UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN

Speaker Showerhead

Electrical & Computer Engineering

Group 19 - Manav, Bhavana, Abhi

04/27/2023

Introduction

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Problem

Use their phones to play music but can't hear it well due to the shower curtain and water noise

Lose track of time and use more water than needed

Struggle to set the right temperature
Eg: too hot could damage hair

What is our project and solution?

Enhance user experience by displaying

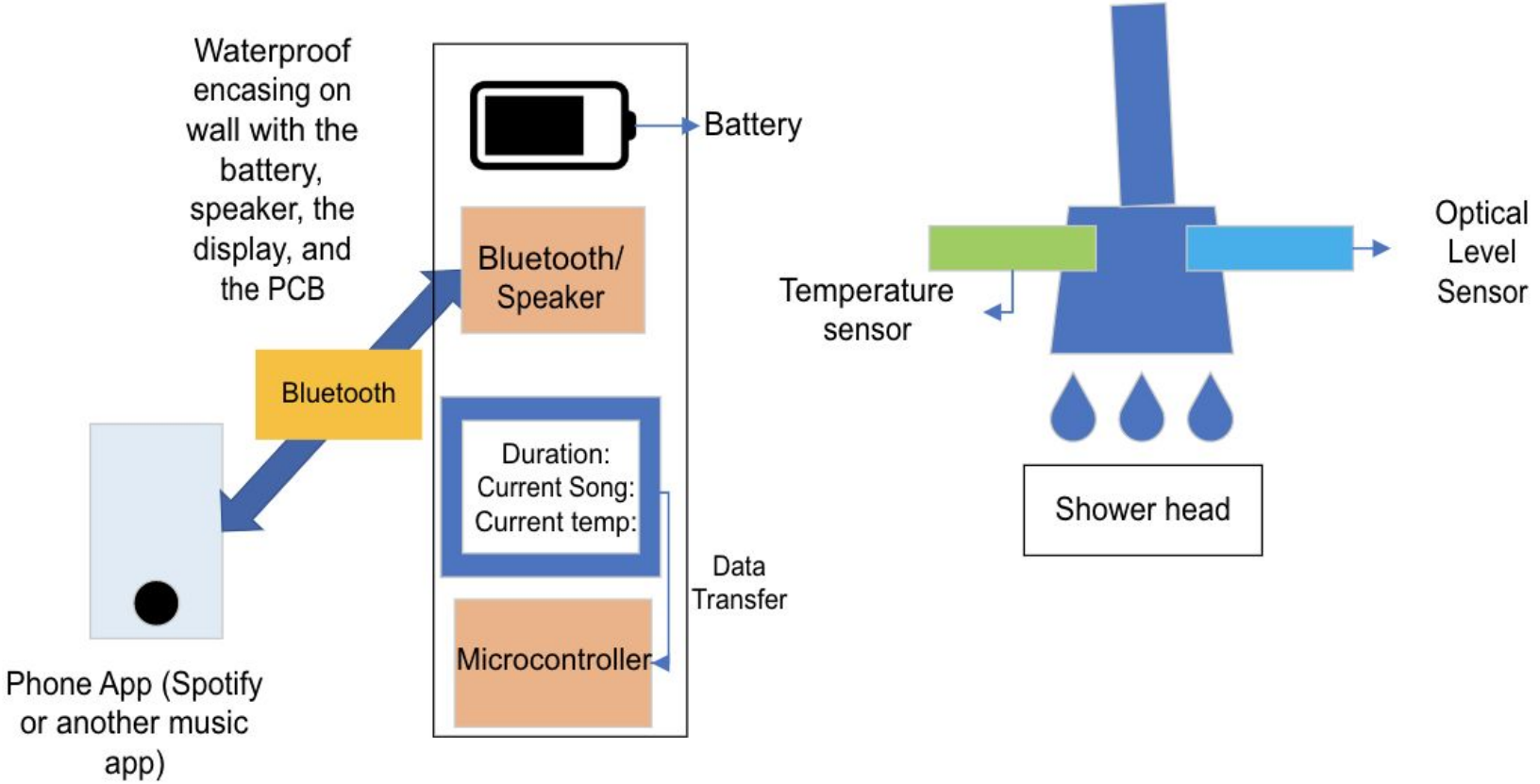
Temperature

Length

Average Length

Current Song

Visual aid


Waterproof encasing on wall with the battery, speaker, the display, and the PCB
Battery
Bluetooth/ Speaker
Bluetooth
Duration:
Current Song:
Current temp:
Data Transfer
Microcontroller
Phone App (Spotify or another music app)
Temperature sensor
Optical Level Sensor
Shower head

