Book of Abstracts

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1. Multi-material Scaffold Printing
   Anns Charles
   Prof. Ozlem Yasar

   In today's technology, organ transplantation is found very challenging as it is not easy to find the right donor organ in a short period of time. In the last several decades, tissue engineering was rapidly developed to be used as an alternative approach to the organ transplantation. Tissue engineering aims to regenerate the tissues and also organs to help patients who waits for the organ transplantation. Recent research showed that in order to regenerate the tissues, cells must be seeded onto the 3D artificial laboratory fabricated matrices called scaffolds. If cells show healthy growth within the scaffolds, they can be implanted to the injured tissue to do the regeneration. One of the biggest limitation that reduces the success rate of tissue regeneration is the fabrication of accurate thick 3D scaffolds. In this research scaffolds were fabricated with micro-molding and photolithography. Combination of these two fabrication techniques allowed us to work with multiple different materials. Our preliminary results show that, scaffolds can be fabricated with different materials and this allows researchers to control the mechanical properties of engineered scaffolds.

2. Measurement of Airflows Through Entrance Doors
   Lev Chesnov, Demba Diop, Jelani Barro, Haoxiang Cui
   Prof. Daeho Kang

   There have been many studies on the impact of infiltration through the building envelope, not many studies have focused on the air flow through the entrance doors of buildings. This research will show the quantification of air flow rates and the implication of the effects on energy flows. This implication can have a great impact on the energy footprint of a building.
   This research is an ongoing process throughout the course of a year, during which measurements of the: temperature, relative humidity, CO_2 levels, and the frequency of door openings using occupancy sensors. Differential pressure and air velocity over the doors are recorded using an air velocity meter and a pressure differential transmitter. All sensors are placed strategically throughout the lobbies with a weather station monitoring the outdoor environment. The data is primarily focused on air flow over the entrance

doors and the indoor thermal environment within 10-20 ft. of the entrances in both the Voorhees and Environmental buildings of the NYC College of Technology campus. The project seeks to present the results of the measurements taken. Findings so far have proven that the indoor thermal environment in the lobby areas significantly varies during cold and windy outdoor weather. With future studies, the results will enable us to identify the impact of the energy flow through entrance doors in the buildings.

3. Using AI in Developing Web Sites and Applications
Courtney Choy
Prof. Marcos Pinto

Mimicking the way we think and react to real-world situations are the objectives of the field of Artificial Intelligence (AI). The theory behind AI is machine-learning by repetition or induction. Intelligent Web sites/applications which make use of AI would be on the lookout to serve us on the spur of the moment, however, we should have the first word of allowing such service or not. This research proposes a Web application that uses AI in order to assist the computer systems technology department in assigning course sections depending on the apparent preference of incoming students (freshman level) demonstrated through a survey that may be included during the class registration process.

4. Internet of Things (IoT): Raspberry Pi
Lynese Edwards
Prof. Marcos Pinto

In the past research we were introduced to the Internet of Things. We discussed the whole idea behind IoT and it is that devices of all kinds are connected to each other and to the internet. Digging deeper, that connection enables a message of some sort. Whether it be a command to tell a device to actually "do something", for example turning on or off. Or it be a actual message for a user.

Raspberry Pi projects are the best way to get started when working with IoT if one wants to build knowledge and expand it to other applications. Real-time communication technology is an requirement for the development of all IoT applications. Not receiving an important message could change the fate of any situation. For example, one could have a security system and if it doesn't notify you when someone breaks in then it's ultimately worthless. Without IoT the sending of these messages wouldn't be possible. This research project consists of demonstrating how the raspberry pi communicates with another device. This action is the beauty of IoT working. Even though we are going to set up a simple messaging application the use of messaging is very broad. You can use it to

tell a device in your home to do something like turn on the light. That action is relayed in a message form. That is why messaging is so important to IoT.

5. Public Data Visualization Scheme for Smart City
Astrid Frank
Prof. Xin-Zhou Wei

Wireless sensor network plays a very important role in the infrastructure of Internet of Things (IoT). A wireless sensor node is defined as an XBee module connected with one, two, or a couple of different sensors and powered by a battery. The data collected by wireless sensor nodes of IoT with different types of sensors such as light sensors, temperature sensors, humidity sensors, and carbon monoxide gas sensors could be used to monitor the energy consumption and detect hazards in public buildings such as schools, museums, shopping malls, and subway stations. We have successfully built an XBee wireless network with several Xbee end nodes, an Xbee coordinator, a local computer as a host to monitor and display real time data collected by the wireless sensors. We will expend the scale of the smart building monitoring system with more wireless nodes in future.

