Book of Abstracts

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The plug: When Entertainment Connects

Adewale Adegbemigun
Prof. Crystal Kim

The Plug is about alumni empowerment, it is a way for the students that want to get into the entertainment business to get their first piece of opportunity. We are not giving students information that is top secret we are just providing a one stop shot for job opportunities that they should know about and asking for nothing in return. The top artists earn a large percentage of recorded music income, a portion of that money is being made behind the scenes. The average musician makes an extremely small amount of money from sound recordings. Therefore most of the money is behind the scenes, which is unfortunate because not that many people are privy to the connections that need to be made in order to make money behind the scenes in the industry. Sixty percent of the revenue that artists live off of comes from performances, teaching and bands/ ensembles. This is very significant because of the amount of people that want to go into the record business and entertainment business but don't know how to go about it, not knowing that most of the steady money is behind the scenes.

Semi Classical Motion of Quantum Particle in One Dimension

Carlos Aguayza
Prof. Boris Gelman

The goal of the project is to model dynamics of non-relativistic single and two-particle quantum systems in one dimension using the semi classical approximation. In this approximation, the motion of particles can be described in terms of wave packets propagating according to the time-dependent Schrodinger equation. Our goal is to develop numerical solutions of the time-dependent Schrodinger equation using the Mathematica software package. In addition, we will create animations of the wave packet motion.

A Case Study of Linkage Synthesis for Robotic Application

Rafaela Alba
Prof. Angran Xiao

Roboticists often model movement in their machines after the natural movement of humans and animals. The linkages used to transmit forces and motions in robots are usually designed with inspiration from natural joints of humans and animals. The most commonly used linkage is the 4-bar linkage, and because of its efficacy and simplicity it was chosen as the linkage for the “walking motions” of a quadrupedal robot. Designing a linkage from motion requirements, also called synthesizing, involves designing the sizes of all the individual links and their topological structure. The input of the linkage that would generate the motion in this linkage comes from a servo motor attached to the body of the quadrupedal robot. Then, using Grashof’s Law, the input link’s ability to complete full rotational motion was verified. The linkage was then designed using a CAD program, Fusion360, in which the linkage can be moved, simulating the motion that would occur when actuated.

Measurement of Airflow through Entrance Doors

Fuxin Bao, Adam Brzozowski, Raymond Sandoval
Jelani Barro, Demba Diop
Prof. Daeho Kang

Saving energy in buildings is of vital importance since the buildings sector is a major contributor to the global carbon footprint. While many studies have focused on infiltration through the building envelope, influences of air flow through entrance doors have not been well studied. Our research is to compare the variation of indoor environment due to infiltration through building entrance doors in lobby areas in two City Tech buildings that have different entrance door configurations.

We monitored outdoor weather and the indoor environment in the lobby areas in the Environmental building without vestibule and Voorhees building with a vestibule on a day. We analyzed the data collected to see the variation of the indoor thermal environment in the two buildings along with the time series of entrance door openings. This poster presents the results of the measurements and compares the results between the two buildings. The results show that the indoor thermal environment in the Environmental building significantly varies while stable in the Voorhees building.

3D Printed Computer Circuits

Sultana Begum
Prof. Farrukh Zia

3D printing technology has rapidly become a mature technology due to the availability of low-cost 3D printers based on open source designs and components. A wide variety of 3D print materials are now available with many different physical and electrical properties. This research project will explore novel and innovative ways to use 3D printing technology to create electronic computer circuits, sub-systems and devices by using a combination of conducting and non-conducting materials and components. The 3D printed computer circuits will have a range of applications in creating systems such as IoT (Internet of Things) devices, bio-sensors, wearable tech garments and jewelry and robots.

