Fall 2010)

This project investigates a new micropump concept based on Electrorheological (ER) fluid. The objective is to learn about photolithography, lithography PDMS, and how to fabricate the microchips and performing testing. These are key concepts needed to further research on the micropump using smart polymer membrane.

Lab on a Chip: Separation and Detection of DNA in Microfluidic Chips

Advisor : YOBAS Levent / ECE
Student : WAN Xinwei / ELEC-HR
(UROP1100, Spring 2011)

Capillary electrophoresis (CE) separates molecules based on their differential electrophoretic migration under uniform electric field applied through a narrow-diameter tube. In this project, I intent to test our microfludic chips for capillary electrophoresis and demonstrate separation and detection of our target DNA sequence on such chip. Previous work about the theory of the Micro Capillary Electrophoresis for DNA separation is studied, and then I try to repeat the experiment with the current design of CE chips.

Microchip for Automated Manipulation of Biological Cells through Electric Fields

Advisor : YOBAS Levent / ECE
Student : ZHANG Yiyu / EEIC
(UROP1100 & 1200, Fall 2010 & Summer 2011)

The objectives of this project are 1. Learn about the theory of dielectrophoresis (DEP), 2. Learn about the micro-fabrication techniques and the making of microfluidic chips, 3, learn about the background knowledge of patch clamp, and 4. Characterize microfluidic chips with biological cells. Building microfluidic chips with DEP devices can capture a group of cells and relocate them to desired location, and multiple patch clamp recording can be done simultaneously which largely increases the throughput and reduce the complicity of the experiment. Also, the DEP can select the cell from the other particles suspended in the solution.

Visible Light Data Acquisition System Design and Characterization

Advisor : YUAN Jie / ECE
Student : WENG Siyuan / ELEC-EP
(UROP1000, Summer 2011)

Optical communication is used in a broad range of daily activities, with the most common application in optical fibers. However, optical communication through wireless air is also in development. A major obstacle is the significant interference and attenuation by natural light. This project focuses on characterizing the noise and interference to the channel receiver from natural light as well as the noise caused by circuit board. By characterizing the noise pattern in a frequency domain, the appropriate intensity and frequency of the signal can be obtained and further experiment can be carried out in transmitting signal through wireless air by light.

Between Supply Chain Operations and Financial Performances

Advisor : TSENG Mitchell M / IELM
Student : CHEN Minying / LMGBM
(UROP1100, Fall 2010)

The purpose of this project is to develop a systematic and practical model to associate the supply chain matrices with financial performance on an individual product-level, such that the impact of Kanban System on the overall financial performance of a major Fortune 500 multinational company can be quantified. The analysis is part of a major research project, and the assumptions and implications are specifically based on a major Fortune 500 multinational company's unique situation. However, it may also be able to provide management insights to the manufacturing industry in general.

Software Documentation for Push – Pull Production System for a Major Fortune 500 Multinational Company

Advisor : TSENG Mitchell M / IELM
Students : HE Zhiyi / IELM
(UROP1000, Summer 2011)
LUO Sihua / IELM
(UROP1000, Summer 2011)

This project is to build a simulation model to verify the effectiveness of proposed push-pull production system for a major Fortune 500 multinational company by doing experiments. Given actual demand and initial inventory data, the model should be able to determine inventory levels for both RMs and FGs daily/weekly and report correspondent OTD performance. With these performance indicators, we can make further comparison between the push-pull production system and current MRP-based system.

ZnMn$_2$O$_4$ Nanofibres as Anode Material for Lithium-ion Batteries

Advisor : *KIM Jang Kyo / MECH*
Co-Advisor : *ZHANG Biao / MECH*
Students : *FU Ying Kiu Yonnie / PHYS-PP*
(UROP1100, Summer 2011)
QIU Zhiwei / MECH
(UROP1100, Summer 2011)

Lithium-ion batteries (LIBs), for their high power and energy densities, are considered to be one of the most important power supplies for laptop computers, mobile phones, cameras and other portable electronic devices. However, due to rapid growth in power demand of electronic devices and the increasing interest in electric vehicles, the electrochemical performance of commercially available LIBs need to be further improved in terms of power and energy densities, safety and service life. ZnMn$_2$O$_4$ has attracted much attention as the electrode material for LIBs due to its high theoretical capacity and environmental friendliness. Electrospinning has been widely used to prepare metal oxide fibres as anode. In this study, ZnMn$_2$O$_4$ nanofibres are synthesized via electrospining and their electrochemical characteristics are evaluated.

Digital Image Correlation Method for Full-field Deformation Measurement

Advisor : YE Wenjing / MECH
Student : CAI Yaxiong / MECH
(UROP1100, Fall 2010)

In order to investigate the complex deformation of porous solids under dynamic loading, a combination of two measurement methods, namely the Digital Image Correlation (DIC) method and the strain gauge measurement are proposed. Experiments are conducted to compare and evaluate the performance of the two methods. A high speed camera with micro-lens is used to measure the wave propagation inside porous material, and the results shows that the DIC method can be used to measure full-field deformation under dynamic loading.

Digital Image Correlation Method for Full-field Deformation Measurement

Advisor : YE Wenjing / MECH
Student : CAI Yaxiong / MECH
(UROP1200, Spring 2011)

As a continuation of previous semester's work, the findings are applied to further investigate an important and specific application – determining the plastic wave speed inside porous material with arbitrary pore size and geometric distribution. The preliminary results show that the process of plastic wave propagation is clearly evident and the magnitude of the plastic wave speed is also on the right order compared to approximate theoretical estimation.

