

JJ-GEEX

Homie

The Intranet of Things

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Thank you To ECEE Capstone for
being our “Homie” in funding this
project.

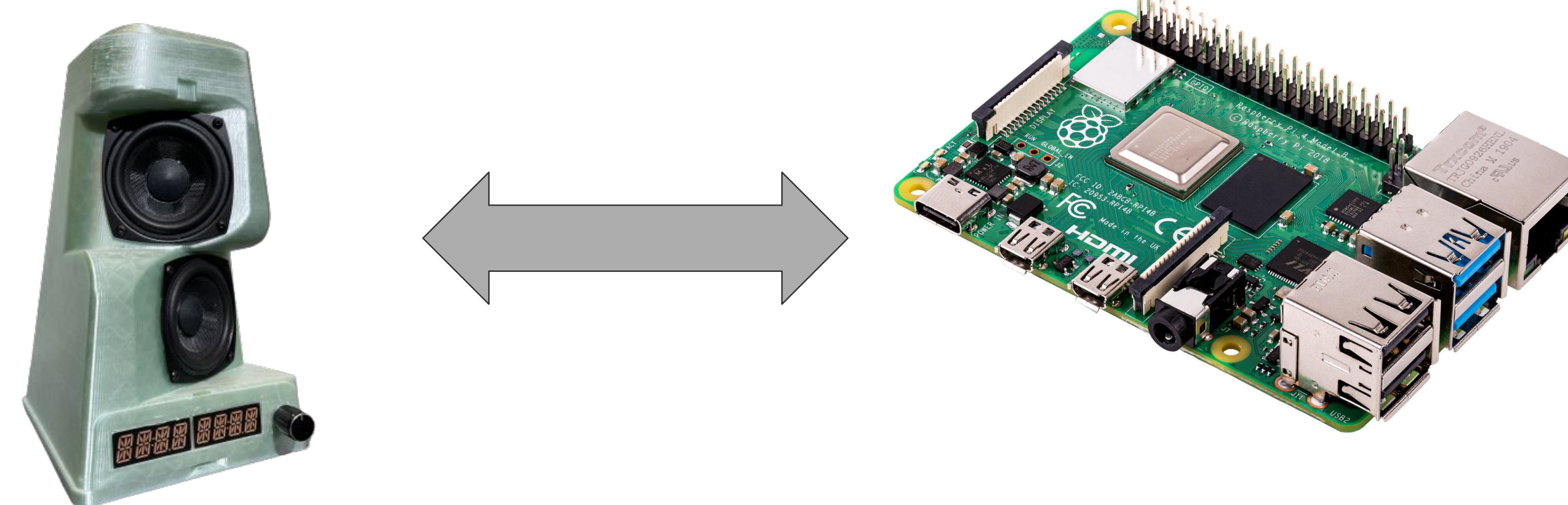
Problem Statement

The current smart home speakers on the market rely on smart home control though cloud computing. These cloud computing companies then profit off of selling and using the personal data collected. This is a huge privacy concern, as well as limits many potential customers from owning their own smart home system.

