Computer Engineering

Pythia

Abstract
The Algorithmic Stock Trading System uses historical stock data to make predictions for future stock high and low trading values. Team Pythia developed and adapted a predictive algorithm based on the genetic model to run in both software and hardware.

The software implementation is programmed in C++ and runs in a Linux environment on an x86 architecture CPU. The hardware implementation is in VHSIC Hardware Description Language (VHDL) and runs on a Xilinx Field Programmable Gate Array (FPGA).

The stock trader can use a graphic user interface (GUI) to select up to ten stocks at a time to analyze. The analysis and performance results are displayed for the user on the GUI. Both implementations are compared to identify performance gains from the hardware implementation of the predictive algorithm.

The VHDL implementation takes advantage of the hardware level parallelism of the FPGA which results in lower latency than the software implementation. Therefore, stock traders can make better informed sales and purchases, faster. This project serves as a proof of concept that FPGAs are a viable solution for stock trading.

Team members:
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Chris Roche
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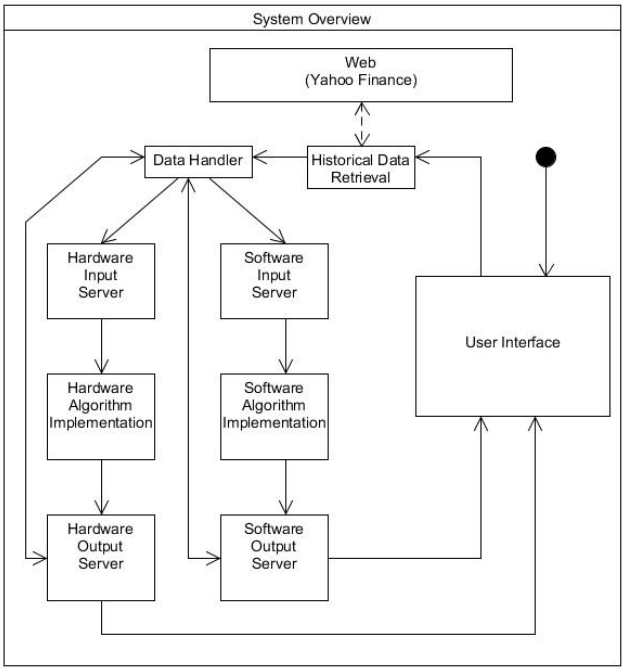
Sponsors
Dr. Robin Pottathuparambil



Computer Engineering

Spatium Lucis

Abstract
The Intelligent Lighting Control System (ILCS) is a response to a project proposed by NASA to address lighting in space-faring vehicles. An intelligent lighting system is needed not only for allowing sight in the blackness of space, but to also in maintaining circadian rhythms. The ILCS will be customizable to the personal and working spaces of individual crew members and attempt to maintain healthy circadian rhythms by modeling light intensity and color values. In addition, the ILCS will be capable of compensating for any degradation in intensity or color values. Any degradation measured from 8 feet away will cause the system to compensate by increasing output or activating a secondary source and will cause the system to emit auditory and visual warnings. The ILCS will consist of three subsystems connected wirelessly, to accomplish these tasks: The Control Subsystem, Sensor Subsystem, and Lighting Subsystem. The Control Subsystem will allow the user to view the status of the system by using a browser enabled device. The Sensor Subsystem checks the status of the lights and provide feedback to the Control Subsystem. The Lighting Subsystem interacts with an RGB LED network to provide light to the user based on the time of day.