Micro Resonator for the Measurement of Accommodation Coefficient

Advisor : YE Wenjing / MECH
Student : OU Chubin / MECH
(UROP1100 & 1200, Fall 2010 & Spring 2011)

MEMS/NMES devices are developing rapidly and they are widely used for their powerful functions. The accommodation coefficient is an important parameter that dictates the gas-wall interaction in micro structures. Although this parameter is important in the modeling and design of MEMS/NMES devices, its actual value is still largely unknown. A new damping-based approach of using micro resonator to measure this parameter is proposed. This project focuses on the fabrication of the proposed micro resonators. In particular, a micro fabrication process is developed and investigated on several resonators with different dimensions. The release etching time needed for each resonator is studied in detail.

Robotic Design Infrastructure – Control System and Algorithm

Advisor   : YUEN Matthew M F / MECH
Co-Advisor   : WOO Kam Tim / ECE
Students   : WANG Mingxi / MECH
(UROP1000, Summer 2011)
XIE Yuyang / MECH
(UROP1000, Summer 2011)

HKUST has competed in quite a number of robotic competitions in the past. The design effort for each competition was done on an ad-hoc basis and there has not been a systematic approach in the overall design. This project aims to design a systematic approach towards the overall system design of a robot. We use simulation approach to analyze and optimize the robot control system and also develop a new control algorithm for the robot. We intend to identify an approach which can improve the control system algorithm and help to reduce the time for tuning and to enhance stability.

School of

Business and Management

Legal Environment and Accounting Policy

> *Advisor : HUANG Allen H / ACCT*
> *Student : LAU Ka Yi / ACCT*
> *(UROP1100, Summer 2011)*

Earnings manipulation is adopted in the financial statement of some companies to meet their earnings target, and the two types of manipulations are accrual and real. However, accrual manipulation, which involves underestimating bad debt expenses, may lead to lawsuit if fraud is detected. In contrast, real manipulation, which includes cutting expenses, overproducing inventory and selling fixed assets, is legal without any regulatory consequences. Considering that the adoption of real manipulation complies with the law while accrual manipulation is not, in this project, I study whether management will switch to real manipulation from accrual manipulation in response to increased litigation risk and outside scrutiny.

Further Evidence on the Tradeoff between Real Manipulation and Accural Manipulation

> *Advisor : HUANG Allen H / ACCT*
> *Student : LEUNG Justin Hilyin / ECOF*
> *(UROP1000, Summer 2011)*

There have been major corporate and accounting scandals unraveled shortly after the turn of the century, such as those of Enron and WorldCom. As a response to these scandals, the Sarbanes-Oxley Act was passed in 2002, which has set more stringent standards for all US public companies. This has led to increased regulation and litigation risks for firms, and this project employs a small sample test to examine how firm managers, subject to securities class action lawsuits, substitute real activities management for discretional accruals management in reporting earnings.

Real Manipulation, Accural Manipulation and Change in Litigation Risk

> *Advisor : HUANG Allen H / ACCT*
> *Student : SUN Yee Lok / QFIN*
> *(UROP1000, Summer 2011)*

In this project, I study whether there is any change in earnings management when firms are subjected to change in the legal environment, in the period of and after securities class action lawsuits. I find that managers tend to substitute real manipulation for accrual manipulation after lawsuit filings, and the result suggests a tradeoff between real and accrual manipulations.

Legal Environment and Accounting Policy

Advisor : HUANG Allen H / ACCT
Student : WONG Yin Lam / FINA
(UROP1000, Summer 2011)

The objective of this research project is to study the over-time changes in accounting policy due to the change in legal environment in the US. Calculations on the abnormal level of key real manipulation activities and computed by equations quoted from past research. This shows whether companies which exercised accrual manipulation before will change their earnings management approach to real manipulation. We believe the findings will have important implication to researchers, accountants and government agencies.

Management Decision between Real Manipulation and Accural Manipulation

Advisor : HUANG Allen H / ACCT
Student : XIAO Mengdi / FINA
(UROP1000, Summer 2011)

In this research project, I aim to study managers' decision on accounting policy when they are faced with litigation risk. According to Graham, Harvey and Rajgopal's survey (2006), 80% of the surveyed CFOs would lower expenditures by real manipulation method, while 55% would postpone starting a new project. I intend to find out from the research whether managers engage in real manipulation will use all five aspects (cutting R & D and SG & A expenditures, overproducing inventory, timing of asset sale and increase total accruals) to report higher earnings.

The Microeconomics of Migrant Worker in Hong Kong

Advisor : VISARIA Sujata / ECON
Student : WONG To Yeung / MAEC
(UROP1000, Summer 2011)

This is a research project on migrant domestic workers in Hong Kong conducted during the summer of 2011. Their savings, expenses, remittances and borrowing behavior are analyzed. Factors affecting their saving pattern are tested for their significance and the underlying mechanism is proposed.

Industry Structure and Finance

Advisor : MACKAY Peter Ian / FINA
Student : ZHANG Jin / FINA
      (UROP1100, Spring 2011)

The Herfindahl-Hirshman Index (HHI) is a measure of the size of firms relative to the industry and an indicator of the level of competition among them. This project examines the effects of industry structure on a variety of finance issues by investigating HHI data from US Census Bureau website with data analyzed by SAS programming.

Industry Structure and Finance

Advisor : MACKAY Peter Ian / FINA
Student : ZHU Juan / FINA
      (UROP1100, Spring 2011)

By participating in UROP under the supervision of Prof Peter MacKay in spring 2011, I have gained a diversified understanding and hands-on practical experience in three different projects. These projects mainly focus on examining the effects of industry structure on various finance issues, such as the cyclicality of investment, diversification and the fraction of systemic and idiosyncratic risk.