6. Computerized Homework Education SyStem (C.H.E.S.S)
Harpreet Gaur
Prof. Viviana Acquaviva

In summer of 2017, we developed a web application named C.H.E.S.S. It stands for, Computerized Homework Exercise SyStem. The goal of CHESS is to create a fun, engaging, accessible, low-to-no cost homework solution for teachers to use in classrooms regardless of discipline.

We aim to implement several features through our platform for both instructors and students. On the teachers side, a feature we plan to complete is the ability for instructors to input question-answer sets, with point values of either 5,10, 15, or 20 when creating a topic for a specified course. Multiple topics can be created and assigned per course.

Given an amount of points for an assignment, a list of topics with their corresponding question-answer sets, an in-progress student feature will randomly generate assignments per student.

This semester our goals were to revamp the design of the application to accommodate the new features, complete the teacher's portal of the application, and demonstrate and test a functioning live demo of C.H.E.S.S. in a classroom.

Our long-term goal for C.H.E.S.S. is to have a flexible and secure platform that can be tailored to the needs of professor teaching at the college or high-school level.

Hardware Implementation of an Assistive Technology Mobile Robot
Jannat Hoque
Prof. Ohbong Kwon

In this research I will be upgrading the two different sensors in the 1990 robot Heathkit Education Robot (HERO). The two most common techniques for mobile robot obstacle detection and navigation are based on ultrasonic sensor using sound waves and infrared sensor using light waves. In this research project we compared the pros and cons as well as technical specifications of the two techniques and implement them on a mobile robot to test their effectiveness in real world situations. I used Arduino programming to upgrade the light wave sensors. And to upgrade the sound wave sensor I used raspberry pi programming. Upgrading the sensors of the robot can help the robot to sense if there is something in front of it and react to it, and upgrading the sound sensor can help the robot to react to any sound. Also I am working on connecting the robot to a Bluetooth device.

7. Study of HIV Transmission and Comparisons of various Disease Scenarios
   Kwokching Hui
   Prof. Urmi Gosh-Dastidar

   Infection by HIV is an ongoing crisis globally. According to WHO approximately 36.7 million people were living with HIV at the end of 2016. Globally 1 million people suffered disease induced deaths. Strategy for HIV prevention requires a good plan of actions that includes medical screening, availability of medicines, and a rigorous disease analysis with the available data. In this project we studied HIV transmission during various stages of infection. We looked at different disease scenarios among various cohorts. Comparisons of categorical variables were performed using the contingency table Chi-squared test using 5% level of significance. Fisher's exact test was used for the smaller data size.

8. Solar and Rain Canopies: Urban Oasis
   Afolabi Ibitoye , Elena Zimareca, Evan Banks
   Prof. Alexander Aptekar

   The Urban Oasis is designed to work within existing "Pocket Parks" in New York city as a combined rainwater collector, personal electronics charging station and resting designation for New Yorkers. Intended to not only lessen the demand on the city power grid by using renewable energy to charge devices, the urban oasis is also intended to mitigate grey water overfill in the sewer system and, in general, serve as a model for responsible environmental stewardship in urban areas. The important technical aspects of the canopy specifically to be analyzed were a) how much rainwater could the canopy be expected to collect per operating season b) what the optimal solar panel angle based off of New York's specific geographical location was to maximize solar collection and c) how many full device charges could be expected per operating day. Information was gathered from various local and state organizations. The first prototype is constructed of locally sourced lumber and is currently being assembled by hand using power and hand tools. Based off of historical rainfall data taken from NOAA as well as the design square footage of the canopy, expected total annual rainfall collection was calculated to be 311 gallons. Using sun angle calculations taken from existing solar charts and averaging optimal angles across each month, it was determined that a fixed angle of 60° would be optimal for solar collection. Based off of the specs of the specific solar panel being used and using research from existing sources of information on solar panels, the urban oasis is expected to produce 147 watt hours per day (which approximates as about 27 cellular phone charges per day.) While construction is still underway, the density of the material being used has necessitated design changes to aid in its structural stability. Additionally, New York city specific code is still being researched and officials being consulted to determine the legal hurdles still to overcome and long-term viability of the project existing in a public space.

9. Optimizations in Design and Fabrication of Borromean Rings with Mathematica and Grasshopper
    Faith Kakshak
   Prof. Anne Leonhardt

   The Borromean Rings in the world of mathematics consist of three topological circles, which are linked in a way where removing any ring results in two unlinked rings. In other words all three rings are interlinked but not touching, as in the Olympic ring logo. The Borromean Rings are formed from ellipses, and form compatible near circular forms. Using the 3D visualization software, Mathematica, I will establish a establish the

fundamental form to be 3D printed and add the Seiffert surface to establish surface boundaries, that are compact, connected, and oriented surfaces. After this, adaptation will transform the form to more architectural design iterations.