Our Solution

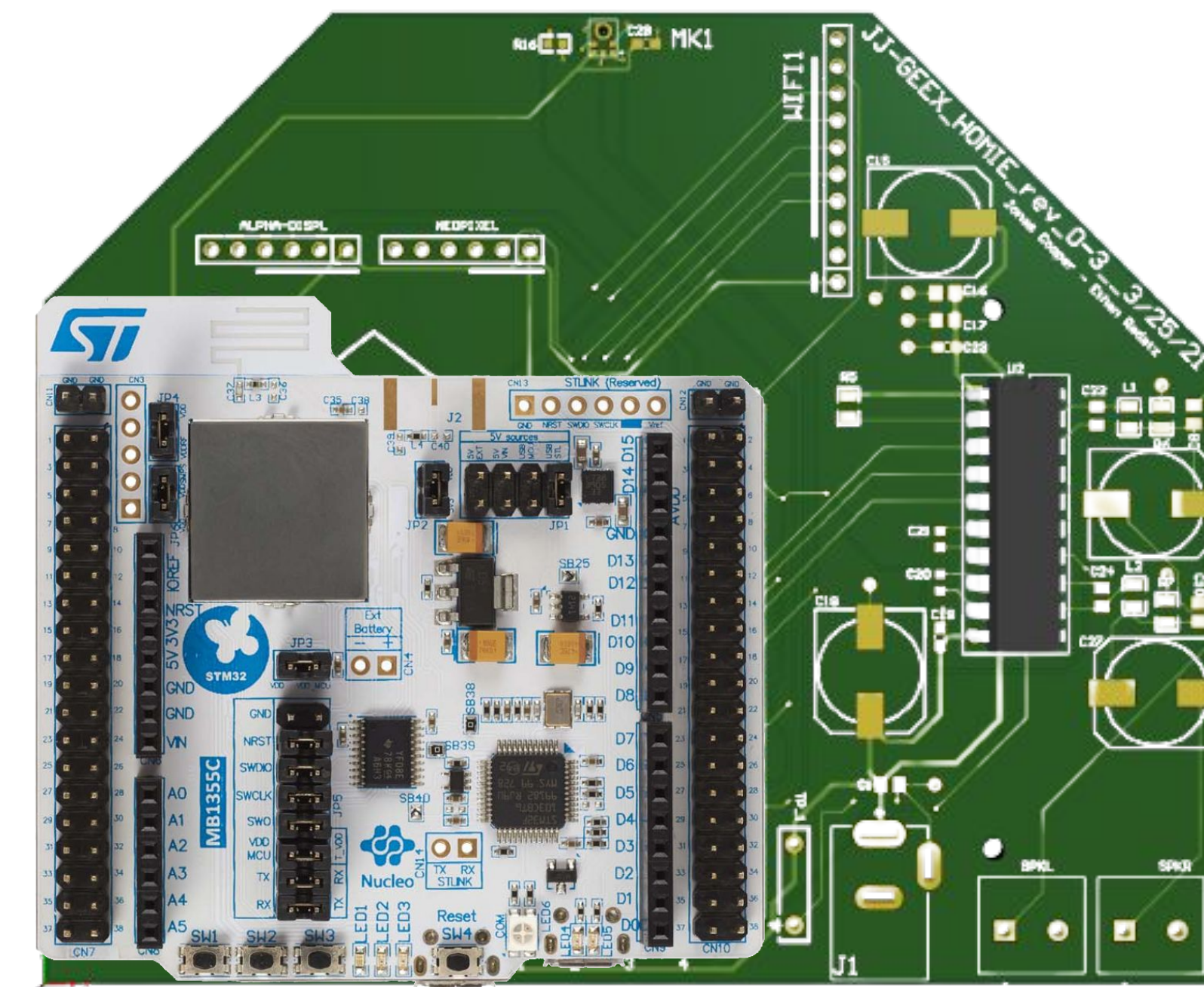
Homie, the smart home speaker system, specializes in keeping your data within your network. Homie is an open source source software with a dedicated backend to handle voice recognition. Data has no reason to leave your personal network or to be stored and sold.

User-Overview



HOMIE FRONTEND

HOMIE BACKEND/ RASPBERRY PI 4



Hardware

The Homie PCB is built to take in a single 12V line and via power conditioning done on the development board we power the: microphone, 8-segment display, LED's, WiFi controller, volume knob, digital to analog amplifier, and speakers. The Homie PCB allows us to have an all in one unit that controls each of the individual subsystems needed for the Homie Frontend.

Backend Support



- Implemented using python 3

Features

- Play music from local library
- Play music using youtube
- Stopwatch support
- Timer support
- Weather Search for any City
- IoT Device Support
 - HS103 Smart Plug
 - Flux WiFi LED light bulb

Implementation

- Receive audio
- Decipher audio to text
- Match command
- Send voice audio
- Execute function
 - If applicable
- Restart Process