Areas of Design that Changed

ORIGINAL DESIGN

1. Box on pipe connected to showerhead
2. 3.7 Volt battery
3. Remote System
4. Raspberry PI

NEW DESIGN

1. Box on the wall
2. 9 Volt battery
3. No remote system
4. ESP 32 Microcontroller

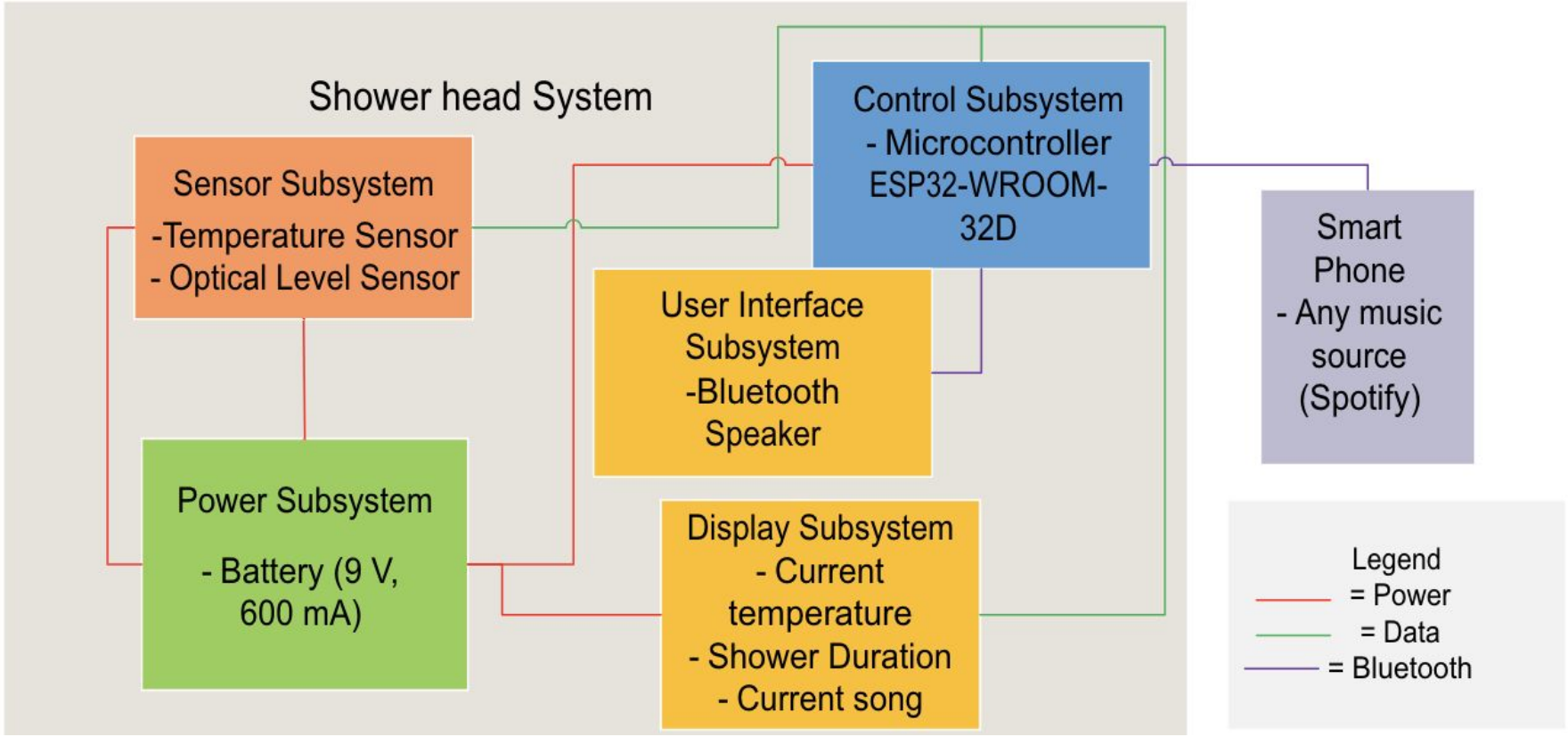
High Level Requirements

1. Correctly displaying temperature of the water: one of the core requirements of