Book of Abstracts

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Schematic/3D Printing of Bluetooth Speaker

Adewale Adegbemigun
Prof. Sebastian Morales

In 2019 purchasing a good looking, portable Bluetooth speaker is pretty costly and people from the inner city usually purchase low quality sound devices because nobody wants to pay more than $50 to listen to good music; and more times than not the device breaks because it is low quality. For this reason I decided to create the foundation of my own homemade Bluetooth speaker with a custom design in the shape of heart created by two music notes (for aesthetic purposes). The purpose of this project is to show that music can be listened to at a low cost, with quality equipment and can still look great. I created this by buying a few easy to build pieces like a Bluetooth receiver, and a mini speaker along with a manual amplifier.

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. 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.

The robot will have four distinct 4-bar linkage with each leg moving along with the output link. The input link was adapted as a spur gear so that the linkages for the front and back legs would be joined by a gear train. This ensures that there will only be need for a total of two motors.

A motion analysis done in Fusion360, shows that there shouldn't be any collisions during motion, confirming that the design should work adequately. A prototype of the leg was printed to insure that there wouldn't be any problems in the lower half of the legs when it comes to creating enough friction with the floor, since the knee is not motorized.

Measurement of Heat Transfer Rate with Outdoor Weather Station

Fuxin Bao
Prof. Daeho Kang

The waste of energy has become one of the focuses of global attention. It is recognized that effective and long-term control of energy use can significantly reduce the loss of the earth's resources and economy. Energy control is reflected in many aspects, the most common being the

efficiency of equipment and architectural design and material selection. Our study is intended to contribute to such efforts.

We monitored the outdoor weather and the indoor thermal environment in the Environmental building and Voorhees building. We analyzed the data collected to calculate heat transfer rate due to unwanted air flow through the entrance doors. We also calculate the heat transfer rate by using standard weather data measured by a local weather station. This poster presents the results of the measurements and compares the calculated heat transfer rates by the weather data we collected and the standard weather data.

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 1500 miles of the New York City region shoreline is vulnerable to accelerated sea waves and rising sea level due to the anticipated climate change. In this phase of research is a study about the impact and characteristics of sea waves on the coast of New York. As the impacts of climate change accelerate over time, more damage, more flooding, and more erosion is likely in New York, with sea levels continuing to rise and more of the most intense storms expected. The final phase is about how to protect the coastline of New York from waves and sea level rise. In response to these challenges, the City believes that it must bulk up its defenses, improving the coastline with protective measures. This will not eliminate all flooding from all conceivable storms an impossible goal but mitigate the effects of sea level rise where the risk is greatest and reduces the effects of storm waves and storm flooding significantly.
in this career but does not know where to start. Based on the results, the project may branch to other departments.

On Using AI Bots for Voice Controlled Augmented Reality Applications

Juan Estrella
Prof. Benito Mendoza

Artificial Intelligence (AI) has the potential to benefit society in the realms of medicine, security, manufacturing, entertainment, marketing, and many others. One of the advances of AI is in the field of Natural Language Processing and Speech Recognition; making computers understand what humans say and mean. On the other hand, 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. Our research project focuses on integrating AI with AR, specifically on using Speech Recognition for controlling virtual AR objects to enhance the human-computer interaction. We present an empirical study that compares currently available alternatives for creating an AI Bot to implement voice controlled systems. We selected the alternative that meets the criteria of openness, usability, and cost. Here, we present an application in which an online AI Bot process user's commands to control the behavior of cars in a virtual show room. The technology used by this application can be used on a wide range of Internet of Things (IoT) applications such as monitoring systems, entertainment, or commerce and advertising.

Mechanical Characterization of Nano-material Doped Polydimethylsiloxane (PDMS)

Deldrys Gomez
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 and micro-molding techniques are used to fabricate the scaffolds. In this project, dogbone 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.

Entertainment Connect

Conny Gordon
Edsel Torres
Prof. Tamrah D Cunningham

In this study, we focus on seeing how well informed the students of the Entertainment Department are on their major choice. A survey was conducted and given to both students and faculty members.

For the fall semester the goal will focus on researching what the website should entail by polling current students and faculty. For the spring semester, a trial website was created to run a usability test to see if it succeeds with the students. The students were questioned on major choice, track choice, knowledge of the career paths that this major can offer, job/internship opportunities, and how they feel about the information that is provided by the school. The faculty is questioned on their transition from student to employee to teacher. They were also questioned on their networking opportunities and their best advice for the students. After gathering all data relevant to the study, the construction of a resourceful website was developed. Entertainment Connection was created to bring together old and new people of the industry and to inform anyone that might be interested.

