



Food Computer

status **active**

Food Computer

Table of Contents

- [About](#)
- [Getting Started](#)
- [Prerequisites](#)
- [Installation and Config](#)
- [Test](#)
- [Circuit](#)
- [Dashboard](#)
- [Built Using](#)
- [Authors](#)

About

This repo contains circuit, firmware and backend for Food Computer Project.

Getting Started

These instructions will get you a copy of the project up and running on your local machine for development and testing purposes. See [deployment](#) for notes on how to deploy the project on a live system.

Prerequisites

What things you need to install the software and how to install them.

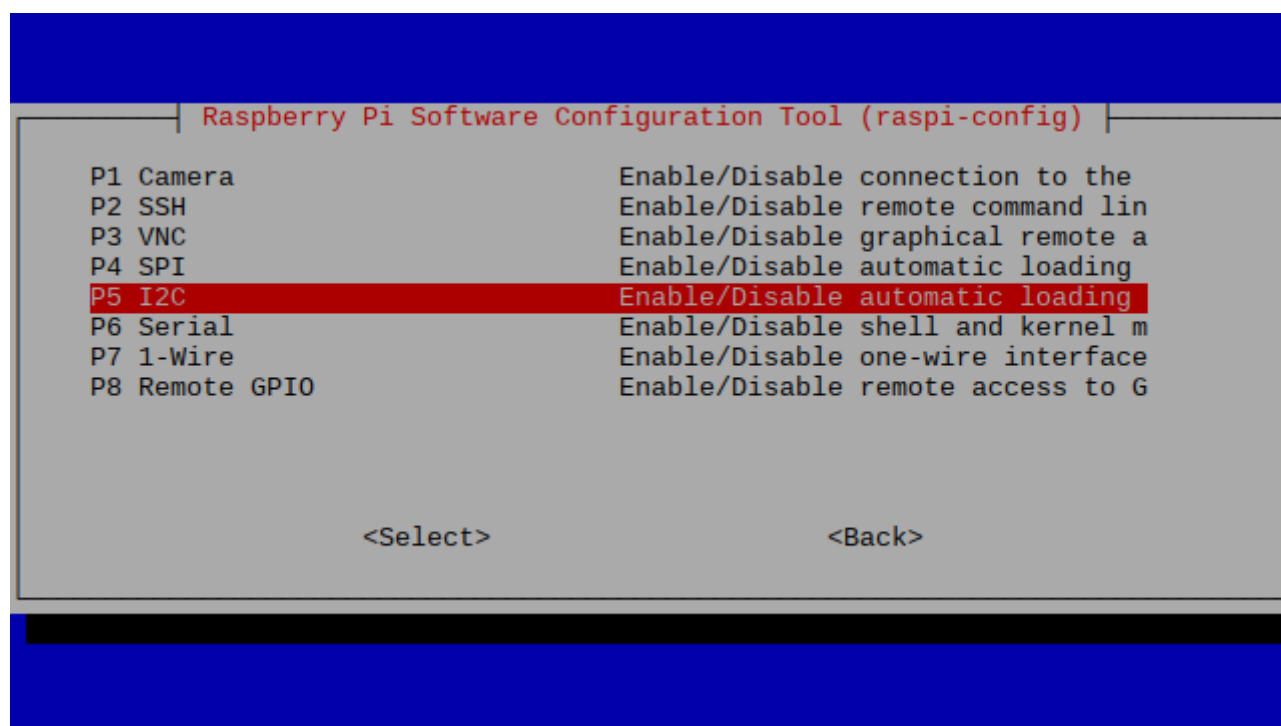
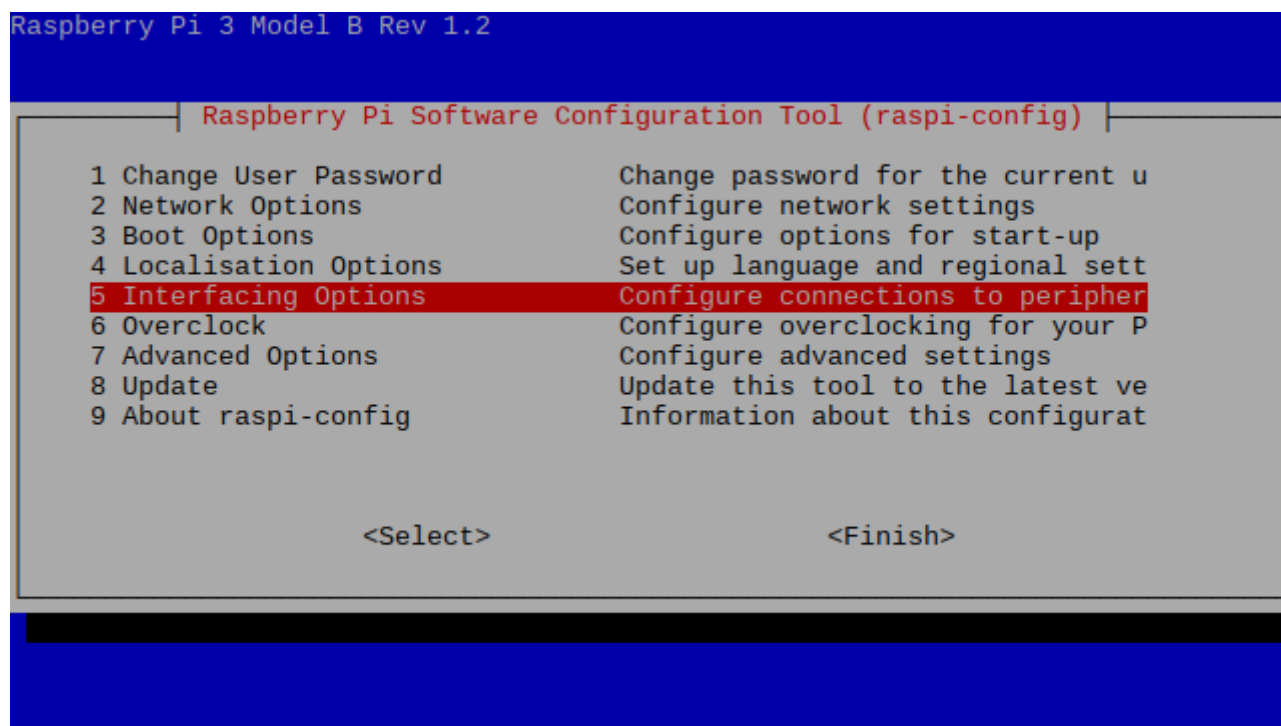
- Raspberry Pi Model 3B, 3B+, 4B or CM4