10. Determination of Fluoride in Varnish Products by Instrumental Analysis
    Zhengdao Li
    Prof. Anty Lam

    Fluoride has been one of the common ingredients used in dental products due to its recognized effect as beneficial in prevention of tooth decay as well as detrimental on the other hand as excess fluoride can lead to dental fluorosis in young age population. Different brands of varnish products have known to be added in 5% sodium fluoride. Analyzation of fluoride in fluoride varnishes by applying different sample preparation protocols based on the fluoride content, in this case Colgate and Darbys' fluoride varnish products. Proposed experiment employing ion chromatography provided direct determination of concentration of fluoride through dilution, centrifuge, filtration and lastly solid phase extraction. Standard samples with varying concentrations were made for construction of calibration curve. Concentration of fluoride is determined as relatively uniform bands in different brands of fluoride varnish.

11. Hardware Implementation of an Assisted Technology Mobile Robot
    Joycephine Li, Jannatul Mahdi
    Prof. Farrukh Zia

    This is a two-part research project in which Heathkit Education Robot (HERO) hardware circuits and software features will be upgraded. Modern hardware devices and sensors will be added to implement assistive technologies that will help people with disabilities. A brief historical background of old hardware devices will be explained along with the new hardware devices. Previous work on this project included background information of the HERO and brief discussion of old hardware devices. Also, from previous research, the script that was installed for Raspberry Pi to test the ultrasonic distance sensor was tested with no mistakes for modern devices. This time, the script with the ultrasonic sensor and the LED was tested using Raspberry Pi with good results. Currently, the code for a servo motor, an electric motor that consists of rotary actuator, was tested with positive results. In the future, a script for servo motor and ultrasonic sensor will be tested to replace the old hardware device in the HERO robot. This part of experiment will be tested for people who need help with vision by producing speech output.

12. Continuous Tunable Terahertz Wave Generation Via a Novel CW Optical Beat Laser Source
Richard Lin
Prof. Muhammad Ali Ummy

The main objective of this research work is to utilize a semiconductor optical amplifier (SOA) based fiber compound-ring resonator as an optical source to generate terahertz (THz) radiation. This novel optical source specifically utilizes difference frequency mixing which occurs when two optical beams with slightly shifted wavelengths combine to generate a third resultant beam with a beat frequency of the first two optical sources. This resultant beam excites a biased photomixer which then emits radiation whose pulse peaks fall within the THz range. Each wavelength spacing between the source beams corresponds to a frequency in THz radiation. In this work, a fixed wavelength of 1550 nm was combined with a tunable wavelength from 1552 nm to 1573 nm to result in a THz range from 0.8 THz to 2.51 THz. A THz detector measured the resultant THz radiation emitted by the InGaAs photomixer. There are currently numerous applications of THz radiation such as, but not limited to, biomedical and security screenings and even communications. Because THz radiation has less energy relative to X-rays while still providing high resolution imaging, it is much more suitable for the human body as it less harmful to biological tissue.

13. Developing Lab Exercises Using a Super Mechatronics Trainer
Wen Jie Long & Farid Rodriguez
Prof. Muhammad Ali Ummy

This research looks at the operation of the Super Mechatronics Trainer, a workstation that has a variety of different technologies, for instance: different sensors, assembly, sorting, and storing functions. The goal is to implement Programmable Language Code using the Super Mechatronics Trainer in a classroom environment. In doing so, we plan to create a readily-understandable lab manual that applies all of multiple aspects of the programming language for use in a mechatronics course. In order to do this, both the hardware and software must be well understood. Then, it is to be applied in LabVIEW, a graphical programming language. It is a language that is already taught in the mechatronics class, and its ease of hardware implementation makes it an optimal way to teach it in a classroom. Ultimately, the manual produced will cover all of the functions of the machine and recreate an automated system operation seen in the industry.

14. A Mobile Chatbot for Learning
    Waseem Mohammed
    Prof. Marcos Pinto

    A mobile application that uses artificial intelligence and helps students to learn. The knowledge domain is initially in computer systems programming, more specifically, an introduction to an object-oriented programming language such as Java. The application employs a rule-based reasoning to teach students how to program in Java by maintaining a "conversation" with the student who can type in questions about programming in Java and the system will answer with an explanation that might contains snippets of Java coding. The application presents the user with an initial list of learning subjects: data types, classes, and methods, and the student can ask questions on these subjects. The objective is to extend the app to cover more subjects on Java programming so the student will have a complete learning experience using this mobile application.