Artificial Intelligence

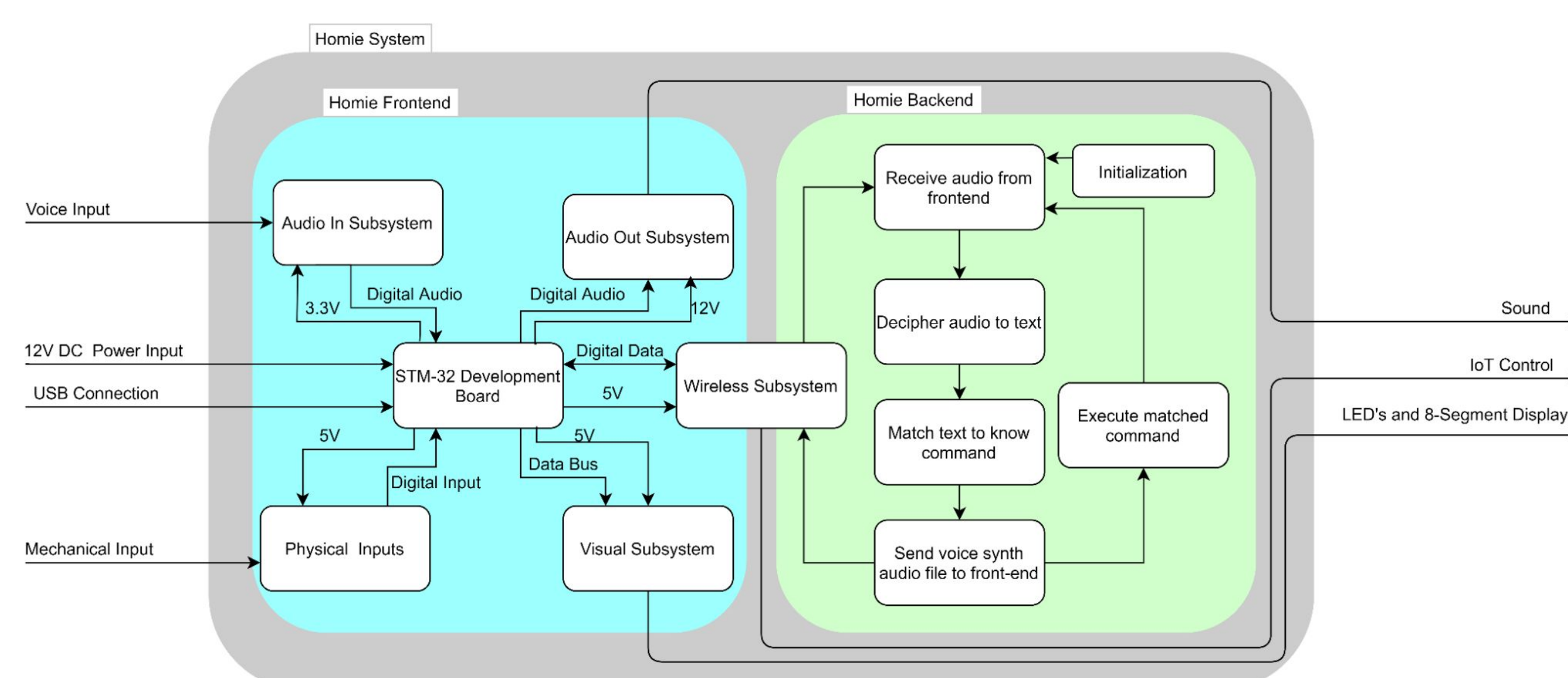
Tensorflow Lite

- Embedded Neural Network
- X-Cube-AI
- Single Custom Wake Word Recognition

VOSK

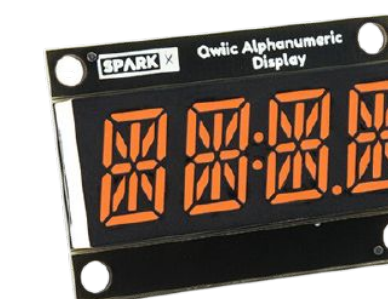
- Levenstein and Cosine Similarity
- Auto Silence detection

System Diagram



Frontend Features

- Secure TCP connection between Frontend and Backend through Wifi Coprocessor.
- High Speed board communication through SPI, I2C, and I2S protocols.
- Elaborate visual indication and feedback through Alphanumeric displays and Neopixels.



Next Steps

Given more time and resources, we would improve the sound quality of Homie. We would also implement more local storage capacity on the Homie speaker itself to allow quick reconnection, on board voice recognition and command creation, and additional frontend IoT device support.

All the Homie files are free to access and use at
https://github.com/JJGEEX/HOMIE_RELEASE