Installation and Configuration

A step by step series that covers how to get the Firmware running.

Raspberry Pi Firmware Pre-Reqs

1. Download and install the latest Raspberry Pi OS Desktop image to your SD card
2. Open the terminal and execute the following command `sudo raspi-config`
3. Then follow the following pictures to enable I2C bus on you raspberry pi



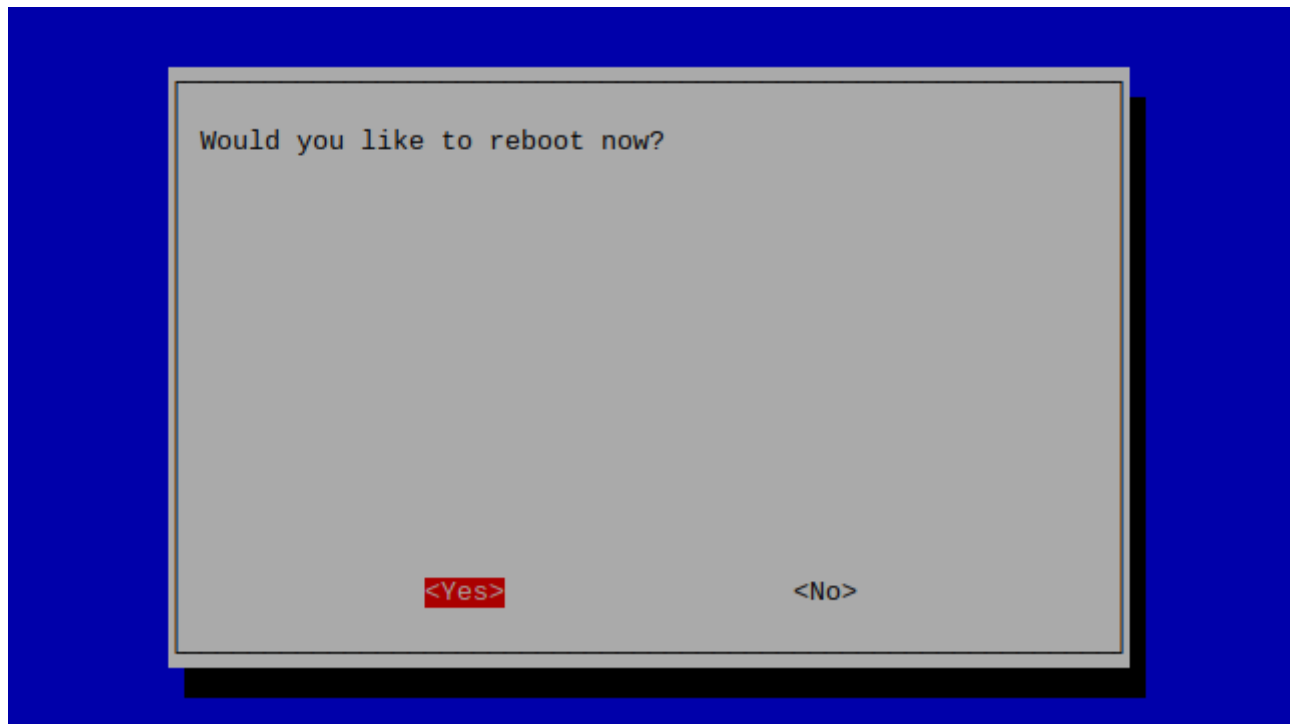
Would you like the ARM I2C interface to be enabled?