A Comparative Study of Incidence of Domestic Violence between Immigrant and Non-immigrant Women in USA

Nadia Gordon,
Prof. Urmi Gosh-Dastidar
Prof. Janet Liou-Mark,
Shamita Das Dasgupta

Immigrant women in the USA come from various socio-economic, cultural, and religious backgrounds. Some of these women suffer from domestic violence; however, due to their strict cultural or social structure they often stay quiet and rarely report these incidents to the authorities. Additionally, since these immigrant women face more challenges than their non-immigrant peers, they are more reluctant or unlikely to leave their abusive partners. An analysis was completed using published data as an attempt to establish if any statistically significant differences exist between reported incidences among immigrant women and non-immigrant women. A chi-square analysis ($\chi 2 = 14.53$; p-value = $0.0023 < 0.01$) reveals that the variation of intimate partner violence incidences among immigrant and native populations is too large to have occurred by chance alone. Comparisons based on gender, marital status, and residency statuses are also studied.

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.

Degradation Rate Calculations of PEGDA

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 scaffold fabrication. Design and precise fabrication of scaffolds are required to support cells to expand and migrate to 3D environment. PEGDA is a bio-degradable and bio-compatible material that is commonly used in Tissue Engineering field. In this research, degradation rate of PEGDA will be investigated 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.

Stock Market Prediction with Neural Network

Dominika Markowska-Desvallons
Prof. Marcos Pinto

Predicting the stock market is a complex mission to understand, especially for folks without any financial background whatsoever. But being able to predict the future economy can be a huge benefit to anyone's financial situation. The idea is to create a tool, which would be able to envision the stock price for the future by analyzing past trends. Using python, high-level programming language, I am working on creating a model of an artificial neural network to predict stock market prices. The neural network is being trained to recognize existing similarities in past stock market data to be able to foresee the future of stocks. Furthermore, I will try to develop ideas which can improve accuracy to over 99 percent. The neural network would be able to detect the market trend, which would let us trade without dramatic errors, especially for folks as me, without financial expertise.

Advanced Composites for Structural and Biomedical Applications

Saminur Miah, Khristian Lang, Astrid Frank
Prof. Akm Rahman

PLA Nanofiber is biodegradable material and useful in biomedical applications. However, PLA nanofibers are weak in mechanical strength. Several efforts are on the way to improve mechanical strength of PLA. The goal of this project is to evaluate mechanical strength of PLA using poly-Imide in a form of composite blend. In addition to the mechanical strength, thermal and micro-structural properties will be evaluated using TGA, DSC, TMA and SEM. The resultant PLA/Polyimide composite will be useful in invasive biomedical structure.

The 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. The results from previous groups showed improved compression strength with Rice Husk ash and Fumed Silica. Also, the results will be presented in terms of Compressive strength, Flexural Strength, Fire test, Optical and Scanning Electron Microscope. Additionally, currently we are still working on the research and its presentation through the website, which is being created by one of the students.

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.

Smart City Observatory

Patrice Prosper
Prof. Masato Nakamura

This project seeks to develop a better method to live stream Particulate Matter (PM2.5) data from air quality sensors for public access. Currently the best format for doing so is by way of PHP and MYSQL however, this requires internet access during the data collection process. Within the NYC subway system, not all stations are equip with WIFI. Nodejs a JavaScript framework and package manager; allows for swifter data transfer between server and client, without the need to Wifi connection.
The New York City Panel of Climate Change (NPCC) proposed a Resilience and Monitoring System (NYCLIM) to the NYC Mayor's office of Recovery and Resilience. This plan partners scientists to decision makers, to improve energy and transportation sectors, with transparency of data findings. The air quality within NYC Subways have been found to be saturated with PM2.5, as discover in prior EESL research. The data needs to be made visible to NYC MTA, decisions makers and the public.

The methodology involves collecting underground subway air quality PM2.5 data using the Adafruite air quality sensor which is connected to an Arduino Uno device. The Arduino Uno is connected to a computer and data filtered through terminal is livestreamed using Web Sockets (Socketio) and viewed in chart format on localhost.

The future goal of this project is to livestream the data to a local Sql or NoSql database and cloud storage and remote accessibility. This will allow for complex statistic and graphical data analysis and possible an open Application Programing Interface (API).