High Dimensional Data Analysis

> *Advisor : HU Inchi / ISOM*
> *Student : HO Ho Yin / MAEC*
> *(UROP1100, Spring 2011)*

In traditional statistics, it is assumed that data contain many observations and few explanatory variables. High dimensional data analysis is a completely contrasting case. It is data containing large number of explanatory variables and limited number of observations. A typical example would be medical test. Researchers tend to collect as much information as possible from every test takers. As a result, they usually have only a few observations but a large amount of explanatory variables. In this project, I study several methods for high dimensional data analysis and conduct a simulation to demonstrate these methods by using two toy models.

High Dimensional Data Analysis

> *Advisor : HU Inchi / ISOM*
> *Student : HU Jianchang / MAEC*
> *(UROP1100, Fall 2010)*

According to Donoho (2000), there are four important fields in high dimensional data analysis: Classification, clustering, regression and latent variable analysis. The ultimate goal is to try to find out the most useful information from the huge data sets on hand and to build a model based on the information for predicting possible outcomes. In this project, I conduct a simulation study to test the feasibility of the method proposed by Chernoff et al (2009) based on the backward haplotype-transmission association (BHTA) algorithm pioneered by Lo and Zheng (2002). This method attempts to discover several most influential subsets of variables. The testing is also applied to an existing data set as a preparation for further study.

Strategic Pricing and Timing of New Products

> *Advisor : HUI Kai Lung / ISOM*
> *Student : LEUNG Cheuk Shing / ACCT*
> *(UROP1100, Spring 2011)*

This research project uses a game theory approach to investigate the problem of pricing strategies adopted by vendors selling durable goods. Firms deal with consumers that have different valuations towards a product, and so they may not buy the same product at the same price. Usually, firms sell projects only to those who have higher valuation, because they can achieve higher profits from such type of consumers. However, vendors will face a problem with pricing and targeting which type of consumers when new products are introduced. In this project, the vendor's timing and pricing decision are analyzed when it faces an installed base of the old product. The setting allows the vendor to decide whether, when and how much to sell both the old and new products.

Strategic Pricing and Timing of New Products

> *Advisor : HUI Kai Lung / ISOM*
> *Student : XIE Wenxin / GBUS*
>   *(UROP1100, Spring 2011)*

This project is based on game-theoretic analysis to study the timing and pricing strategies of a vendor when introducing new production. In a previous version of the study, it is assumed that high type consumers own the old product prior to the beginning of the game. In this study, the purpose is to extending the game-theoretic model to consider the case where the low type consumers own the old product. Subsequent pricing and timing strategies for the vendor are derived using backward induction. The findings show that inter-temporal pricing discrimination and delayed product introduction have relevant policy implications and help researchers to understand business strategies of new production introduction in real-life situations.

The Economics and Social Implications of Search Engine Optimization

> *Advisor   : SIN Raymond G / ISOM*
> *Co-Advisor   : SHUM Stephen W H / ISOM*
> *Student   : WANG Yitong / ECOF*
>   *(UROP1000, Summer 2011)*

This project is an investigation into how search engine users are influenced by various strategies that firms adopt in improving their visibility on search engine results page. My work in this project involves summarizing and analyzing academic papers on search advertising. I have also compared the key questions, assumptions, models and key findings between different studies, so as to prepare for formulating and solving analytical models.

The Economics and Social Implications of Search Engine Optimization

> *Advisor   : SIN Raymond G / ISOM*
> *Co-Advisor   : SHUM Stephen W H / ISOM*
> *Student   : ZHAO Yiqun / MATH-ST*
>   *(UROP1100, Fall 2010)*

As the internet is developing very rapidly nowadays, search engine optimization (SEO) is also gaining importance. By maintaining a high position on the search engine result page, a company can get more traffic for its website, which leads to higher sales and reputation. In this project, we investigate how search engine users are influenced by various strategies that firms adopt in improving their visibility on search engine results page.

Financial Risk Management

Advisor : SO Mike K P / ISOM
Student : JIANG Yue / RMBI
(UROP1100, Fall 2010)

This research project focuses on finding a suitable model to forecast the quantile based realized volatility of financial asset's return. We first learn about the necessary background knowledge and review literature about modeling technology. We then collect high-frequency data, write programs for sorting stock prices, calculate quantile based realized volatility and study its properties.

A Text Mining Approach on News Analytics: Overview and Empirical Study

Advisor : SO Mike K P / ISOM
Student : LI Wai Ming / RMBI
(UROP1100, Fall 2010)

This project studies the use of text mining approach in trading volume prediction in high frequency context. Several state-of-the-art algorithms are introduced and an empirical study is conducted. Results show that the classification attains 75% accuracy at cross validation in predicting whether trading period subsequent to the news arrival has an abnormally high/low trading volume.

Use of Statistical Technique in Financial News Analytics: Experimental Study and Discussion

Advisor : SO Mike K P / ISOM
Student : LI Wai Ming / RMBI
(UROP1200, Spring 2011)

This project is a study on various techniques in classification problem of financial news analytics. The Principal Component Analysis (PCA), Linear Discriminant Analysis and Latent Semantic Indexing techniques are examined for level of accuracy and ability in reducing the noise level of the extracted data. Results show that the use of PCA attains a similar level of accuracy but a much smaller bias in classification.