<Yes>

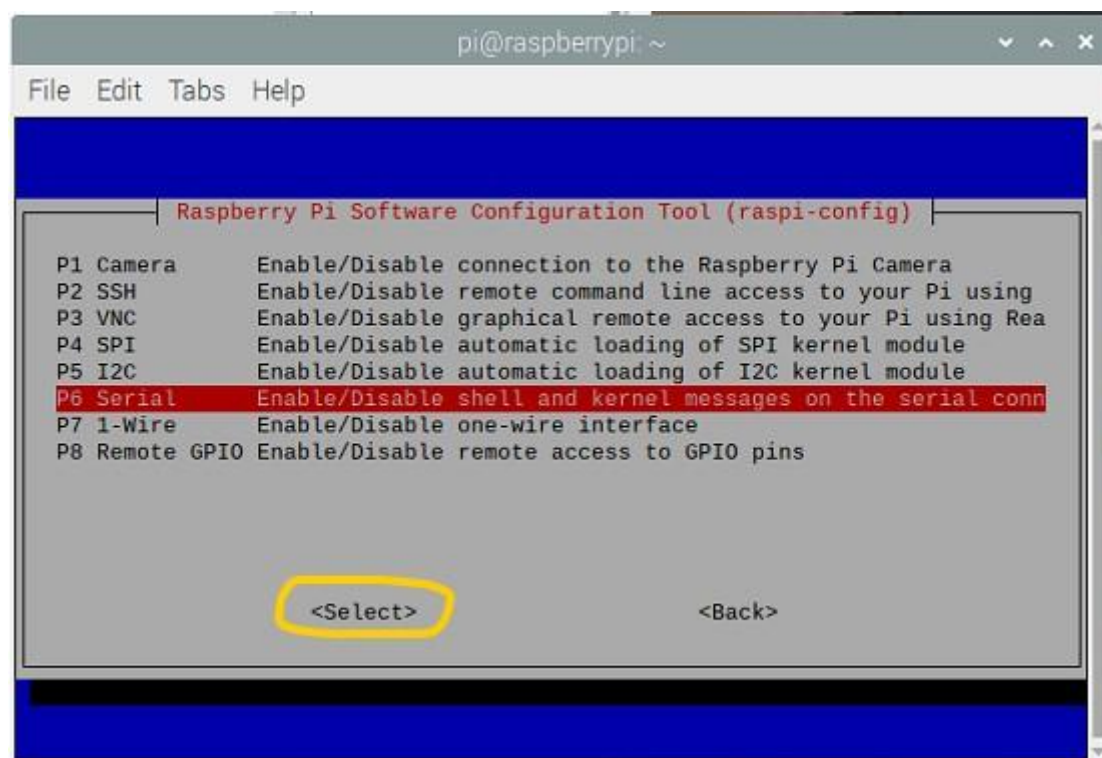
<No>

The ARM I2C interface is enabled

<Ok>



-
- Then do the same for Serial(UART)



-
- And same for SPI, SSH and Camera

Configuring Raspberry Pi and Running the UI

1. Copy FirmwareRPI folder to the desktop of your Raspberry Pi, open the terminal of your Raspberry Pi and execute the following commands

```
- sudo apt-get update  
- sudo apt-get upgrade
```

```
- sudo apt install python3-pip
- pip3 install paho-mqtt
- sudo adduser $USER dialout
- sudo cp siSensor.service /lib/systemd/system/
```

Once done, import `flows.json` to the nodered, form `dashboard` folder.

Installing and Configuring Node-RED on Raspberry Pi

Conifguring NodeRED, MQTT is required only one time.

Open the terminal and execute the following commands

```
- sudo apt install ufw
- sudo ufw enable
- sudo ufw allow tcp http https 1883 8883 1880 80 8080 443
```

Installing MQTT(Mosquitto)

Open the terminal and execute the following commands

```
- sudo apt install -y mosquitto mosquitto-clients
- sudo systemctl enable mosquitto.service
- mosquitto -v
```

Installing and Configuring NodeRED

Open the terminal and execute the following commands

```
- bash <(curl -sL https://raw.githubusercontent.com/node-red/linux-
installers/master/deb/update-nodejs-and-nodered)
- sudo systemctl enable nodered.service
- npm install node-red-dashboard
- sudo npm install node-red-dashboard
- sudo systemctl restart nodered.service
```

Then open NodeRED in your raspberry pi or using any other device which is connected to the same network as your Raspberry Pi is. In the browser you can type `http://raspberrypi.local:1880` to open the node-red

- Once node-red is opened, click on the menu button on the top left corner of the app and click on import.
- Click on `select file to import` and select `flows.json` present in the `dashboard` directory of this repo.

- After flows are imported, click on Deploy button on the top of the screen to save the changes.
- You can access the Dashboard using <http://raspberrypi.local:1880/ui>

1. To run the program just restart the raspberry pi.

This program make use of MQTT to communicate with the webapp.