Team members:
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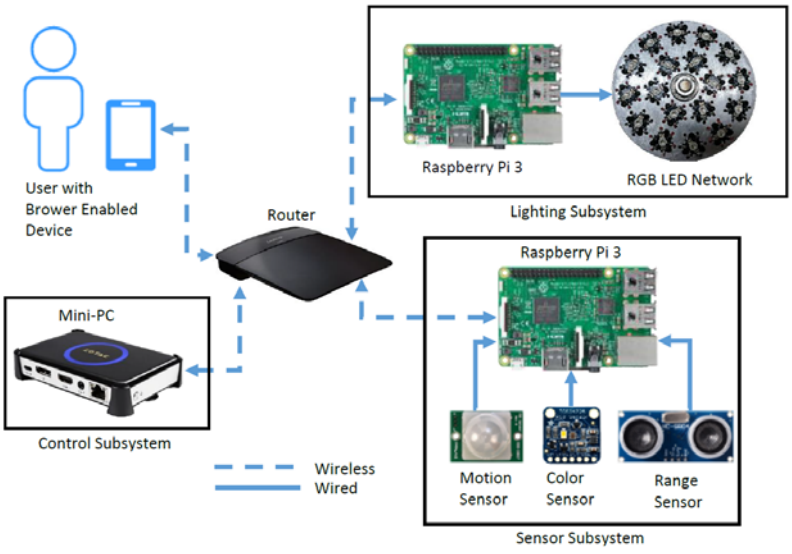
Acknowledgements:
We would like to thank our NASA adviser, George A. Salazar, for ensuring that we understood the problem, Dr. Tim Urban and Talia Jurgens of the TSGC for providing us with this great opportunity, Dr. Barrett Bryant and Sally Pettyjohn of the UNT CSE Department for ensuring that we get the tools and parts needed for the project, and our faculty adviser, Dr. Robin Pottathuparambil of the UNT CSE Department for his advice and making sure that the project meets its requirements.



COLLEGE OF ENGINEERING UNT

Computer Engineering

Remote Systems Online

Abstract
The Remote Embedded Systems Lab (RESL) is a development environment for embedded systems. This lab is remotely accessible through web browser, and allows users to upload compiled code to an embedded systems board, and to monitor the board s outputs by camera, microphone, and serial port. The lab includes hardware capable of interacting with the target board, to activate sensors and buttons, through the web interface. This includes relays, Peltier modules, and LEDs, to manipulate buttons, temperature sensors, and light sensors on the target boards. The Remote Embedded Systems Lab also features an extensive database, permitting the management of boards, users, permissions, and statistics of usage. This lab provides a web-based method of developing embedded systems, which opens paths to distance education as well as helping to reduce the required number of workstations and boards in the traditional Labs.

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Acknowledgements:
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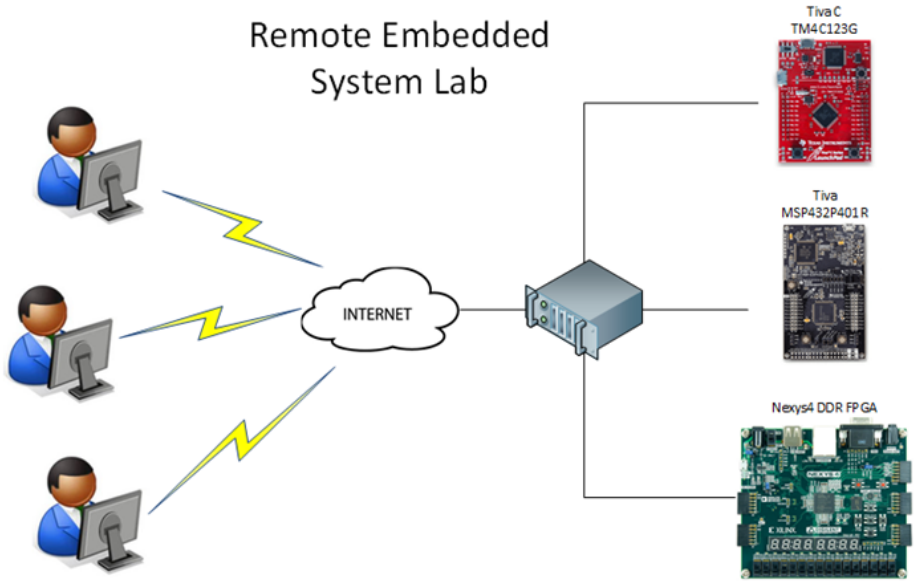

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Computer Engineering

Hear Me Out

Abstract
The Bat is a wearable, indoor navigation assistant for the visually impaired. It is designed to be discreet when compared to other aids, such as a cane or service animal, which can give the user more independence. The user can use this device to freely roam around the interior of a building or enable the navigation system to be guided, with verbal instruction, to an exit.

Team members:
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Computer Engineering

Team Lux

Abstract
AcculightUSA is a light manufacturer with a focus on sustainability and efficiency. The company creates custom built LED lighting solutions for industrial, commercial, and public use. They have reached out with UNT to implement a smart street light system that will provide greater functionality and positively impact the communities served by their products.

