Thermo Sense: Digital Classroom Detection
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Goal

- Deploy a sensor network to obtain human occupancy data.
- Develop an application that displays classroom occupancy data through a heat map.
- Develop a simulation using data for smart lighting.
- Design a system that controls lighting in classrooms based on live occupancy.

Motivations and Objectives

- Motivations
  - Ensure cost and lighting efficiency without compromising illumination standards.
  - Ensure students use application to minimize their time in choosing a place for studying and collaborating.
  - Save university at least $1.7 million in electricity costs per year if the lights were controlled in each classroom.

- Objectives
  - Conduct experiment in CORE Room 538 to test our node to collect data.
  - Analyze collected data to create a smart lighting simulation which is used in system for lighting control.

Research Challenges

- Limited nodes to conduct research and small sized classroom.
- Collecting live data based on the distance and connection of each node.
- Controlled stable room temperature to distinguish between the environment and human.

Acknowledgement

We would like to thank Dr. Hana Godrich for helping us create a project, dedicating her time, and guiding us in the right direction.

Methodology

- Create a node by stacking an Arduino Uno with a Bluefruit Bluetooth Shield.
- Create a sensor network by connecting multiple nodes through Bluetooth to a Raspberry Pi for data processing.
- Remote access into the Raspberry Pi through Wifi to display readings.
- Use smart lighting simulation in order to create the system to control lighting in the classroom.

Results

Temperature (°F) Readings Converted into a Heat Map

| 69 | 70 | 70 | 69 |
| 69 | 71 | 70 | 70 |
| 70 | 72 | 71 | 70 |
| 68 | 68 | 70 | 69 |

- Established wireless communication within sensor network.
- Accurately display sensor readings as a heat map.
- Created an application to display occupancy/availability of classrooms.
- Data can be used to optimize lighting and HVAC systems.

References

[4] "Applications of Human Motion Tracking: Smart Lighting Control” https://pdfs.semanticscholar.org/0c94/7d11659f7386972751084eb0b857c10130138.pdf