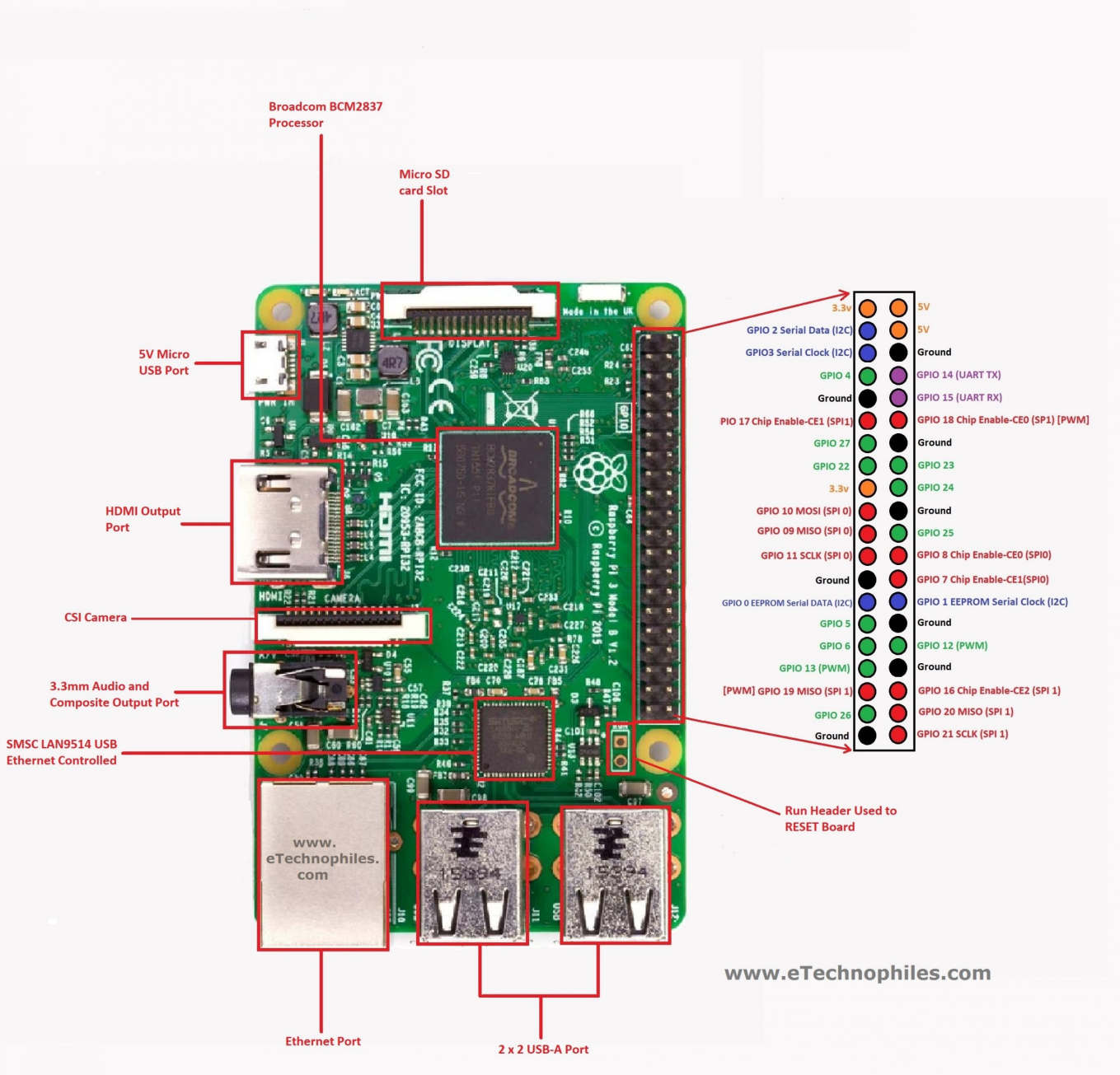
```
+ broker used is mosquitto, deployed on the Raspberry Pi.  
+ vending can be done by publishing an ammount to mdb/invoke topic
```

Testing

1. The Firmware can be tested on Raspberry Pi 3B, 3B+ or 4B with the following modifications
2. Connect the sensor as shown in the Circuit Diagram section below.