Team Enlightened (UNT, 2015-2016) implemented a prototype version of the design, which features a Central Management Server that communicates using powerline communication (PLC). Streetlight features implemented include dimmable and light-sensitive LED control, temperature sensor, camera, motion sensor, and a sleek, user-friendly web interface, which controls LED lights and the ability to stream and record video from the camera.

AcculightUSA agreed to continue its partnership with the University of North Texas and provide another year for prototype design and testing. Team Lux will augment the design by adding a speaker system, for announcement capability; network attached storage device, for backing up video feed from the onboard camera for later review; solar panel and battery backup, for powering the LED; networked lighting detection, for automatically brightening the area when car or pedestrian traffic is detected; and finally, a Wi-Fi access point, for public internet use.

Team members:
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Sponsors
AcculightUSA
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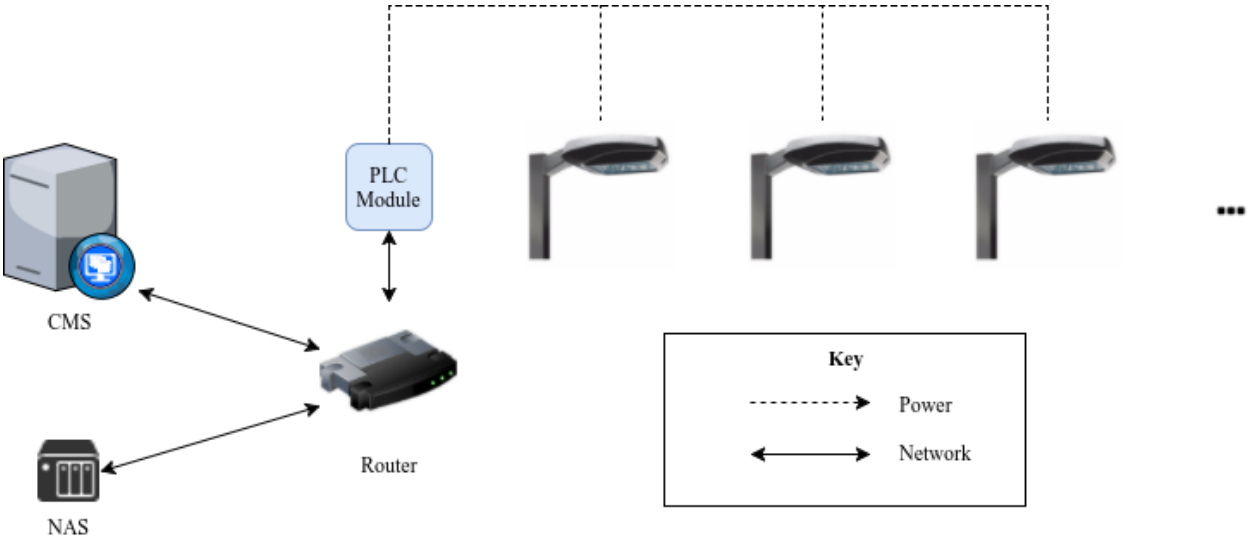

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Computer Engineering

Disease Contact Detectives (DCD)

Abstract
A project called Detect Disease Contacts Initiative (DDCI) has been created to assist in research directed by Dr. Armin Mikler from the University of North Texas. The team Disease Contact Detectives(DCD) accepted a proposal to work on this project for Dr. Mikler. A research tool was requested that would allow for the measurement of the number of contacts that a person receives in an average day. This research data has many applications; but is primarily focused on the potentiality of airborne disease spread. The tool that was requested will focus detecting the presence of an individual (or multiple people) within 6 feet of a subject with the tool.
A volunteer will wear the DDCI tool for a period up to 12 hours collecting data of the contacts that they acquire during that period. Once the period has lapsed the data will is then collected and processed by Dr. Mikler and his research team. To facilitate this, function the tool or tools will cover a 360 field of view and sustain both power and data requirements for the 12-hour period. The tool has a software component that processes the data from the sensors and delivers that data to the research team in a workable format. The DDCI tool allows Dr. Mikler and his team to accurately measure person to person contact over a period of time. This data is instrumental in forming an algorithm of the ways certain diseases spread in a population.