Impact of Sea Waves on the Coast of New York

Bill Chinskul
Prof. Gerarda M. Shields

Over 2400 km of the New York City region shoreline is vulnerable to accelerated sea waves and rising sea level due to the anticipated climate change. Since Hurricane Sandy hit the New York coast in 2012, there were more than 50 million people at risk and more than 70 people died from the hurricane as the direct cause. It is important for us to study and prepare for the future. This research is separated into three phases, the first phase is the study of how the waves are generated and move in the ocean and sea. The second phase is the study about the impact and characteristics of sea waves on the coast of New York, and final phase is about how to protect the coastline of

New York from waves and sea level rise. So far research indicates most ocean waves is created from the movement of air across the ocean surfaces or mass movement into the ocean, such coastal landslides, caving and icebergs.

Entertainment Connect

Angle De La Vega
Conny Gordon
Edsel Torres
Prof. Tamrah D Cunningham

The goal of the project is to create, test, and maintain a website that will function as an advisement tool for the Entertainment Technology department. For the fall semester the goal will focus on researching what the website should entail by polling the students currently in the major and creating a website mockup and sitemap. For the spring semester, a trial website will be created to run a usability test to see if it succeeds in making an advisement website that would be used by the students. Based on the results, the project may branch to other departments. In this study, we focus on seeing how well our college (New York City College of Technology) has informed and prepared students of the ENT department [Entertainment Technology] on the major choice/ career tracks in the department. A survey was conducted on the majority of the student department, as well as the faculty staff. For students, they are questioned on major choice, track choice, knowledge of the career paths that this major can offer, job/internship opportunities, and how well they feel on how much information is provided from the school. Faculty is questioned on what they feel they want their students, and students of the major, to know about the major/ career options available to them and any further advice they feel applicable. As well as any possible improvements to the major that could be implemented at school to help incoming and attending student have more interest, knowledge, and to gain in edge after graduating. After gathering all data relevant to the study, the construction of a new advisement website for City tech's ENT majors will be made in order to evaluate how well a more accessible information "booth" will be for incoming and already attending ENT students. The site will include various links ranging from which professor better suits the student for advisement, career information, track information (includes class requirements and track explanation), networking information for potential partners, information on any job/internship opportunities, etc.

Using Augmented Reality in Engineering Education

Juan Estrella
Prof. Benito Mendoza

The term Augmented Reality (AR) refers to the technologies that superimpose digital content generated by computers over the user's view of the real world. AR technologies enhance the version of the physical environment with computer-generated sensory input such as sound, video, or graphics overlaid on top of the real-world view. In recent years, AR has moved beyond expensive military applications and has now entered a wide variety of domains. In engineering education, AR technologies can serve as a learning aid as well as a basis for innovation. The

technology provides 3-D visualizations that allow to: (i) observe flaws in designs before the building process starts; (ii) see phenomena that are invisible to the naked eye, such as electromagnetic fields; (iii) incorporate features of the real world, machinery, facilities, etc. We present mobile app that uses different approaches of AR. Our app aims to enhance learning about electrical circuits, in particular learning about breadboards, series circuits, and parallel circuits.

Mechanical Characterization of Nano-material Doped Polydimethylsiloxane (PDMS)

Deldrys Gomez Reynoso
Prof. Ozlem Yasar

In recent years, Tissue Engineering is utilized as an alternative approach for the organ transplantation. Success rate of tissue regeneration influenced by the biomaterials, cell sources, growth factors and scaffold fabrication. Design and precise fabrication of scaffolds are required to support cells to expand and migrate to 3D environment. At the SET Research Laboratory at City Tech, photolithography and micro-molding techniques are used to fabricate the scaffolds. In this project, dog-bone shaped PDMS and PEGDA testers are fabricated at the Research Laboratory SET in the Department of Mechanical Engineering Technology. Then tensile tests are performed to investigate the mechanical properties of the PDMS. Similar procedure will be repeated for the nanomaterial doped PDMS and PEGDA to investigate the effects of nanomaterials on the mechanical properties of PDMS and PEGDA.

Neural Network to Predict Stock Price

Tsering Y Gurung
Prof. Marcos Pinto

Is there something we can do to predict future stock prices given a dataset of past prices? Machine Learning! Machine Learning is a tool and technology that we can utilize to answer questions with the data and experience. There are a lot of data in the world today generated not only by people but also by computer, phones and other devices. This will only continue to grow in years to come. Traditionally, humans have analyzed data and systems to the changes in data patterns. There are overwhelming number of products in machine learning today.

