**E/CE DEPARTMENT**

**THE COLLEGE OF NEW JERSEY**

**Spring 2018**

**ELC 495 - Senior Project**

**FINAL DESIGN REVIEW (FDR)**

**MAY 3rd from 9:00 am to 12:05 pm in ARMSTRONG 134**

**PRESENTATION SCHEDULE:**

9:00 am Visual & Aural Telepresence Via NAO Robot, by Theresa Pham, Chelsea Cantone and Daniel Ponsini, Advisor: Seung-yun Kim.

A growing need for advanced telepresence systems has developed in recent years as the internet has increasingly globalized communication.  This project will utilize a NAO robot to create a telepresence application, allowing a person to feel immersed in a location in which they are not physically present.  A virtual reality headset consisting of a Google cardboard (with a smartphone strapped in), headphones, and mic will be used in order to wirelessly transmit data between the NAO and its user, who will operate the robot.  A mobile web application will be used as the interface between the two.  The goal is to develop a system which will permit its user to see and hear into a different location using a NAO robot, allow for speech into a microphone that prompts the robot to speak, and control of the robot’s head motions using data sent from the phone in the headset.  A motion controller developed in a previous year’s project will be incorporated to give the user control of the robot’s full range of motion.

9:30 am TCNJ Parking Lot Availability System using a Campus-Wide Wireless Network, by Matthew Cook, Nikita Eisenhauer, Stephanie Fournier and Warren Seto, Advisor: Larry Pearlstein.

 **Abstract**:

As The College of New Jersey increases its student and faculty size, there is an ever increasing need to manage its growth appropriately. One area in particular need of attention is parking on campus. Currently, many commuting facility, staff, and students attempt to find available parking spaces by driving around to different parking lots and guessing where parking spaces may be available.

The Parking Lot Availability and Traffic Prediction System provides commuters with information about the availability of free parking spaces, which will not only alleviate traffic congestion but also increase coordination for commuters. This system is made up of three components: detection nodes to detect vehicles entering and exiting parking lots, a base station that will host a wireless network to collect traffic data from each detection node, and a web server to provide current parking space availability at a glance. Each detection unit contains: sensors, wireless radio, and custom solar charging circuit for renewable outdoor operation. The base station contains a microcomputer and a wireless radio to communicate with each detection unit. All traffic data is securely stored and displayed on an Amazon web server which is accessible to TCNJ commuters. The final product allows commuters to view the status of open spaces and make The College of New Jersey a better and more coordinated campus.

10:05 am Triggered Guitar Effects Platform, by Bryan Guner, Haley Scott and Ralph Quinto, Advisor: Ambrose Adegbege.

 In live performance, guitar effect pedals are a versatile yet limiting asset. They require presence of mind on the part of the performer, and restrict the performer to the area of the stage in which the pedal board is located. These constraints limit the performance quality and stage presence by splitting the performer’s focus. This project proposes an automatic solution to the restrictions that guitar effect pedals present. The performer will record the first performance into the proposed software, which will analyze and store the sequential frequencies. The performer will then utilize the software during a subsequent live performance, to trigger effects when preceding frequencies of the live performance are recognized against the first performance. This platform is achieved through the use of Pure Data, a GUI (Graphical User Interface) for audio manipulation applications. Our team has designed an application that implements dynamic times warping (DTW) in order to compare the first performance against the live performance. The system compares MIDI data using the dynamic time warping distance threshold, opposed to the Euclidean distance threshold, making it a robust approach to mitigating live performance error.

10:35 am Smart Pet Door, by Jason Ivins, Bryan Jimenez and Alex Kalemba, Advisor: Anthony Deese.

 Everyone loves their pets, and people are willing to spend exorbitant amounts of money on their pet. The team has set forth to design a unique and cutting edge system for pet access control, which far exceeds the currently available measures. The team aims to create a reliable and secure way of allowing pets to enter and exit their home freely; while at the same time allowing the owner to: set curfews, view statistics, and manage other tasks via an Android mobile application. The system design involves the use of the latest in Bluetooth beacon technology, and a cutting edge microprocessor with built in receivers for Bluetooth and WiFi compatibility. The team has so far successfully connected the RedBear Duo microprocessor to a WiFi source and programmed the microprocessor, through the Particle Web IDE (Particle Build), to detect a local Bluetooth beacon with a specific ID. The team has also thus far established the framework and architecture of the mobile application’s use of the DynamoDB database they will be using, hosted through Amazon Web Services. In the upcoming weeks, the team plans to implement and test the system using a standard pet door with the designed features. Once the core features have been implemented, the team will use the remaining time and budget to improve on system performance and to achieve as close to 100 percent system reliability as possible.

11:05 am Sampled Sound Polyphonic Synthesizer, by Amauri Lopez and Darrien Pinkman, Advisor: Anthony Dees

 In music production, being able to produce sounds originating from a wide variety of instruments as a strategy to attract the listener and to create pieces that would otherwise be played and recorded through live performance is very important. It allows the producer to write, or at least model, sections of music without needing the real instrument at hand or even the possible expertise required to play that particular instrument. By using pre-recorded digital samples to represent the sounds that would otherwise be produced through a live performance, and manipulating these samples to produce sounds of varying pitch, duration, and effect, the producer can essentially compose music exhibiting many different instruments and styles of play without ever having to play the instruments themselves. This project aims to recreate such a music synthesizer that uses sampled sounds as WAV files downloaded from the internet and wave manipulation algorithms to remodel these sounds to desired outputs, using a raspberry pi as the base computational platform and keys built onto a breadboard to model a launchpad for synthesis.

11:30 Am Orchestra: A Distributed Video Presentation System, by Brandon Siebert, Advisor: Larry Pearlstein.

   Orchestra is a system of applications for the purpose of synchronizing video playback between mobile devices. Using the Orchestra mobile application, your android device can become part of a video ensemble connected to a Raspberry Pi base station, which acts as the video conductor. All members of the ensemble determine their playback location and playback speed based on the conductor, which communicates to the devices via multicast connectionless Bluetooth advertisement packets. Devices attempt to synchronize playback by using a deterministic algorithm to calculate and correct for a cumulative delay. If the device is out of sync, then it will attempt to seek its playback position provided by the next available synchronization packet. If the device does not receive packets for a period of time, it will continue video playback as normal until it receives a new synchronization packet. The project is designed to facilitate an easy and accessible way for multiple devices to correct for playback drift using an affordable controller for the purposes of applications such as video walls or interactive audience experiences.

11:50 am App-based visual aid utilizing laser diffraction and Hough transform, by Jacob Levine, Advisor: Orlando Hernandez.

 Existing assistive devices for aiding sight impaired individuals leave a lot to be desired.  The traditional white cane has significant drawbacks in range, as well as the height of objects, which can be detected.  My project aims to create a new solution based on utilization of laser diffraction and image processing, as well as a common smartphone, in order to enable obstacle detection.  This will allow users to navigate more efficiently, quickly, and detect obstacles at a farther and wider range than traditional methods and with less active user involvement than before.