Trading Volume and News Headlines

Advisor : SO Mike K P / ISOM
Student : WONG Chun Ko / RMBI
(UROP1100, Fall 2010)

The aim of this study is to explore the relationship between trading volume and news headlines in content and quantity. In particular, we investigate how emergence of news affects the trading volume. Stock data from HSBC trading volume from a particular period of time and news headlines from major publications are obtained to analyze whether the quantity and quality of news are closely related to trading volume.

Comparison on Copulas and Conditional Depending using Copula-GARCH

Advisor : SO Mike K P / ISOM
Student : YEUNG Yuk Ting / RMBI
(UROP1100, Fall 2010)

Multivariate GARCH (MGARCH) models are popularly discussed in academic studies because of its satisfactory estimation of conditional dependence. In this project, copula-GARCH, another type of MGARCH, is studied for its ability in giving more precise estimation on conditional dependence with non-normal multivariate distributions. Important functions and properties of copula and MGARCH are highlighted and studied. Through these understanding, we identify a new research direction on financial time series.

Corporate Campaign Contributions and Political Favoritism

Advisor : ZHANG Michael X / ISOM
Student : ZHANG Tong / IS
(UROP1000, Summer 2011)

This project examines the causal link between corporate campaign contributions and political favoritism. We analyze the impact of unexpected news coverage of some Congressmen's scandals on their contributing companies' stock market performance. The study shows that companies donated to those politicians have suffered negative cumulative abnormal returns around the days the scandals were made public, and companies with more donations also suffered more seriously. To the extent that politicians' unexpected career crises should not have any impact on donating firms' financial prospects if no political favoritism existed, our results suggest the existence of firm-specific political favoritism.

Consumer Shopping Behavior in Internet Group-buying

Advisor : ZHENG Rong / ISOM
Student : HUANG Yuelun / MAEC
(UROP1000, Summer 2011)

Internet-based group-buying is one of several important innovations of modern transaction. It has advantage over traditional sales in providing more choices, symmetry information and foreseeable deal price. Recently, the popular "groupon.com" is launched in China. However, the transactions in China are set by very low limit on the number of buyers for every successful deal, and most of the transactions have low constant prices. This study collects data from past sales on "groupon.com" and the factors are ranked according to contributions to successful deals and consumer behavior in future deals are predicted.

Consumer Shopping Behavior in Internet Group-buying

Advisor : ZHENG Rong / ISOM
Student : KHOR Sher Lyn / ACCT & IS
(UROP1000, Summer 2011)

The trend of group-buying has become more and more popular in many countries around the world. Every day, more than 100,000 new deals are made in this market. The overwhelming responses from consumers have resulted in extremely favorable outcomes to merchants, which include boost in sales as well as increase in reputation. This project aims at understanding consumers' buying behavior by collecting information on buying patterns on group-buying websites. Codes are developed for the purpose of data collection related to cities, current deals and specific details of the deals.

Consumer Incentives in Participating Internet Group-buying

Advisor : ZHENG Rong / ISOM
Student : TSOI Ho Yin / ECOF
(UROP1000, Summer 2011)

In the past few years, internet group-buying has become popular in Hong Kong. To investigate what factors influence the number of purchases, we have to collect and quantify real-life data from leading group-buying websites. Results show that discount is not the only factor influencing the number of purchases in internet group-buying. Instead, other factors such as cost, location, category and number of pictures contribute to the incentives for consumer to participate in group-buying.

Why do Consumers buy Counterfeid Goods?

Advisor : DALTON Amy N / MARK
Student : LEE Wing Sze Ida / MARK
(UROP1100, Spring 2011)

A materialistic social environment has led individuals in the pursuit of obtaining luxury possession that are heavily advertised. With genuine products demanding a premium price tag, some consumers purchase counterfeit products as an alternative. Most existing literature focuses on materialism being the main motivation for consumers to purchase counterfeit goods, however there is a need for further investigation to explore other possible motives. This research will focus on how self-monitoring and variety seeking consumers would affect the relationship between the presence of counterfeit products appearing in a consumer's choice set and the likelihood to buy designer brands.

Counterfeit Consumption: Self-control and Temptations

Advisor : DALTON Amy N / MARK
Student : LEUNG Kiu Man Lydia / MARK
(UROP1100, Spring 2011)

This research demonstrates that consumers' desire for counterfeit goods is based on their level of self-control. To consumers, counterfeit products may be regarded as a temptation regardless of their level of self-control. In particular, people with higher self-control tend to choose items they have classified as necessity while those with lower self-control tend to choose items to fulfill their indulgence. However, with the presence of counterfeit product, people with higher self-control seek for more hedonic options. Experiments are conducted to demonstrate the above theory by manipulation of choice sets. Interestingly, results suggest the opposite as proposed, due to variety seeking in the choice sets.

Counterfeit Consumption

Advisor : DALTON Amy N / MARK
Student : YIP Kwan Kiu / FINA
(UROP1100, Spring 2011)

This research aims at exploring the effects of the presence of counterfeit luxury brands on consumers' perception for genuine luxury brands and other non-luxury brand options. The effects vary with the level of self-monitoring. Results show that the subsequent negative change in their preference for the real brand is greater when the luxury brand option is known to be a popular choice. There are several hypothesis made: 1. Low self-monitoring tend to be a consistent factor regardless of the counterfeit option; 2. High self-monitoring may give a higher or lower rating to the luxury brand with the presence of counterfeit option; 3. Popularity has an impact on high self-monitoring to go for the genuine designer brand.