We have known for a while that the tiniest components of the brain that makes it think and do smart things are special cells called neurons. Some computer scientists had the idea that we can make computer that is modelled after the system of neuron connections. This popular and interesting study is called Neural Networks. Here, we are going to use Neural Network to predict future stock. According to Efficient Market Hypothesis, stock price is random and unpredictable. Changes in Stock Prices are not completely random but very close to it. Good traders will use good predictive models as a tool and decide where to invest. In this project, I am going to build models to predict the stock and plot them on the graph to predict the research.

High Power Laser (ATF Lab)

Yicheng Wang, Xin Yi He
Prof. Viviana Vladutescu

The ATF stands for Accelerator Test Facility, it is a laboratory that focuses on plasma physics and interaction of laser with matter. The type of lasers used include High Power CO_2 Lasers, Ti: Sapphire, NdYAG, fiber and semiconductor lasers. Additionally, the facility includes Ultrafast Electron Diffraction (UED) and Electron Beam. ATF allows scientist from different places (private and public) to use their facility for research and improve their technology and equipment based on the need of users and the funding by the Department of Energy (DOE). By proposing their research project, the scientists are able to set up the experiment and conduct their research after propose is granted. As project's requirement on laser's power increases, the ATF laboratory continue to develop CO_2 High Power Laser. From 2014 to 2018, the laboratory successfully increased the CO_2 laser Peak to Peak power from 1TW to 2.5 TW, and have been able to reliably operate at 2 TW using chirped pulse amplification (CPA).
Our work will be geared towards the improvement of the CO_2 laser. The team will be involved in the pulse stretching and compression stages of the high power laser using diffraction gratings and the actual NaCl lenses which display negative dispersion. This process is also known as Optical Parametric Chirped Pulse Amplification (OPCPA) and is necessary for the amplification of the laser pulse without going over the damage threshold of the elements in the system. The wavelength range of the laser we shall work with is 9.2 μm, the pulse width is 0.22 THz, and the pulse length is on the order of 2 ps. It is our intention to collaborate with the BNL scientists to further improve the OPCPA system in order to achieve CO2 laser output powers as high as 4-5TW. The quality of the beam will be determined using different methods which include M2 parameter and Streak Camera.
Additionally, the team will work on synchronization issues between the amplified 9.2 μm laser beam and the NdYAG laser beam used for the Ge plate in the optical train (the plate works as a mirror when exposed to the 1064 μm due to the surface plasma created).
More work will be done in the interaction between the laser and electron beam in terms of acceleration, diffraction and general matter interaction.

Pitch Labelling of a Corpus of Guitar Sounds for Training a Neural Net Pitch Classifier

Arash Izadi
Prof. Adam J. Wilson

Our research involves developing a labelled corpus of monophonic guitar music suitable for use in (1) training a neural network designed for classification of audio segments as pitched or un-pitched, and (2) training a neural network designed to perform fundamental frequency estimation of audio segments. In the course of producing this training set, we will develop a methodology for combining automated and manual labelling techniques. We will investigate a variety of computational approaches, in both frequency and time domains, for labelling note onsets and

fundamental frequencies. We will also employ manual approaches, marking audio features by listening to and visually examining waveform segments.

Gut Microbiome Analysis of Arthropods

Daniella Labarbera
Prof. Jeremy Seto

The microbiome encompasses the sum total of microorganisms found on and within a body. The gut microbes of hematophagic (blood feeding) insects illustrate a venue of investigation to provide insight into the spread of disease amongst hosts. Ticks are arachnids that feed off diverse hosts. There exist 3 known local ticks that are capable of carrying disease microbes in New York. The Culex complex of mosquitoes represent another hematophagic disease vector. These are of interest because of their blood meal isolation where one species will feed on birds and another on mammals. However, hyrbids between two Culex species will feed on both birds and mammals which provides an avenue of zoonotic disease passage. Through the use of DNA barcoding and metabarcoding, the analysis of gut DNA will verify the types of blood meals as well as the totality of the gut microbiome. Analysis will reveal the possibility of manipulating disease microbes in our environment before they can be spread through hematophagic organisms.