Smart IoT Sprinkler System

Galib F. Rahman
Prof. Xiaohai Li

The average family spends more than $1000 in water costs per year. One-way water is commonly wasted in many households is via inefficient sprinkler systems for lawns. Current technology has enabled the development of automatic sprinkler systems, which can be preconfigured to operate at desired times of day and intervals. Although these systems may reduce the amount of water utilized overall, they are not weather forecast aware. In situations when rainfall is upcoming the systems still water the lawn.
In this project, we plan to implement a smart sprinkler system that has full awareness of upcoming weather and take account of environmental conditions in the past and present. We will utilize the latest cloud computing technology and take account of environmental conditions to create a smart dynamic watering solution. Our system will maximize the cost effectiveness and efficiency regarding water utilization and flexibility.

Interchangeable All Fiber-Based Passive VOA/VOC System

Andrei Statchevschi
Prof. Muhammad A. Ummy,
Prof. Abdullah Hossain

Variable optical couplers (VOC) and variable optical attenuators (VOA) play essential roles in optical communications. VOCs serve to couple or decouple optical beams while VOAs attenuate the optical power of signals; both devices do so with a variable and adjustable ratio. VOCs typically have a single input with multiple output while VOAs have both single input and output. The goal of our research endeavor is to implement a novel design which combines both the above functionalities into one system and characterize said system. The two components that makes this hybridization of two devices into one and switchable operation (coupling and attenuating) possible are a circulator and Sagnac Loop Mirror (SLM). Such components dictate the number of output ports in use (to switch between VOC and VOA modes) and the variable coupling and attenuating ratio. This novel design however requires the fabrication of a novel optical circulator; a circulator is a three-port device which accepts input beam from one port and transmits an output to another port; any input beam injected from the output port will be forwarded to a third port. The new fabricated circulator we are interested in acquiring does the above with one exceptional difference:

any input coming from the third port will be forwarded to the second port to create an oscillation between the two ports. This is vital to the overall design of the system. The SLM contains a polarization controller which manipulates the reflectivity and thus the overall coupling or attenuation ratio of the system; in simpler terms, it controls how much light exits from any single port. The system does not require external power to function and can simply be attached to any optical source as a stand-alone device.

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

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 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) 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, the chassis was outsourced by Elegoo. The implementation of 3D printing for the chassis would enhance its durability and allow it to be driven into objects to test its parameters. Their design allowed the chassis to be sturdy, resulting in little to no damage when the RC car bumped or crashed into objects. To stabilize communication, Elegoo also provided the signal processing circuit and digital filter, which depresses any environmental disturbances. To stabilize the PSU, a low pass filter was added to the battery. Its addition stabilized the PSU by blocking out all high frequency created by the batteries. By implementing additive manufacturing, signal processing circuits, digital filters, and low pass filters, the RC car performed as expected. The 3D printed chassis didn't break when it bumped and crashed into object. The signal processing circuit and digital filter allowed the RC car to operate without any disturbances affecting the signal. Additionally, the low pass filter blocked any high frequency voltage fluctuations from the batteries. The success of this project will benefit CUNY students in future Capstone projects and provide potential solutions to industrial problems related to Robotics.

Solar Responsive Facade in an Urban Environment

Cheriyah Wilmot
Prof. Phillip Anzalone

Due to the high energy consumption in cities like New York, I am designing a shading system to be retrofitted on an existing façade that responds to external thermal conditions. I've conceptualized the functions of the shading system to either block/allow sunlight and analyzed its effectiveness in terms of energy use and illuminance in comparison to the modeled office space. Materials will be explored as well as how it'll function in the future.

Kinetic Study of Amine Cured Epoxy Resins

Xiaona Zhou, Xiaolan Wu, Swati Neogi
Prof. Urmi Ghosh-Dastidar
Prof. Diana Samaroo

The epoxy resin is a class of polymer containing more than one epoxy group (or cyclic ether) and featuring a broad range of applications in the field of paints and coatings, adhesives, electronics.

With utilization of different curing agents including amines, amides, acid anhydrides, phenols and metal oxides, epoxy resins can be hardened via curing reactions. Owing to their excellent mechanical, electrical properties, chemical stability and extensively industrial applications, many chemists have been interested in studying the curing kinetics of epoxy resins. However, one of the major challenges towards the kinetic studies of epoxy resins curing is the high-cost of laboratory simulation of epoxy resins formations. The construction of computer-simulating kinetic models are not only significant to overcome this challenge but also to optimize a better chemical environment and experimental parameters, which ultimately contribute to the success in formation of desired epoxy resin products. Our research focuses on establishing a suitable kinetic models to better study the curing reaction of epoxy resins. Presently, we are working on identifying potential proposed kinetics models based on mathematical analysis on experimental data. Future work will focus on using the functionality and accuracy of the proposed kinetics models to predict both the degree of cure and rate of cure qualitatively and quantitatively.