Team members:
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Computer Engineering

Team MARS

Abstract
With SpaceX, NASA, ESA, and Roscosmos all proposing and developing technology to establish a colony on Mars, there will inevitably be communication issues between Earth and the red planet. The colony would have all the essential data available to them on local storage, but needs a way to access the terrestrial internet, limited by vast distances and connectionless transmission protocols.

The main focus of this project is to create a priority-driven, connectionless file distribution network between the Mars colony and the global internet on Earth. This network would be able to accept data and website requests from the colonists on Mars, securely and efficiently download the data from Earth, and store it on the Martian servers. During the course of this project, the development would include a software communication system, an interface to request content from Earth, and compression/encryption algorithms to ensure secure communication and achieve minimal data loss.

The simulation environment will be built to mimic the bandwidth and transmission window limitations Martian colonists will experience, and adjust to these constraints. As interplanetary communication technology improves and allows for more uptime, higher bandwidth, and lower latency, the system s simulation environment can be adjusted to best utilize these improvements.

Team members:
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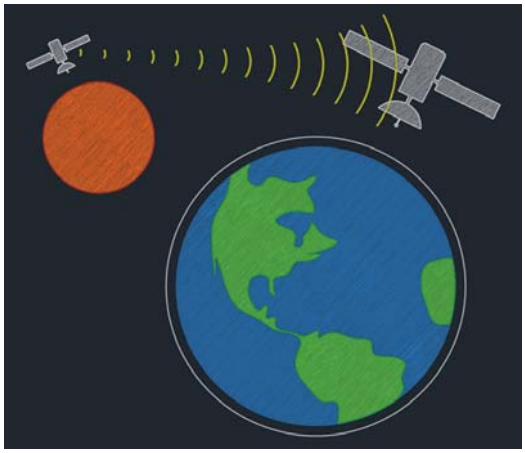
Acknowledgements:
We would like to thank the CSE Department at UNT for the continuous support and contribution to our engineering education. A special thank you to Dr. Robin Pottathuparambil for guidance and direction throughout the senior design sequence, as well as to Thomas Kanabay for providing the necessary tools and resources over the course of the project.



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Computer Engineering

IRIS

Abstract
NASA currently statically assigns all the addresses that spacecraft use for networking in space. Since NASA is responsible for over a thousand spacecraft, this labor intensive, manual process can lead to errors and duplications. Dynamically assigning these addresses in unfeasible because the vast distances of space cause significant delays with the four war DHCP handshake. We have been tasked with finding a method to efficiently assign addresses in space dynamically. Currently, the relay satellites are just repeaters, so the DHCP server would have to be put on earth. We are proposing adding computational ability to future relay satellites, allowing us to move the DHCP server into space, cutting the distance in half. We are then proposing a pipelined DHCP protocol enabled by the ability to make line of sight orbital mechanic predictions. With these combined changes, we can cut the amount of time to make a DHCP handshake to twenty five percent.
You can read more on our GitHub project page: JacenRKohler.GitHub.io/IRIS/

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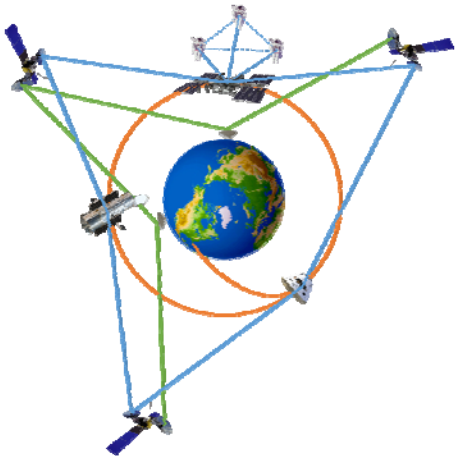

Computer Engineering

Navigators

Abstract
Our project named Beacate is an indoor navigation and user interaction iOS application using the Bluetooth Low Energy Signal. We are looking forward to building an indoor navigation system, that can be used in a specific indoor environment but can be implemented on different locations all around the world. We will be using Beacons to get the signals and using that signal the application will find the user s location and help them to navigate and a lot more such as save parking spot, add notes, add reminder, etc.

We found that there is no practical application that is used to describe the user's position within inside the buildings and stores, and that the Satellite technology that is used on roadmaps is not an alternative since it lacks on the tight places accuracy, where it's unable to determine an accurate position inside a specific building due to many factors. So we are trying to find a solution by using Beacons to locate the user inside the building and help them navigate inside the building precisely.

Team members:
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