Circuit Diagram

- RPi 3,4 GPIOs Pinout



Circuit

Pins connections

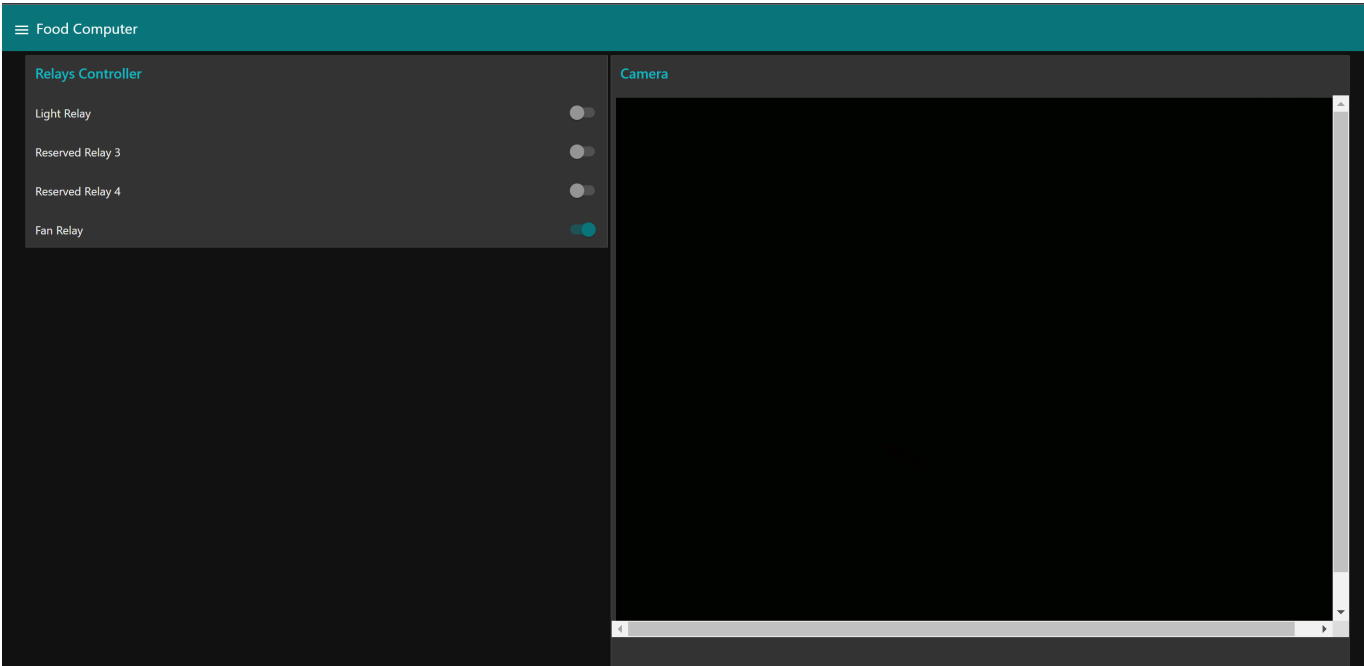
Si7021	Raspberry Pi
SDA	3
GND	GND
3V3	3V3
SCL	5
Relay Pins	Raspberry Pi
VCC	5V