Gut Microbiome Analysis of Arthropods

Mitchell Landero
Prof. Ozlem Yasar

In recent years, Tissue Engineering is utilized as an alternative approach for the organ transplantation. Success rate of tissue regeneration influenced by the biomaterials, cell sources, growth factors and scaffolds are required to support cells to expand and migrate to 3D environment. PEGDA is a bio-degradable and bio-competable material that is commonly used in Tissue Engineering field. In this research, degradation rate of PEGDA will be investigate by dissolving the PEGDA within the water and ethyl alcohol. And results will be compared to decide the degradation speed of engineered scaffolds.

RoboQueen 3D

Jensy Maldonado
Prof. Farrukh Zia

RoboQueen (Robotic Mannequin) is an ongoing research project in the Computer Engineering Technology Department. Its goal is to create a semi-autonomous internet-connected remote-controlled robotic mannequin to conduct research in several areas such as social robotics, interactive storefront fashion display model and to teach computer hardware, software, networking and mathematics concepts in various courses. In the current phase of the research project, some of the RoboQueen hardware circuits and components will be improved and updated with the help of 3D printed electronic and embedded circuits and sensors. 3D printing technology has advanced to

the point where it is now possible to make composite circuits by mixing conducting and non-conducting materials to make custom devices and circuits. These custom 3D printed devices and circuits will be used to add more functionality and features to the RoboQueen project.

Development of Advanced Geopolymer Composites for Structural and Thermal Application

Saminur Miah
Astrid Frank
Prof. Akm S. Rahman

The goal of this project is to improve the mechanical and thermal performance of geopolymer for fiber reinforced geopolymer composites. Due to low temperature processing and high thermal stability, geopolymer is a potential alternative to ordinary Portland cement in construction engineering. It is also a viable alternative to ceramic matrix composites. In this project we will focus on fire retardant geopolymer matrix composites with high flexural strength.
This geopolymer will be prepared using Class F Fly ash, Metakaolin, Potassium Silicate and potassium Hydroxide. Several filler materials including Rice Husk ash, Fumed Silica, Zirconium oxide and Titanium oxide will be used in order to increase compression strength and reduce porosities.
This project will allow us the utilization of several equipment including Vacuum Bagging System, Thinky Mixer, Shake Table, Micro Balance, Optical Microscope, Carver Hot Press, Instron Mechanical Testing Machine, and Rockwell Hardness Tester. The results from previous groups showed improved compression strength with Rice Husk ash and Fumed Silica. We will do further studies in order to evaluate mechanical and thermal properties in with more attention. The results will be presented in terms of Compressive strength, Flexural Strength, Fire test, Optical and Scanning Electron Microscope.

Environmental and Energy Sustainable City (EESC)

Patrice Prosper
Prof. Masato Nakamura

There is a strong correlation between population size and energy emitted CO_2 levels and an average correlation between the sample populations opposed to idea of anthropogenic causes of climate change and CO_2 emissions.
The final goal of this study is to build a web/mobile application that grows awareness of CO_2 emissions, provides a method to track and monitor harmful energy consumption and wasteful activities. Users will be offered alternative fuel and consumer product options to motivate reducing energy and per capita carbon footprints.

A Novel Hybrid Passive Single Mode Fiber Based VOA/VOC System

Andrei Statchevschi
Prof. Muhammad A. Ummy

Variable Optical Couplers (VOC) and Attenuators (VOA) play essential roles in optical communication systems. VOCs serve to couple or decouple (split) optical beams into more than one beam with a varying and adjustable ratio. VOA, on the other hand, serve to attenuate or reduce, with a varying and adjustable ratio, the optical power of signals. Essentially, the goal is to implement a novel design that will combine both, VOA and VOC, using only passive components and to characterize the specifications of the system. The system operates in the 1550 nm wavelength range which is the wavelength used in optical communications. VOCs are often employed in wavelength division multiplexing (WDM) based optical communication systems where multiple optical signals, each with a different wavelength, can be coupled together into a single fiber or split into multiple fibers. VOAs are often used to protect optical receivers from optical saturation and can reduce the power of beams with certain wavelengths while not affecting others. VOCs and VOAs are two distinct systems and they are mutually exclusive meaning that one system cannot perform the function of the other. Professor Ummy has in this light designed a novel system which combines both the functionalities of VOAs and VOCs into a single hybrid system using financially rewarding passive optical components. Such components do not require external power to function and can simply be attached to the optical transmitter such as a laser.