Consumer Nostalgia

Advisor : HONG Jiewen / MARK
Student : HE Yirou / ISOM
(UROP1000, Summer 2011)

Nostalgia, for many people, is a "joyous" experience that can generate positive affectivity and give rise to a "feeling of elation" and raise the level of happiness. Enhancing positive self-regard proposes that nostalgia puts people's earlier selves in a positive light and further adds recognition to "the self". Nostalgia can also make people more affirmed to their relationship with others and make them feel more loved and protected, and can make them perceive their lives in a more meaningful way. After studying literature on nostalgia, I come up with a hypothesis that "the more nostalgic people feel, the more likely they are willing to get involved in voluntary work".

Information Availability v.s. Level of Materialism

Advisor : HONG Jiewen / MARK
Student : LI Ka Yee / ECON
(UROP1000, Summer 2011)

This idea arises when I think of my days as a child. Back then, I knew nothing about trend, fashion and luxury items. So, I was comfortable with what I wore and what I had. When I grew up, I started to learn about luxury from magazines, media, television and friends, and the desire to own some of these items increased. However, when I ask my mother about luxury items, she is familiar with them but she is not interested in owning any of them. Therefore, I aim to investigate through the study to find out whether this pattern in common among the general public.

Nostalgia and Its Effect on Risk Taking

Advisor : HONG Jiewen / MARK
Student : MAK Siu Fung / ECON
(UROP1000, Summer 2011)

Nostalgia is generally understood by psychologists as an emotion from longing for the past; it can be either joyous or sad, but research shows that it is often the former. From marketers' perspective, nostalgia is consumers' common preference towards objects from when they were young. This study focuses on the psychology aspect of nostalgia and its effect on one's risk-taking behavior. It is believed nostalgia affects people's risk-taking behavior for both the low and high life continuity individuals.

Materialism: A Product of Perception

Advisor : HONG Jiewen / MARK
Student : SOO Yi Xin / ACCT
(UROP1000, Summer 2011)

Materialism is defined as the importance a customer attaches to worldly possessions (Belk 1984), while Burroughs and Rindfleisch (2002) state materialism as "the value a consumer places on the acquisition and possession on material objects, and highly materialistic individuals believe that well-being can be enhanced through one's relationship with objects". However, there are still questions about whether non-possession of material objects necessarily make a person non-materialistic, and whether those who spend on expensive holidays and restaurants but not tangible goods can be considered non-materialistic. In this project, I draw several hypotheses in how people are more likely to be perceived as materialistic.

Fading of the Functional Value

Advisor : HONG Jiewen / MARK
Student : ZHANG Tianying / NA-BM
(UROP1000, Summer 2011)

Most rational people consume products for their original function value, for example, books are for reading, furniture is for decorating the house, etc. The more functional value consumers can realize, the more reasonable purchase they will make. Yet, some purchasing behavior may cause the fading of the functional value after payment, which can be considered as irrational purchases. This study examines the process of the fading of the functional value when consumers are faced with an irrational commodity.

Theories Review and Further Thoughts in Consumer Psychology

Advisor : MUKHOPADHYAY Anirban / MARK
Student : LIU Yuan / ECOF
(UROP1000, Summer 2011)

Researchers have developed theories in lay theories of different domains (e.g. self-control, emotions and mood management). These theories are reviewed in this study, and hypotheses are drawn in terms of lay theories of emotion, influence of mood and whether nutrition labels can "change" the taste of food, for further research.

Lay Theory of Obesity

Advisor : MUKHOPADHYAY Anirban / MARK
Student : XU Yingxin / NA-BM
(UROP1000, Summer 2011)

Lay theories are basic assumptions that ordinary people hold about themselves and their world. They can affect people's thoughts and actions implicitly. Lay theory of obesity is what people believe is the main cause of obesity. Researches show that consumers hold mainly one or two lay theories of obesity, such as exercise and diet. This project is an attempt to obtain a big picture of people's lay theories of obesity in order to determine the prevalence of these beliefs, and whether there are other beliefs held by people.

Greed and Relevant Factors in Behavioral Economics

Advisor : MUKHOPADHYAY Anirban / MARK
Student : YANG Yumeng / ECOF
(UROP1000, Summer 2011)

This project is developed based on several empirical studies from research papers, and it focuses on the factors that influence the degree to which people are being "greedy", including social conformity, concerns of fairness, as well as competition. Aspects related to greed, including behavior and outcomes are analyzed for their short term and long term effects.

Consumer Greed

Advisor : MUKHOPADHYAY Anirban / MARK
Student : YU Ronghao / ECON
(UROP1000, Summer 2011)

"Greed" has long been a topic of study in different areas, such as psychology, marketing and economics. In this research project, I conduct basic research particularly about "greed and dishonesty" and "greed and limited time perspective".

The Other Side of Escaping Affect: Whether Compassion would be Regulated when People are in Face of Multi-beneficiary

Advisor : CHAO Melody Man Chi / MGMT
Students: CHEUNG Hoi Fai / CBGBM
(UROP1000, Summer 2011)
 DU Yiwei / FINA
(UROP1000, Summer 2011)

Research on emotional regulation suggested that people can feel compassionate towards the suffering of an individual; however, their compassion would "collapse" in the face of mass suffering. Most of this research focuses on examining the psychological processes underlying helping behaviors and compassion towards other people (e.g., donation to help victims). Little is known about how this emotional regulation process might manifest itself in the context of environmental protection and green behaviors. The current project aims to fill this gap.