Relay Pins	Raspberry Pi
GND	GND
P1	29
P2	31
P2	33
P2	35

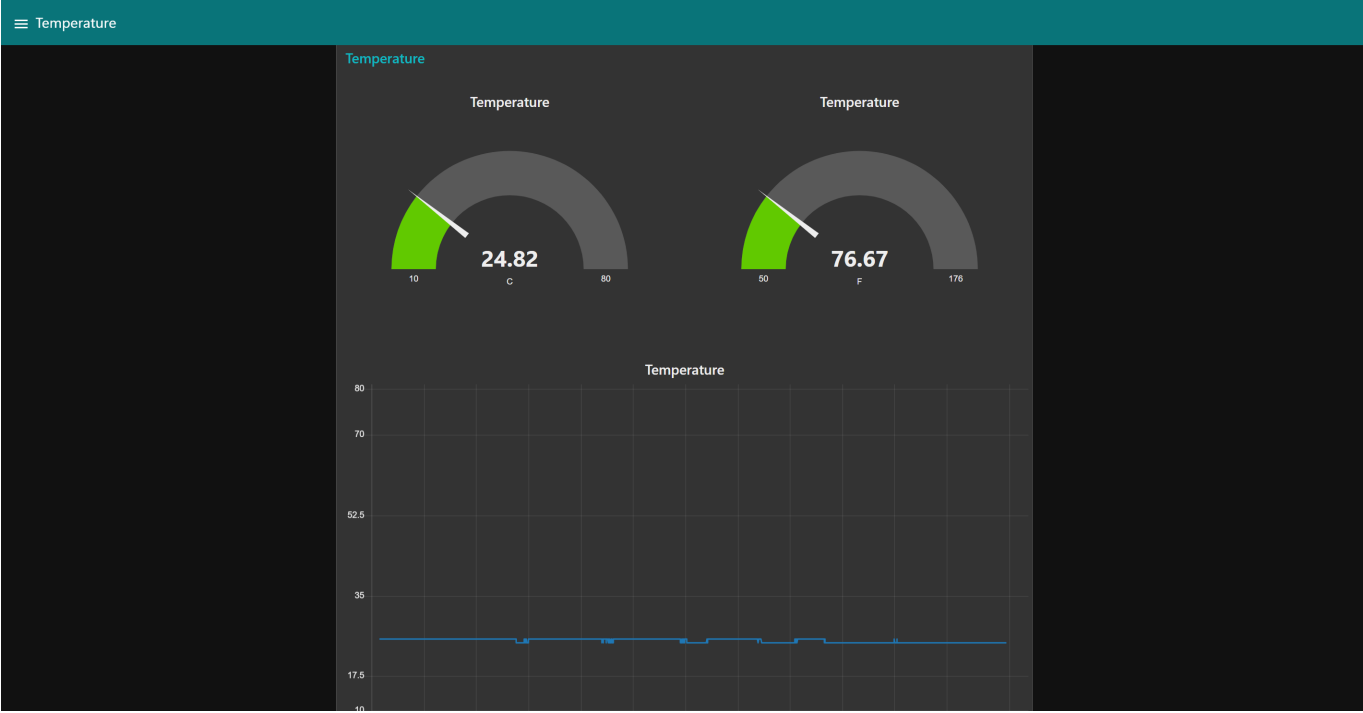
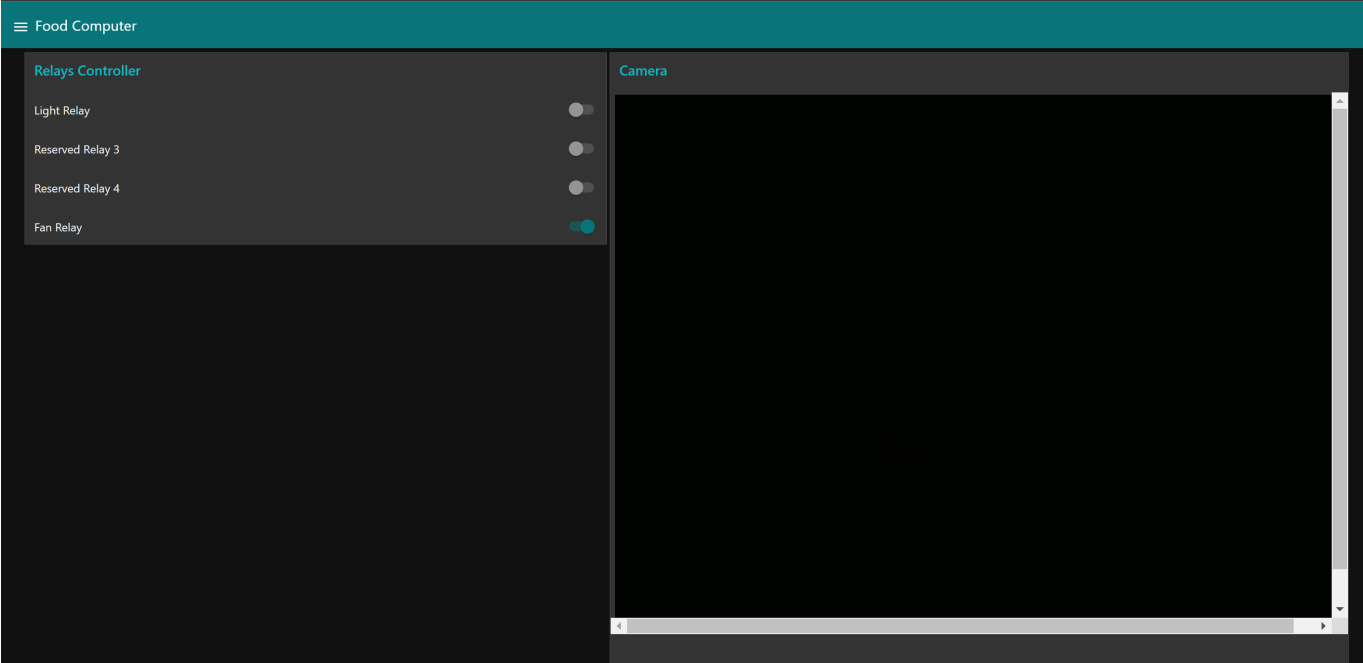
Dashboard