15. Advanced Composites for Structural and Biomedical Applications
    Tin Oo & Raul Rosario
    Prof. Akm Rahman

    A global interest has grown immensely that we as a people seek new ways of creating for industrial, health, and commercial that are more in tune with the natural world instead of disruptive to its rhythms. It is with this endeavor that the material scientists of the world test and research their way to improve current mechanical materials to connect us to that brighter future. The current project is focused on the development of an earth-friendly cementitious binder for the composite that is process-able in low temperature but is applicable to high temperature environments, resulting in a lower energy costing material.

    The primary objective of this study was to understand the role of the mole ratios in inherent strengthening mechanism of this binder. It is critical to estimate the Si/Al ratio and unreacted SiO_2 particle size in order to understand the degree of non-stoichiometry and dispersion strengthening. The formulation of this binder included a Fly Ash based geopolymer in an alkali silicate medium. The proposed geopolymer is formed by a polycondensation reaction with the specific ratios of $Al_2\text{-}O_3/K_2O$, SiO_2/Al_2O, and K_2O/SiO_2.

    Several characterization techniques were involved in this study such as mechanical testing, Scanning Electron Microscopy, fire resistance test. It was found that Si/Al ratio between two to four is optimum for improved compressive strength and flexure strength. The fire resistance study showed some pitting formation in the range of 250 to 500 degrees Celsius which suggests removal of entrapped air bubbles.

16. Scaffold Fabrication for Cell Viability Analysis
    Brian Parra
    Prof. Ozlem Yasar

    One of the principle challenges in Tissue Engineering, especially with the production of large tissue constructs, is the cell survivability within the scaffolds. Cells can show healthy growth within the scaffolds if biocompatible materials are used to generate the scaffolds.
    In this project, collaborative work is done between the SET Research Laboratory at the department of Mechanical Engineering Technology at City Tech and department of Mechanical Engineering at California State University, Chico. Scaffolds are fabricated with PDMS which is a biomaterial that widely used to fabricate the scaffolds. Our preliminary results show that cells can survive within the PEGDA based scaffolds if 20% of PEGDA is used to fabricate scaffolds.

17. Design and Manufacturing a Robot Arm
    Brittny Roberts
    Prof. Angran Xiao

    Robot arms with 4 degree of freedom are the most widely used robot arms in manufacturing lines. We plan to make a working model using small electrical motors, Arduino controller and 3D printed components. In previous projects, similar robot arms always collapse on themselves when being turned off, because the electrical motors at the joints of these robot arms lost their torque without power. If a robot arm can't hold its position we won't be able to continue where you left off if there is a power loss, or when we simply turn the arm off at the end of a day. In this project, we redesigned a robot arm by adding worm/gear mechanisms at the important joints. Due to the self-locking characteristics of the worm/gear mechanism, we expect the abovementioned problem can be solved. The project will cover the entire product development process from concept design, CAD, detailed design, to manufacturing and assembling of a working prototype.

18. Web Application: Choosing a Major
    Scipio Sargeant
    Prof. Marcos Pinto

    A web application that helps the students to choose which department he/she would like to enroll to. It would be a complement of the usual open house offered by the college.

The app will show the best of each department and will provide students an easier way to decide which department and major he or she would like to enroll in from the three divisions: School of Technology and Design, School of School of Professional Studies, and School of Arts & Sciences. . After completion students or transfers will have a fundamental experience and clear view of what each school offers and their majors of interest.

19. Mechanical Characterization of Nano-Particles Doped PDMS
    Navjot Singh
    Prof. Ozlem Yasar

    Tissue Engineering has been studied to develop tissues as an alternative approach to the organ regeneration. Successful artificial tissue growth in regenerative medicine depends on the precise scaffold fabrication as well as the cell-cell and cell-scaffold interaction. Scaffolds are extracellular matrices that guide cells to grow in 3D to regenerate the tissues. Cell-seeded scaffolds must be implanted to the damaged tissues to do the tissue regeneration. Scaffolds' mechanical properties and porosities are the two main scaffold fabrication parameters as the scaffolds must be able to hold the pressure due to the surrounding tissues after the implantation process. In this research, scaffolds were fabricated by using micro-molding. During the fabrication process, first PDMS was mixed with nano-materials and then it was baken in the oven for 2 hours. This preliminary research showcases that mechanical characterization of PDMS based scaffolds can be altered with nano-material concentration.