Applications of Integrative Complexity

Advisor : CHAO Melody Man Chi / MGMT
Students: CHOO Alex Chian Hon / MAEC
(UROP1000, Summer 2011)
 KAN Tsz Shan / ACCT
(UROP1000, Summer 2011)
 KWAN Hei Wing Karen / MARK
(UROP1000, Summer 2011)
 LEUNG Wing Hay Eiki / GBUS
(UROP1100, Summer 2011)

This project aims to understand the concept of integrative complexity, and investigate how that can be applied in examining students' learning outcomes. Integrative complexity has been extensively used in studies to gauge how participants process information by diversification and integration of multiple perspectives pertaining to an issue. Over the summer, we have acquired the skills in conducting cognitive complexity coding and have completed a thorough review of the cognitive complexity literature.

Literature Review on Creativity

Advisor : CHAO Melody Man Chi / MGMT
Student : NI Weicong / ECOF
(UROP1100, Spring 2011)

Creativity is an important element affecting an individual's development, an organization's ability in doing business and a society's progress in technology. Research has been conducted on creativity and factors affecting creativity. In this project, some of the factors, including age, gender, social network, task conflict and physical environment are reviewed to examine their relationship with creativity.

Multiculturalism, Social Judgments and Decisions

Advisor : CHAO Melody Man Chi / MGMT
Students : PI Chendong / GBUS
(UROP1100 & 1200, Fall 2010 & Spring 2011)
YE Jiong / FINA
(UROP1100 & 1200, Fall 2010 & Spring 2011)

Past studies have suggested that expatriates' perceived distinctiveness of cultures could have an impact on their cross-cultural adjustment and adjustment outcomes. However, few studies have examined how expatriates' lay beliefs could set up their cultural perceptions. Although we have gained significant understanding of the roles of lay theories of race in cognitions and dynamic processes in cross-cultural context, few scholars have applied such a perspective into the field of cross-cultural adjustment of expatriates. This research identifies the gap in the current adjustment literature and develops propositions that address the dynamic processes through which lay beliefs might function. It also aims to examine the implications of this adjustment processes to international assignments.

Corporate Reputation in a Global Context

Advisor : CHAO Melody Man Chi / MGMT
Student : WU Xiaoyue / FINA
(UROP1100 & 1200 Fall 2010 & Spring 2011)

Corporate reputation is a relatively new topic in business management and social sciences. This project is an attempt to contribute new insights to the topic by investigating corporate reputation from a psychological perspective. A business case is used as the focus of study. Literature review is conducted and a model on corporate reputation under global context is also put together based on the literature review. A survey in the form of a questionnaire is then carried out to verify the proposed model and predictions.

A Literature Review on Corporate Reputation

Advisor : CHAO Melody Man Chi / MGMT
Student : ZOU Ailin / FINA
(UROP1100, Spring 2011)

Corporate reputation is of great significance. It is regarded as an intangible asset that enhances customer satisfaction and loyalty, employee retention, firm equity and investor awareness. This project is a study on the factors affecting corporate reputation, namely, familiarity with the company, corporate social responsibility, corporate responsibility and corporate branding.

School of

Humanities and Social Science

Division of Social Science

Urban Renewal and Redevelopment in Hong Kong: Discussion on Future Farmland Utilization in the New Territories

Advisor : CHEN Yun Chung / SOSC
Student : ZHANG Shichen / ECOF
(UROP1100, Spring 2011)

Like many metropolitans, Hong Kong has carried out a series of urban renewal projects. The farmland area in Hong Kong has been decreasing year by year. In 2010, some villages in the New Territories received notice of removal due to the construction of high-speed railway. This means more farmland will be transformed to other use, and peasants have to make their livelihood on a new piece of land. In the context of urban development, we investigate questions such as: what is the prospective of agricultural factors in metropolitans like Hong Kong? What would be the future utilization of existing farmland?

China/Africa Links Project

Advisor : SAUTMAN Barry V / SOSC
Student : BAO Jin / ECON
(UROP1100, 1200 & 1300,
Fall 2010 , Spring 2011 & Summer 2011)

This project was first started in fall 2010 and ended in summer 2011. We first search for blogs and articles with news related to China and Africa and find as many news sources as possible in print and on the internet. Then, the news articles are summarized in a database and the content is categorized to look for patterns in how newspapers illustrate the China/Africa issues. The next step is to look at the bigger picture about China/Africa relationship and the systematic failure existing in the world economy and how to interpret Africa's current situation. In the last semester, we study the grass-root interactions between Chinese and Africans and the interaction between State-owned Enterprises (SOE), private corporations and the state over the years in terms of policy, funding and other support.

China/Africa Links Project

Advisor : SAUTMAN Barry V / SOSC
Student : LEUNG Chin Ka / ACCT
(UROP1100, Spring 2011)

Zambia is the third largest copper producer in the world, and China has invested a huge amount into Zambia's copper industry. The focus of this project is on Zambia's copper industry, and data related to the multi-national companies operating in Zambia are collected and analyzed for a better understanding of labor relations between Chinese-owned enterprises in Africa.

Liu Xiaobo and the 2010 Nobel Peace Prize

Advisor : SAUTMAN Barry V / SOSC
Student : LIU Zhanxiang / FINA
(UROP1100, Spring 2011)

The topic of this project was under major debate at the time I joined the project in spring 2011. I am interested about studying this issue from a social science perspective, and I am involved in reading articles and collecting quotes from the articles for discussion and analysis.

China/Africa Links Project

Advisor : SAUTMAN Barry V / SOSC
Student : SONG Chenlu / ECOF
(UROP1100, 1200 & 1300,
Fall 2010, Spring 2011 & Summer 2011)

In this project, I am involved in searching for articles about China's investment in African countries, mostly from well-known US publications found in research database. The objective is to analyze the articles and draw possible conclusions about the attitude of US mass media towards China's increasing presence and involvement in African countries. Major themes are developed to categorize the news articles collected. Lastly, I research on how Chinese interact with Africans by reading blogs and posts written by Chinese who live and work in Africa.

