2019 Undergraduate Research Conference

NIAGARA UNIVERSITY

Computer & Information Sciences Department

Smart Campus

- ✔Ensuring Security
- ✔Campus Synchrony
- ✔Campus Efficiency

IoT: Smart Campus

Bryce Molnar, Alex Farkas, Cynthia Hunt, Blair Swanick

Advisor: Dr. Yonghong Tong

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Introduction

The College campus is an ever changing environment. There is a lot that impacts a students life. Automation in the college campus is something that people around the world are looking to. There is an ever changing front that is becoming an increasing point of interest for investors, security personnel, and the education environment. When the development of these devices started, there was a need for change in our own atmosphere. There was an issue with missing food, stolen items, and lack of attention paid to some living situation due to the way that everything is spread out across campus. There was a need to reunite these issues with one common device that would allow for easier patrol and protection.

Enter the Arduino, an open source device that allows for simple commands to be executed on a hardware and software basis, using embedded circuits, and integrated understanding of a localized language.

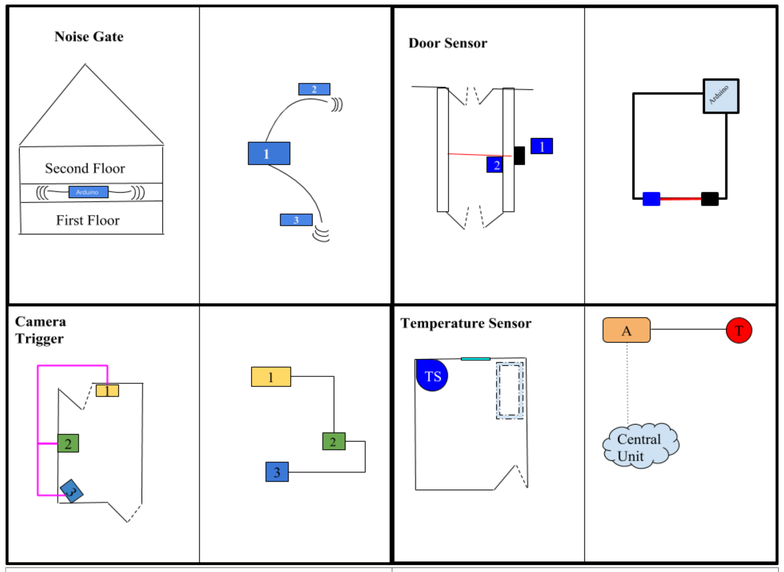
Goals

- Make devices that will allow for a safer university.
- Make the job of campus safety easier.
- Stop the loss of money through certain paths.
- Prevent unsafe experiences from occurring
- Automating the college safety experience.

Future Work

- Eventually fully develop the devices.
- Create a web application that would relay the information to the advising figures.
- Allowing one device to host all of the smaller protective features, for simplicity.
- Begin the use of the campus

Recognize a Problem → Why is it a problem? → Can we solve it with a device?



Noise Gate

The Left Half of the Diagram:
- The Arduino and microphones are built in between the floors.
- The Arduino microphones could also be placed in the wall, which is recommended, pick up on ambient noise and report that to the Arduino

The Right Half of the Diagram:
- The Arduino will receive the ambient noise levels of both of the floors. It will then determine a constant baseline for ambient noise. Then if it sees a rise of noise that is sustained it will issue a warning to the central unit to dispatch the appropriate action. This works by looking at the noise level and comparing it to the average.

Door Sensor

The left half of the Diagram:
- Shows where the device would be used.
- When someone passes through and will break the beam setting off a tripwire.
- The Arduino will receive the information and send it to another device which will alert a system that is in place.

The Right Half of the diagram:
- This shows the construction of the device
- The blue box is the receiver for the laser
- The black box is the laser emitter
- The Arduino is connected to both, to the emitter to deliver power and to the receiver to receive information on when the chain is broken.

Camera Trigger

The Left Half of the Diagram:
[1] Emitter for the infrared sensor
[2] Arduino
[3] Camera

The Right Half of the Diagram:
- The emitter is connected to the Arduino which receives a signal after someone passes through the area.
- The signal the Arduino receives, relays that to the camera to take a picture. The Arduino then records the time and date and relays that to the central unit. This will allow for the appropriate actions to be taken by the person monitoring the devices.

Temperature Sensor

The Left Half of the Diagram:
Shows that the sensor is installed in the room.

The Right Half of the Diagram:
[A] Arduino: Receives temperature from sensor, determines it in Fahrenheit, returns it to the central Unit.
[T] Sensor: The sensor can either be a real sensor, one that has logic built into it to determine and read back a temperature.
[Central Unit] Central Processing unit: Calculate the difference between room temperatures and the overall building temp to determine the inefficiencies.

Design

The Devices that were developed for this project are based off a few of the issues within the Niagara University campus. These issues need remedies in order to assist the university in saving time, money, and hassle. There were a few devices that we worked on which include a door based laser sensor alert system, an entry way based electrical contact trigger assisted by Arduino, a noise sensor to help prevent obtuse quantities of noise, and finally a room based temperature system to help detect efficiency errors.

Using these devices in synchrony will overall help impact the quality of life, through safety, efficiency, and general awareness. Eventually these will all sync up in order to possibly provide a better glimpse of what life is like in a smart campus. The unity of these devices an use of a future database and proper algorithms, will allow for the analysis of trends in data as well as the ability to try and prevent these in the future.

Development

The **door based sensor** helps prevent the loss of assets through the use of a virtual guard. There is safety concern when locking doors as it can prevent people from being able to escape an emergency. It's of paramount importance that these doors and entryways be monitored in a safe and effective manner. This sensor format would alert nearby guard, allowing proper actions to be taken.

The **noise sensor** is purpose built to help enforce certain noise ordinances and guidelines for safe hearing. This system utilizes two small microphones, capable of determining decibels, in accordance with pre-determined lengths of time. A sentry or guard will be alerted to an overabundance of noise for a prolonged period of time, or extreme noise level for a long period of time. This would increase quality of life for people who are living around the device, while also increasing safety.

Finally, the **temperature sensor** is capable of detecting changes in temperature for a specific location. Arduinos have the ability to reference several temperature sensors as they have multiple inputs and manage these inputs accordingly. Allowing for a building or apartment to have a sensor in each room, any sharp changes in temperature are reported to the Arduino, which in turn determines that a particular sensor and it's correlated room are the cause of lost efficiency, leading to overall savings in money and power.

Creative Thinking Creative Learning