our design is accurately measuring how hot or cold the water is for the user.

2. Correctly detecting if the shower is on: the display should accurately show the current shower duration as well as the average shower duration.

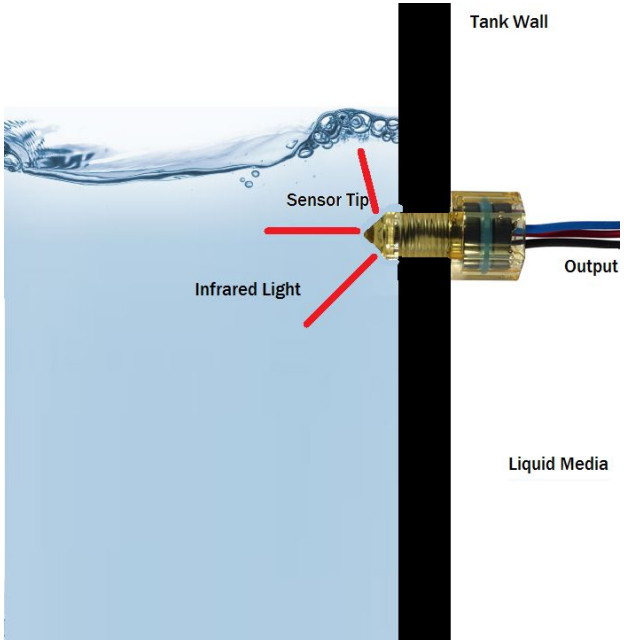
3. Speaker: Have the ability to connect a phone to the speaker through bluetooth and play music through a speaker