China/Africa Links Project

Advisor : SAUTMAN Barry V / SOSC
Student : ZHOU Yishi / ACCT
        (UROP1000, Summer 2011)

In this project, I am working with other students to gather data and information related to China/Africa relationship in databases, newspapers and magazines. I am also involved in finding sources of data and statistics related to agriculture in Africa and their relationship with food market in China.

The Changing Face of Business in Guangdong: How Hong Kong Firms Innovate to Succeed

Advisor : SHARIF Naubahar / SOSC
Student : KWAN Yat Kit / ECON
        (UROP1100, Fall 2010)

Using Hong Kong firms with manufacturing bases in Guangdong as backbone, this project examines the challenges of the operation of Hong Kong firms in Guangdong and the ways to survive in this increasingly competitive market. Several ways for the Hong Kong Government to collaborate and help boost Hong Kong's innovation industry are also suggested.

Investigating the State of Innovation and Technology in Hong Kong and Taking Hong Kong as the Case Study

Advisor : SHARIF Naubahar / SOSC
Student : YE Guangzhi / MAEC
        (UROP1100, Summer 2011)

As the pressure of competition from mainland China and other Asian countries increases, there is a need for Hong Kong to transform into a knowledge-based economy. Many top universities in Hong Kong are supportive of the change and are the driving forces behind the transformation. HKUST is the focus of this case study to evaluate its contribution to research and development and technological innovation and entrepreneurial programs and activities.

Democratic Development in China

Advisor : SING Ming / SOSC
Student : GAO Ang / GBUS & IS
(UROP1000, Summer 2011)

Democratic development is a complicated and controversial topic, and many experts have drawn rather opposite conclusions from different perspectives. In this project, I study the conclusions from various studies and present the findings as a summary.

Where has Income Inequality been Leading Singapore Towards? A Brief Review of Singapore's Income Inequality

Advisor : SING Ming / SOSC
Student : GAO Jinghan / MAEC
(UROP1100, Spring 2011)

This is a brief review of my research work during this semester, including a review of the inequality situation in Singapore, the possible underlying causes of the phenomenon and the effects of democracy on income inequality worldwide.

Constitutional Development of Hong Kong

Advisor : SING Ming / SOSC
Student : LEUNG Tsung Hang / BICH
(UROP1100, Fall 2010)

This project focuses on organizing public opinion on different social service organizations and engineering / business organizations toward the proposals for methods of selecting the Chief Executive (CE) of HKSAR. Views are collected from newspapers and corporations in Hong Kong and then categorized.

Housing Policy, Home Ownership Scheme and My Home Purchase Plan: The Future of Hong Kong

Advisor : SING Ming / SOSC
Student : LEUNG Wai / FINA
(UROP1000, Summer 2011)

The purpose of this project is an attempt to identity an optimal policy for Hong Kong's housing problem – the supply-demand imbalance and the skyrocketing of property prices. The reasons for and against the resumption of the Home Ownership Scheme (HOS) are analyzed, and it is compared with the My Home Purchase Plan (MHPP) raised by the Hong Kong Government, in order to derive suitable housing measures and create a better future for Hong Kong.

Cases of Corruption: A Review of Empirical Literature from 2010-2011

Advisor : SING Ming / SOSC
Student : POON Hok Chi / ECON
(UROP1000, Summer 2011)

The adverse consequences of corruption are gradually recognized by current research. Reducing corruption by understanding its causes is crucial. In reviewing the empirical literature to find out the causes for corruption, a wide range of determinants is displayed and arranged in the following four aspects: level of democracy, natural resources, decentralization and quality of the government. This project summarizes the main theories and explanations for corruption, reveals the major determinants and suggests direction for further research.

Hong Kong's Democratic Development

Advisor : SING Ming / SOSC
Student : WONG Tsz Ying / ACCT
(UROP1000, Summer 2011)

Before the Hong Kong's return of sovereignty to China in 1997, the majority was concerned about the progress of democracy in Hong Kong under new governance. To many, it is surprising that the progress of democratic development has been going steadily. Hong Kong is now in a state of "transition fatigue", under a hybrid regime that combines democratic and authoritarian elements in a tense mixture. This project studies the major political and social factors surrounding Hong Kong's latest democratic development.

How Recent Events in the World have Transformed the Chinese New Middle Class?

Advisor : SO Alvin Y C / SOSC
Student : MO Yee Kwan / CPGBM
(UROP1000, Summer 2011)

China has not escaped unscathed from the global financial tsunami in 2008. Despite China still maintains its economic growth at 8% per year, many new social problems have arisen due to the financial crisis, with inflation viewed as one more the foremost concerns. The new middle class in China is growing, and at the same time more pro-democracy movement are taking place among the middle class. This project focuses on how the recent global economic crisis and the pro-democracy movements in the Arab world have transformed the politics of the new middle class in China.

The Making of the 21st Century Cadre-Capitalist Class in China

Advisor : SO Alvin Y C / SOSC
Student : TAN Sze Jye / FINA
(UROP1000, Summer 2011)

The miracle of the Chinese economic development since the 1980s was accompanied by the rise of the Chinese capitalist class. At the turn of the first decade in the 21st century, the trend of the intertwining Cadre-Capitalist class formation does have its presence. This project aims at further examining the ongoing formation of Cadre-Capitalist class by incorporating three significant historical developments: 1. Jiang Zemin's "Three Representations" in CPC; 2. Development of the Chinese legal system; and 3. the intensification of anti-corruption campaign in China.

