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

BUSCA		=
Clough Undergraduate Learning (Commons	~
1st Floor		>
2nd Floor		>
3rd Floor		>
4th Floor		~
5th Floor		>



Cloud Server



Background

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

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	+ Refresh rate	- Power consumption	Data transmission over TCP	Color-coded UI
Reliable	+		+	
Accurate	+			
User friendly				+

Technical Specifications

	Froximity 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



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