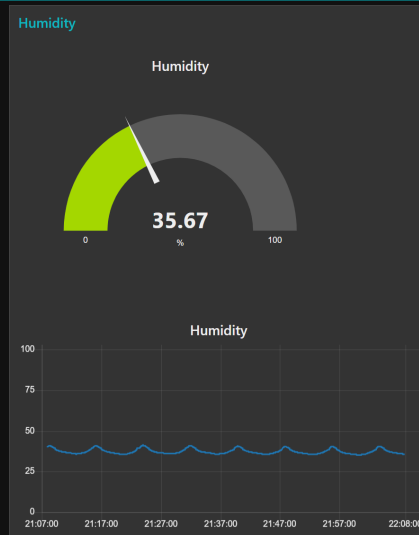
You can use the dashboard with the link below:

<https://maggoty-seaurchin-3431.dataplicity.io/ui>



- The dashboard is running on Raspberry Pi.





About Food Computer

Food Computer is an automated computer-controlled garden to mimic an outdoor environment inside the food computer. Here comes the role of sensors to provide an isolated virtual environment, knowing that the materials have been carefully selected to isolate the plant from the outside world, starting with the insulating material which is used to design the enclosure (Reflectix or any other insulator). The Raspberry Pi is our core/brain of the food computer and operates in the open-source ecosystem: it runs Linux. The raspberry pi is connected to a fan that blows air into the food computer. There are two fans, one is always on for circulation, and the other is thermostat controlled for exhaust ventilation. It is also connected to the temperature sensor that goes inside the food computer and depending on what we set the temperature, the fan will turn on if it is too hot and off if it is also cold. We will attach a grow light at the top, raspberry pi controls the lights, depending on the type of plant we can say we want it to last for 16 hours. We will use the raspberry pi to take images of the plants and I will store it in a directory as jpg files. Plants grow using hydroponics, so from the inside there is a basin that we fill with water and then we add some nutrients to the plants in it so that the plants can grow. We also have an air bubbler inside the hydroponics so that the root can get oxygen so that it can survive. The reservoir is a bus tub with an air-pump and stone. Plants are started in rockwool and placed into net pots in the reservoir lid. All chemistry (EC and pH) is done manually. An air pump is a crucial component of this type of hydroponic system since plant roots are constantly in contact with the nutrient solution and powered by electricity. The dimensions of the Reflectix ST16025 Staple Tab Insulation Roll are 25.4 x 40.64 x 25.4 cm so the plant container should be smaller than the enclosure size. When it comes to plants to grow in a hydroponic system, you can't get much better than mint. Mint is well-suited for hydroponic growing and is a great choice for a beginner. It is a hardy plant that can tolerate a wide range of environmental conditions in multiple varieties in any hydroponic system. Hydroponic mint grows best at a temperature range from 60 to 70 degrees (F). Hydroponic mint can be fertilized with a foliage-based nutrient solution only since it isn't required to flower to harvest for culinary use.

1. [Raspberry Pi](#)
2. USB WebCam
3. Si7021 Temperature and Humidity Sensor
4. 4 Channel Relay Module
5. Fan
6. Lights

Built Using

- [Python3](#) - Raspberry Pi FW
- [Node-RED](#) - Platform for creating dashbaords and backend logic
- Bash

Authors

- [@Nauman3S](#) - Development and Deployment