Anthropomorphism and Pro-environmental Behaviors

Advisor : TAM Kevin K P / SOSC
Student : CHEN Xi / APHYS-MS
(UROP1100, Fall 2010)

The worldwide environmental conditions are witnessed to be deteriorating in recent decades. While environmental protection has become a hot topic, how to arouse people's awareness and activate pro-environmental behaviors have been discussed by many. Anthropomorphism is one of the interesting phenomena observed, that people would describe earth as "Mr Earth", and one of the famous examples is Al Gore's Nobel Peace Prize acceptance speech in 2007, describing the Earth as "suffering from a fever". This project investigates how anthropomorphism could influence pro-environmental behaviors.

Psychology of Happiness

Advisor : TAM Kevin K P / SOSC
Student : LEUNG Tsz Chung / BICH
(UROP1000, Summer 2011)

During the project period, I participate in lab meetings for discussion of different issues related to the topic on the psychology of happiness. Literature review is conducted in areas including the basics of subjective well-being (SWB), methods of examining SWB, variability and stability of SWB and the cultural influence on SWB. I have also contributed in the data entry and verbatim coding of questionnaires on "the relationship between money and happiness".

Do You Generally Feel Happy, but Not Satisfied in Life?

Advisor : YIK Michelle / SOSC
Student : CHAN Perrin / BICH
(UROP1100, Spring 2011)

What determines how happy you are and your subjective well-being? Are there any differences between these two concepts, and if so, in what aspects? Many scholars have used subjective well-being and happiness interchangeably in literature; however, I believe that they are not equivalent. In the proposed study, I aim to conduct a survey study to find out whether there are differences between these two terms by focusing on the culturally appropriate emotions and ideal affect.

The Relationship between Ideal Affect and Normative Affect

Advisor : YIK Michelle / SOSC
Student : DAI Wei / MAEC
(UROP1100, Summer 2011)

In the proposed project, the relationship between ideal affect and normative affect is examined. I focus on two questions: 1. In general, what is the relationship between ideal affect and normative affect? 2. Does this relationship depend on other factors, such as valence of emotion, culture, etc.? My hypothesis is that ideal affect converges to normative affect over time. To test the hypothesis, I design two studies, with the first one testing that ideal affect is more consistent with normative affect in tight cultures than in loose cultures, and the second one testing the relationship between ideal and normative affect.

Desired Affective States of People with Anhedonia

> *Advisor : YIK Michelle / SOSC*
> *Student : HO Yiu Nam / PHYS-PP*
> *(UROP1100 & 1200, Fall 2010 & Spring 2011)*

Anhedonia is generally defined as the diminished capacity to experience pleasure (Meehl 1962; Rado 1962), with physical anhedonia as the lack of pleasure in the engagement of various sensory stimuli, and social anhedonia as the lack of pleasure in the engagement of various social activities. Past research has obtained positive correlation between desired and actual affective states on the affective circumplex with normal, healthy university students (Kampfe & Mitte, 2009). However, no studies were conducted to examine the relationship between the desired affect state of anhedonics and anhedonia. This study furthers our understanding of anhedonia - is anhedonia driven by the incapacity to experience positive affect or the lack of motivation to seek positive affect.

Facial Expressions of Emotions

> *Advisor : YIK Michelle / SOSC*
> *Student : LI Kwan Ho / ECON*
> *(UROP1100 & 1200, Spring 2011 & Summer 2011)*

During the last two decades, there have been fierce debates on how people perceive emotions in facial expressions. Russell (1987) suggested that perception of emotions is not absolute, meaning that the process of perceiving emotion could be influenced by the context, such as other facial expressions in an experiment. In this project, I first reviewed Russell's perspective on facial expressions of emotions and his views on the effect experimental methods on perceiving emotion in faces. Then, I tested if the context influenced the perception of an emotion from faces by asking subjects to recognize emotions from faces in a questionnaire study. Results showed that the emotion perceived in a face depended on the prior faces viewed, implying the significant effect of context in emotion perception.

The Relationship between Social Behaviors and Hedonic Deficits among University Students

> *Advisor : YIK Michelle / SOSC*
> *Student : WAN Hanzhe / FINA*
> *(UROP1100, Summer 2011)*

Anhedonia has been the subject of numerous studies since it was first observed as one of the defining characteristics of schizophrenia. It has been widely accepted that anhedonia reflects a deficit in anticipatory or "appetitive" pleasure, resulting in a failure of motivation and behavior directed towards obtaining reward (Germans & Kring 2000). Plenty of studies have been conducted to examine the relationship between anhedonia and affective experience, but only a few were conducted to study the influence of anhedonia on social behaviors. In the proposed study, I examine the role of anhedonia in romantic relationships and academic performance among university students.

Facial Expressions of Emotions

Advisor : YIK Michelle / SOSC
Student : ZHU Yuwei / MATH-AM
        (UROP1100, Summer 2011)

In the proposed study, I aim at discussing the gender differentiation in the development of ideal affect in the Chinese community.   There have been many studies focusing on cultural differences in ideal affect, mainly between Chinese and Europeans (Tsai, Knutson & Fung 2006). Although some have found the difference of ideal affect in childhood, most focused on the ideal affect of young adults. Therefore, I designed an experiment to assess gender difference in ideal affect among adolescents, andto assess the ideal affect from childhood to middle-age.

Child Care and the Labor Supply of Women in China

Advisor : ZHU Yi / SOSC
Student : ZHANG Zheming / ELEC
        (UROP1100, Spring 2011)

In this project, Stata is used to process the data from a longitudinal household survey. The main work includes data cleaning and construction of new variables and samples.

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