Block Diagram



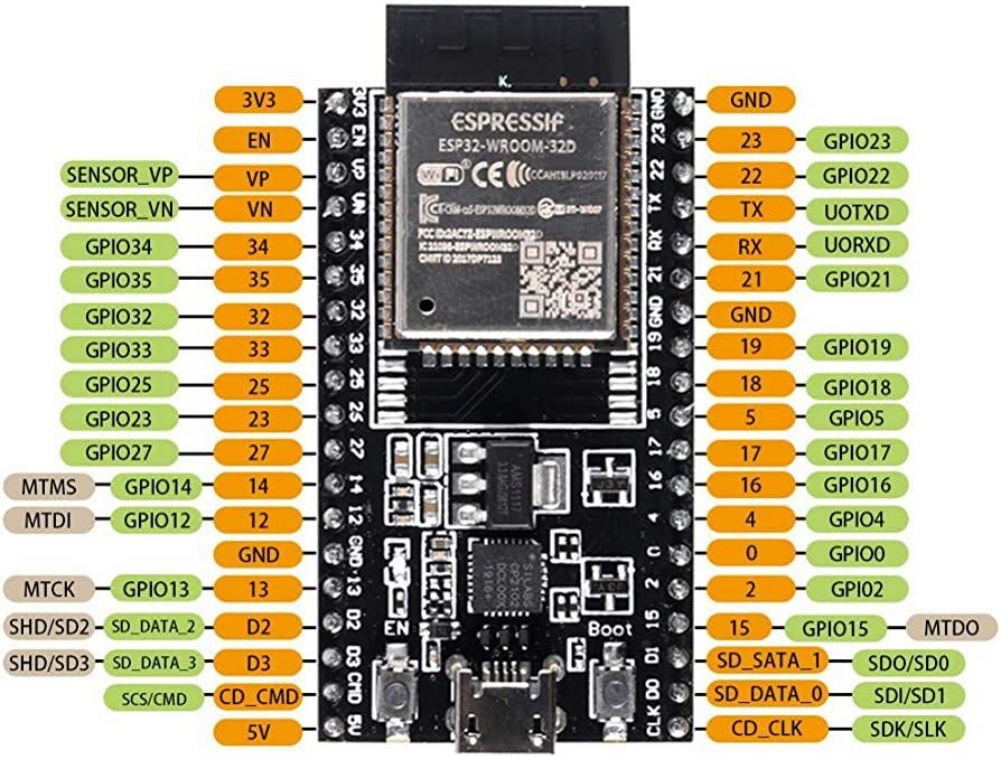
Sensor Subsystem

Optical Liquid Level Sensor



Waterproof Temperature Sensor

Control Subsystem



ESP32-WROOM-32D

Speaker Subsystem

Waterproof Bluetooth Speaker

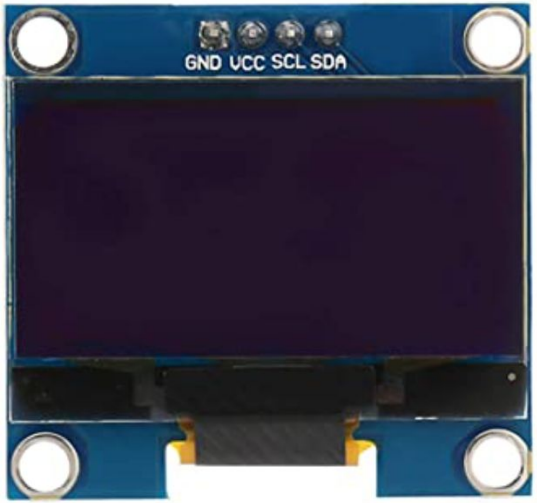
Song Backend Demo

Speaker Subsystem

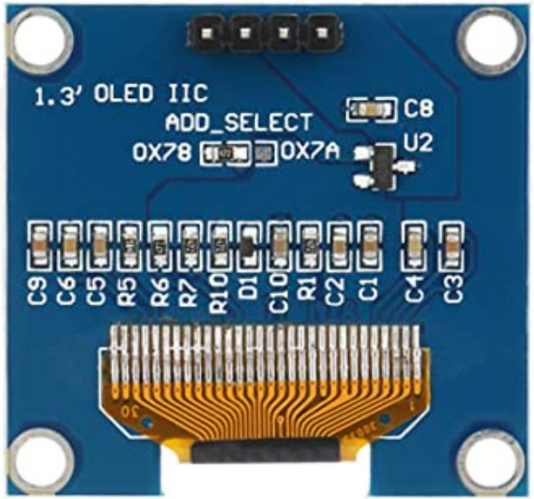
Power and Display Subsystem

9V Battery

OLED Display

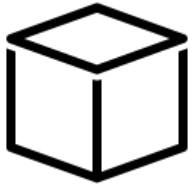


front

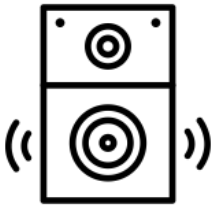


back

Waterproofing



Box
IP67



Speaker
IP67

Wire Encasing
IP67

Water Safety guide

Setup

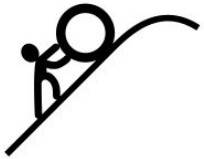
Final Demo Video

Successes and Challenges

SUCCESSES

- Web Server
  - Spotify API
- PCB Design
- Arduino Code

CHALLENGES



- Broken Sensors
- Voltage Regulators
- Physical Design

Failed Verifications

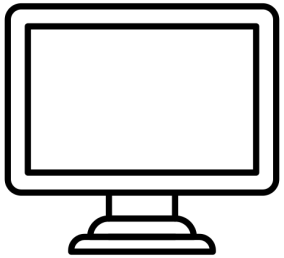
Problems:

1. 3.7 - 5 V voltage booster not working
2. WiFi and bluetooth on ESP32 not working

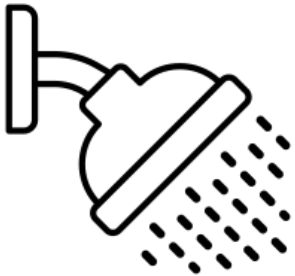
Solutions:

1. Use 9 V battery
2. Use ESP32-WROOM-32 DevKit

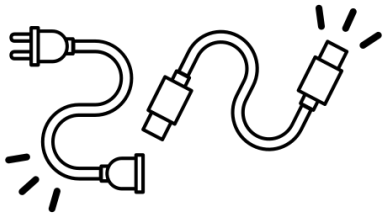
Redesign



Bigger and more prominent display

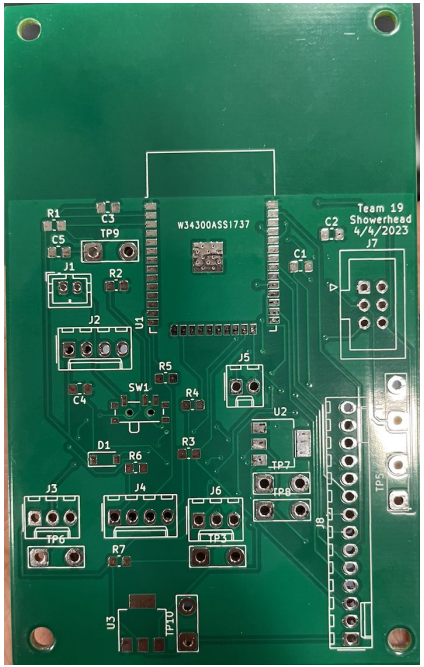


Pipe connection



Better wire management

Skills We Learned for the Future



PCB Design

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"Kabira"
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Creating a backend server and making API calls

3.1 Cost Analysis

We can expect a salary of $40/hr×5 hr×75 = $15000 per team member. We need to multiply this amount with the number of team members, $15000× 3 = $45,000 in labor cost.

The following is the table with the information of the parts we require:

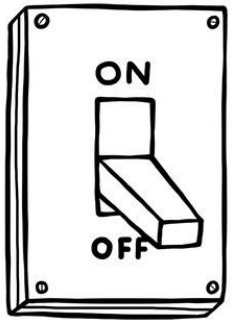
Description	Manufacturer	Quantity	Price ($)
Temperature and Humidity Sensor, T9602 Series	Amphenol Advanced Sensors	1	29.37
IAKLE High Pressure Shower Head with Hose,3-Setting Filtered Detachable Water Saving Jet Handheld Shower Heads Filter for Hard Water,1.6GPM(80in/2m Hose)	IAKLE	1	10.99
Temperature Sensor - Waterproof (DS18B20)	ROHS	1	10.95
Raspberry Pi 3 – Model A+ (PLUS) - 512MB RAM	Raspberry Pi	2	50
Duracell - 9 Volt Battery	Duracell	2	14
2.8" TFT Display with Resistive Touchscreen	Adafruit	1	14.95

Total Parts: $130.26
Total Cost of Labor: $45,000
Total : $45,130,26

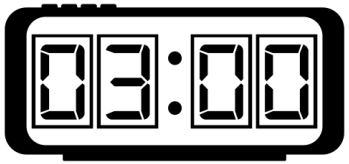
Cost Analysis: Placing value on our efforts and budgeting our expenses

Designing a product

Future Considerations

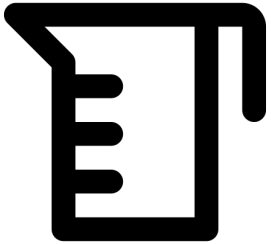


Add switch



Save shower times

Increase budget



Measure amount of water

Thank You
Questions?

The Grainger College of Engineering

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