BUSCA

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Motivation

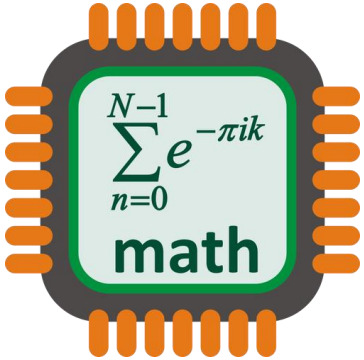
The CULC problem

- Nice study spaces
- Huge building
- Always packed

Objective

- Connect students with available study spaces in real time
- Cost-effective, non-invasive
- User friendly UI

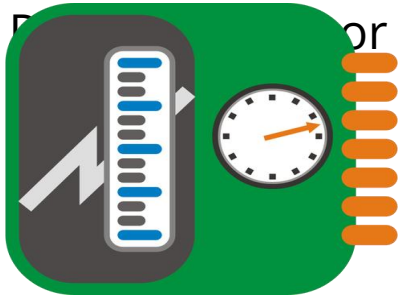
Background



Microcontroller Unit

Cloud Server

Network



Project Description and Goals

Prototype

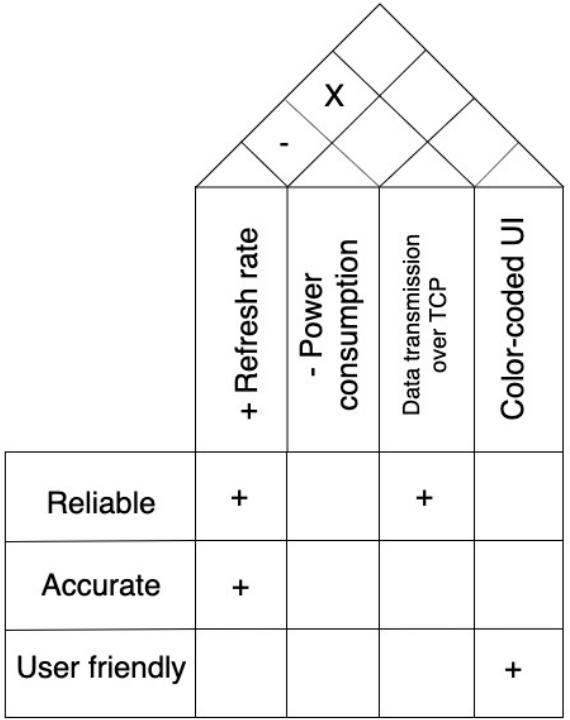
- Battery-powered module containing MCU, proximity sensors, and Wi-Fi capability
- Non-invasive and discrete
- Determine presence of people at study space 90% of the time

iOS Application

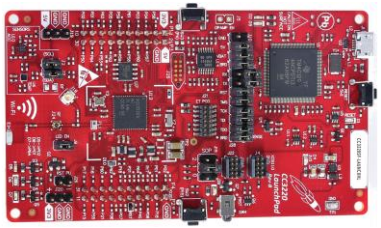
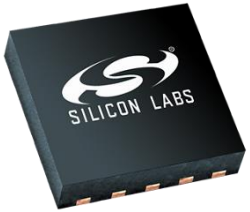
- Color-coded map of available study spaces
- Refresh rate of 10 minutes

Network

- AWS for cloud server (IoT)
- MQTT over TCP for communication between devices, server, and mobile app



Technical Specifications

 **MCU**	 **Proximity Sensor**	 **Power**
● I2C Interface ● Wi-Fi Connectivity ● 15mm x 15mm x 2mm ● Current Draw: < 200 µA	● Voltage: 3.3 V ● Current Draw: < 100 µA ● Minimum Range: 50 cm ● Minimum Angle: 40° ● 90% confidence	● Life: 4 months ● Capacity: > 1 Ah ● Easily replaceable

Design Approach——Sensors and Microcontroller

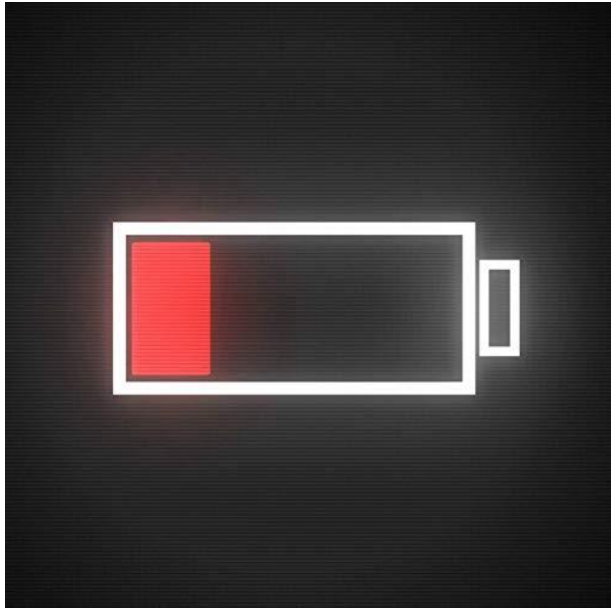
- Multiple sensor connecting to MCU via I2C
- Local data collection and processing
- Microcontroller uses Wi-Fi to connect to server

Design Approach——Server and Mobile App

- Uses Message Queuing Telemetry Transport (MQTT), runs on TCP
- Periodically retrieves data from MCU and updates on App