20. Water, Race, and Class
    Jean-Hus Theodore
    Prof. Aida Euges

    The United States' (U.S.) health agencies have a track record of counteracting health issues with little regard for whom those issues affect the most. Steps have been taken to address the quality of environmental health in the U.S, yet, it appears that national health objectives lack context in their approach: pushing for health equality and not health equity. A review of the literature will examine and analyze some of the objectives constructed by the federal government to counteract environmental health issues (via Healthy People 20/20 and the preliminary Healthy People 2030) while also suggesting some areas where these objectives can best capitalize on their efficacy.

21. Impact of Environmental Policy on Rising Sea Levels: in New York State's Response
    Cheryl Thomas
    Prof. Masato Nakamura

    Sixty percent of New Yorkers live near on the coastline. In the last five years the government has had to provide economic resources to facilitate the recovery of citizens impacted by Hurricane Sandy; that devastated the transportation system; obliterated homes and jobs and took the lives of forty-four individuals. To date the city of New York has allocated over 50 billion dollars towards recovery.
    The Scientific, Architectual, Geographic Demographic and Environmental impact of rising sea level is well documented and many countries have already begun investing in sturdier materials for the construction of levees and sea walls. Technology like smart pavements are already part of the urban planning in some cities. Organizations like "greening the Ghetto" are already in the forefront of reducing carbon emissions. This research will highlight the direction that New York in particular must be a part of in the near future.

22. Combustion Chamber Physical Modeling Group
    Brian Yellis
    Prof. Masato Nakamura

    Trash building up in large urban cities is not a thing people think about. But it is nonetheless a worrying issue. A waste-to-energy (WTE) power plant can save space in landfills while providing energy in return.
    An early step in the WTE process involves the mixing of garbage in an internal combustion chamber. We will build a physical model of an internal combustion chamber to observe and analyze the mixing of trash of various shapes and sizes. There are various methods of mixing. Efficiency of the method of mixing will depend on the trash that is input.
    After building our physical model, we will perform experimental work to collect data. From the data we will create stochastic models using computer programs to better visualize the mixing of the garbage.
    This technology can help build a smart city because of the dual benefit we will have from burning trash and recovering energy as well as freeing up space from landfills. The ash and energy generated will be put to better use than having trash laying around in landfills.

23. Fiber Reinforced Concrete Bowling Ball – Design & Fabrication

Yuping Zhang & Juan Barraza
Prof. Navid Allahverdi

Advancements in concrete technology are moving quickly and discovering mixtures that can generate concrete that is lightweight and have desirable mechanical properties are on demand, not only for their cost-effective benefits, but also for their durability. This research investigates the mechanical properties of lightweight concrete and seeks methods to fabricate different structure designs made without steel reinforcements, from mixtures containing organic impurities like sticky rice, as well as glass-fiber composite materials, and light aggregate produced from 100% postconsumer recycled glass. In the attempt to partake in an ACI (American Concrete Institute) competition, several concrete bowling ball structure designs were produce with different mixtures, with the goal to obtain a total mass not exceeding 5.5 kg, and a spherical diameter no more than 200mm+/- 15mm. These structures allowed for practical identification of change in properties such as mass differentiation, strength and rolling motion. The first concrete ball consisted of common mixture materials for concrete, with slight modifications from the 1 cement: 2 sands: 3 gravel ratios. Instead, the ratios used by volume were 1.5 cement: 2 sand: 3 gravel: 1.5 water, resulting in a total mass of 7.46 kg. To reduce the mass of the structure other alternative mixtures were considered. The next set of concrete balls had mixtures that contained Sticky rice, a new presented light aggregate named "Aero", less water content, fiber glass "MM20" reinforcement and Styrofoam. Moreover, the internal design was changed to have a 127mm diameter polystyrene ball core. These modifications decreased the total mass significantly to about 4.75 kg. Furthermore, in order to evaluate the mechanical properties comprising these designs, the concrete bowling balls underwent a compressive test load, to measure variables like their strain, stress and deformation. The deflection of deformation recorded went by a difference of 5mm. The last concrete ball with mass of 5.00 kg, measured to have a 5mm deflection at about 8340 Newtons, 10mm deflection at 8452 Newtons, 155mm at 8896, 20mm at 9341 Newtons and 25mm at 9786 newtons before fracturing. In comparison to the first few concrete balls, the amount of stress presented on the last design was kept relatively constant, while reduction of mass succeeded. Overall, the continuation of finding more results of mechanical properties on lightweight concrete and careful design considerations are essential to discover new building concrete supply that could help economically and perhaps environmentally. Additional concrete bowling balls are being fabricated, and more strain/stress, deformation test results are becoming apparent, as comparisons are made with the previous results gathered from the experiments conducted in the early stages of this research