Design and Fabrication of UV Light Holder for Photolithography

Szewai Michael Tang
Prof. Ozlem Yasar

In recent years, Tissue Engineering is utilized as an alternative approach for the organ transplantation. Success rate of tissue regeneration influenced by the biomaterials, cell sources, growth factors and scaffold fabrication. Design and precise fabrication of scaffolds are required to support cells to expand and migrate to 3D environment. At the SET Research Laboratory at City Tech, pholithograpy is used to fabricate the scaffolds. Main components of the pholithography are “photo-curable material” and an “elevator system”. In current scaffold fabrication set-up at SET, only 2D scaffolds are generated due to the lack of an elevator stage. In this research, to carry the scaffold fabrication from 2D to 3D, elevator stage is designed and fabricated. Our preliminary research showcases that scaffolds can be successfully fabricated with the use of elevator system.

Building Occupancy and Environment Monitoring System

Syeda Tonni
Prof. Farrukh Zia

Abstract- Energy efficient smart buildings require building occupancy and indoor air quality measurement systems to reduce energy consumption of building control systems such as air conditioning and lighting. A variety of methods have been proposed in the past such as passive

infrared (PIR) sensors and ultrasonic motion detectors. A significant challenge in the implementation of these systems is the high cost and complexity of data communication system to gather data from occupancy sensors. In this research project, low-cost data communication system consisting of inexpensive open source hardware and software components will be designed, implemented and tested in a sequence of three phases. Phase one consists of designing low cost 3D printed units containing sensors and wireless circuits. Phase two involves the implementation of wireless data communication and data collection system. In phase three of the project, complete system will be tested and evaluated to measure building occupancy and indoor air quality in real time.

Remote Control Car

Fox Williams
Prof. Zhou Zhang

As one of the popular projects of Robotics, the project of the remote control (RC) car dominates the practical implementation in nearly all Robotics classes at colleges. However, the current design of the RC car has three disadvantages (1) The chassis is brittle for bumping and crashing, (2) The wireless communication is not stable since it is vulnerable to environmental disturbances, and (3) The batteries are not a stable power source unit (PSU) for the RC car.

To overcome these shortcomings: (1) Additive manufacturing was used to make an integral and flexible chassis because the additive manufacturing allows the chassis to be lightweight and stable due to its lattice structure. (2) A signal processing circuit integrated with digital filters was designed to increase the signal stability, and further provided a robust communication channel because the applied digital circuit can depress disturbances of the environment.

(3) A low pass filter was added to the PSU to stabilize the output of the PSU because voltage fluctuations of a DC power source results from the high-frequency noises, and the low pass filter can prevent these noises from passing through the input component.

In the design of the proposed RC car, a microcontroller board based on a removable, dual-inline-package (DIP) ATmega328 AVR microcontroller, Arduino Uno R3 were taken as the controller. The programmed algorithms were embedded into this controller to control the DC motors which were used to drive the body of the car, to process the data acquired by a ultrasonic sensor which enables the RC car to find the path and avoid obstacles, and to manage a Bluetooth communication module which is used to connect the remote control to the car. Besides these, the App of Arduino used in IOS was employed to enable the remote control to the car via iPhone. After a series of pilot experiments, the proposed solutions for the RC car are helpful to improve the performance of the design in respect of the stabilization of controlling and the robust communication between the Bluetooth module and the iPhone. Moreover, this project will benefit the future Capstone projects, and the solutions in this project also have the potentials to solve the industrial problems related Robotics.