Design Approach——Major constraints

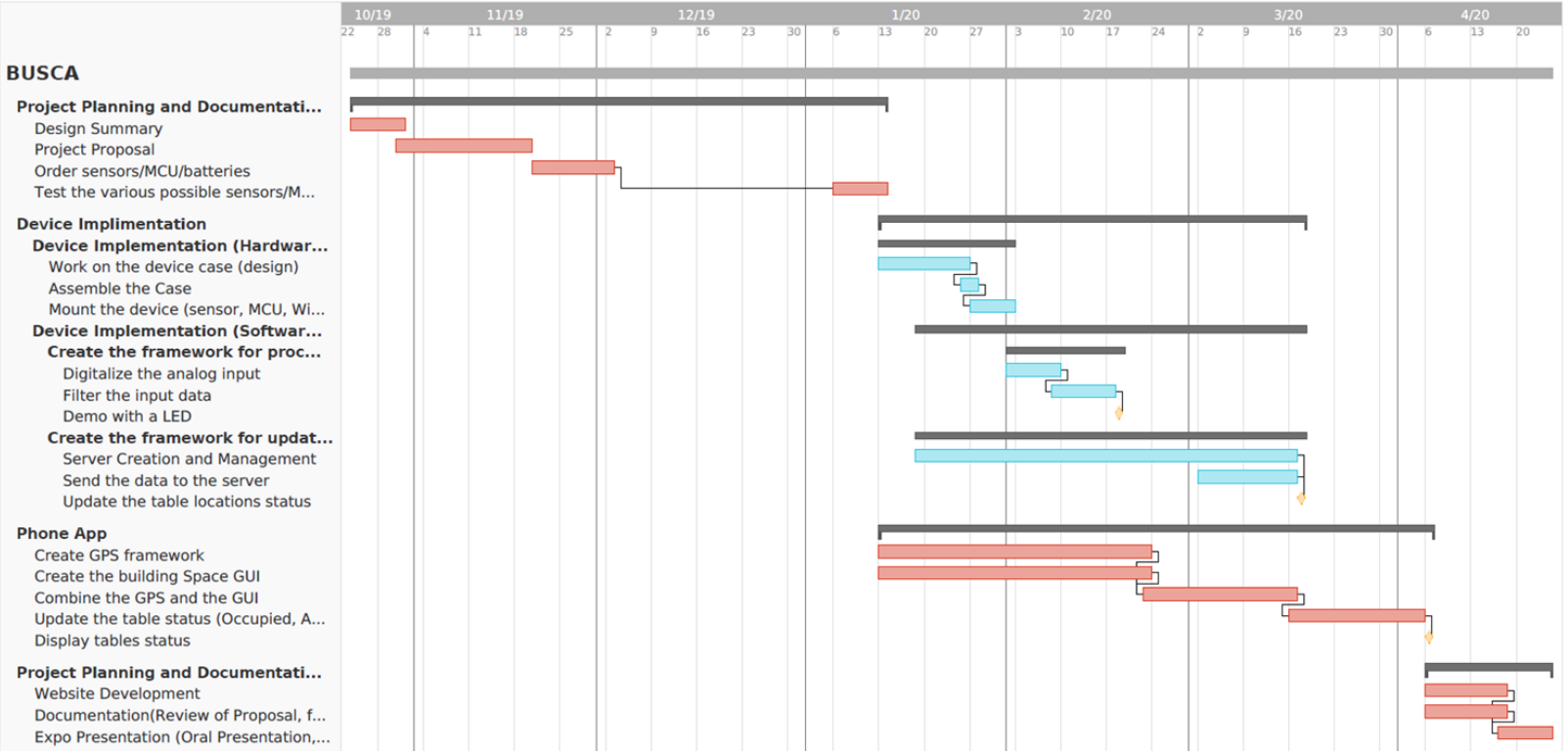
- Sensor range, accuracy and cost
- MCU power consumption and maintenance



Scheduling

- Project Planning (35 days)
  - Location Inspection
  - Part Ordering
  - Documentation
- Device Implementation (62 days)
  - Hardware Implementation
  - Software Implementation
- Mobile App (83 days)
  - Back-end Architecture
  - UI Design and Experience

Gantt Chart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1/20
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22 28 4 11 18 25 2 9 16 23 30 6 13 20 27 3 10 17 24 2 9 16 23 30 6 13 20
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Project Planning and Documentati...
Design Summary
Project Proposal
Order sensors/MCU/batteries
Test the various possible sensors/M...
Device Implimentation
Device Implementation (Hardwar...
Work on the device case (design)
Assemble the Case
Mount the device (sensor, MCU, Wi...
Device Implementation (Softwar...
Create the framework for proc...
Digitalize the analog input
Filter the input data
Demo with a LED
Create the framework for updat...
Server Creation and Management
Send the data to the server
Update the table locations status
Phone App
Create GPS framework
Create the building Space GUI
Combine the GPS and the GUI
Update the table status (Occupied, A...
Display tables status
Project Planning and Documentati...
Website Development
Documentation(Review of Proposal, f...
Expo Presentation (Oral Presentation,...

Market and Cost Analysis

- Target market is college and university campuses
- Potential for counter-serve restaurants
- No direct competitors

Prototype Costs	$79.58
Labor Costs	$46,827.00
Total Development Costs	$133,925.22

Business Model

- 10,000 unit production round
- 10 clients expected within five years
- Clients must sign a one year minimum contract

Setup Fee (per unit)	$35
Operation Fee (per month per unit)	$12
Revenue (one year of operation per unit)	$179.00
Profit (one year of operation per unit)	$34.77, 19.42%
Total Revenue	$1,790,000.00
Total Profit	$370,770