

Team I: Bloom Box

Sponsor: 96boards
UCSD ECE 191 Project

Offline Temperature and Humidity Monitor

Open-Source Project

Overview

The bloom box is a self sustainable developer workstation that is capable of recharging using solar panels and provides a resulting 8 hours of off the grid usage. It is equipped with a [Dragonboard 410c](#) as well as a [mezzanine board](#) to offer consumers computational abilities to see their projects take form off the grid. We intend the bloom box to be used for educational as well as other computational purposes. The equipment provided is scalable and can be used for most applications desired by consumers for off the grid usage. The bloom box is completely open-source and we hope to foster strong community project contributions. The goal with this project is to demonstrate a structure for future projects as well as build a useful and interesting project for beginner users.

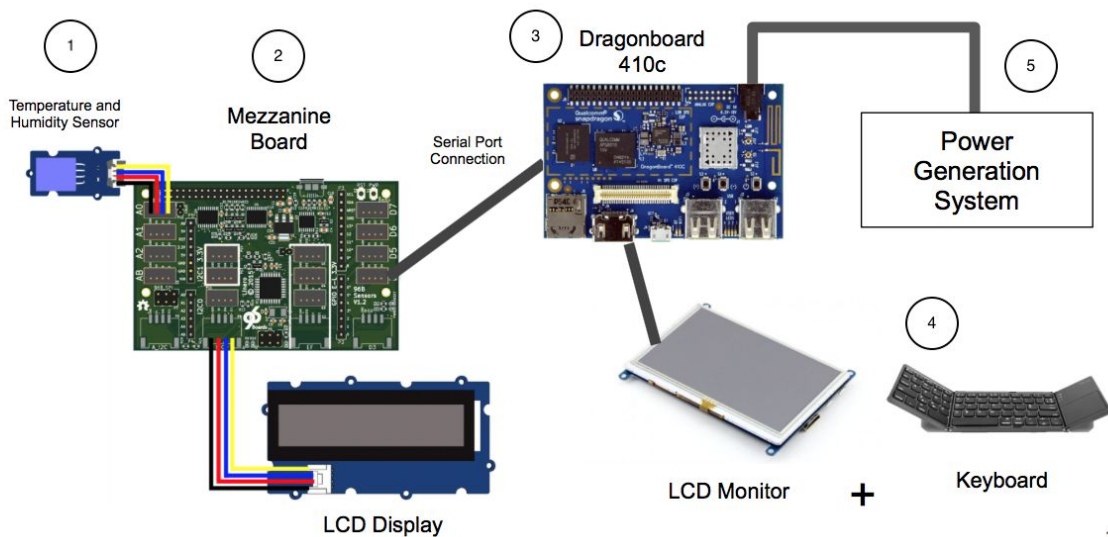
Goals

1. **Make an Offline Temperature and Humidity monitor:** By the end of this project, the user will be able to build a working Temperature and Humidity monitor. The user will be able to connect all the required modules and display the local temperature as well as humidity value on the LCD screen provided by us.

2. **Learn how to Interface with Electrical Sensors using Code:** The user would learn how to bridge the gap between software and hardware. The user would have to write and execute code on the dragonboard and mezzanine board which will be used to control the bidirectional data from and to the sensors.
3. **Learn basic Electrical Project Paradigms:** Most basic projects concerning electrical sensors and software would follow a similar structure to this project. By the end of this project the user would be able to make similar projects on their own.

Specifications

As most basic bloom box projects there will be 5 main components to work with which are pictured in the system diagram below:



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The system components are labelled on the diagram above and described below. Each number corresponds to the number on the diagram above.

Project Components Description

1. The first component is the peripheral sensor, which in our case is the temperature and humidity sensor. This component is responsible for connecting all the data that we need to gather. In our case the sensor would be responsible to gather temperature and humidity data from the environment.
2. The second component is the [mezzanine board](#) which essentially acts as an interface between the computer(dragonboard) and the peripheral sensors. It functions as a microcontroller which is used to control the peripherals attached to it. It has multiple ports that can connect to multiple sensors simultaneously.
3. The third component is our computer which is the [Dragonboard 410c](#). The user would use this component to write scripts and send the scripts to the mezzanine board to execute. After the script is executed the mezzanine board will send the output back to the dragonboard.
4. The fourth component is the computer peripherals including keyboard and monitor. The monitor is used as the display for the dragonboard and the keyboard is used to pass key inputs.
5. This is arguably the most important part; the power source. The Power generation unit of the bloom box is used to provide all the necessary power used by the rest of the components in the system.

Most beginner bloom box projects can be made with the help of these main components.

System Overview

The project is implemented as follows. The sensor connects with the Mezzanine Board which is connected to the Dragonboard. Using the keyboard and LCD Monitor we write scripts which we then execute on the Dragonboard. The script is sent through the Dragonboard to the Mezzanine board which executes it and communicates with the sensor to obtain data and relay the data

gathered back to the dragonboard. This data is then outputted by the LCD monitor connected to the Dragonboard. The setup process for each element is given below.

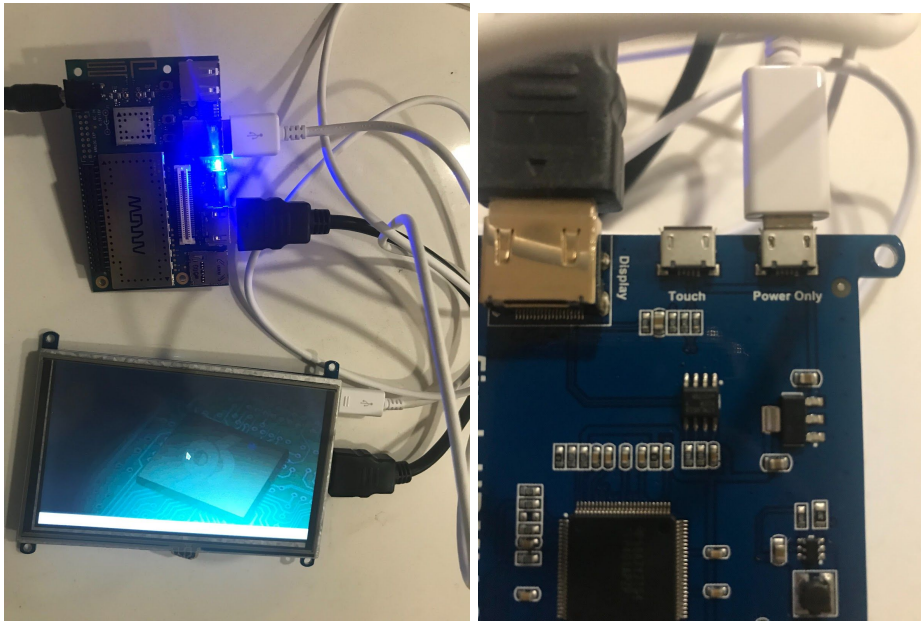
How to guide

1. Setting up the Bloom Box Power Generation Unit

Instructions for this are given in a separate document. Please refer to them to get the bloom box power generation unit set up.

2. Setting up monitor for Dragonboard 410c

There are certain special considerations for first time setup of the monitor provided in the bloom box. The connections are as shown in the images below:



The HDMI cable goes into the HDMI port and the microUSB cable connects to the power only port.

PS: When setting up the monitor for the first time make sure to have all the HDMI and microUSB connection connected before turning on the Dragonboard.

3. Setting up the Dragonboard 410C

Detailed dragonboard first time setup instructions can be found on this link:

<https://www.96boards.org/documentation/consumer/dragonboard410c/getting-started/aws-kit/>

It should be noted that the power supply would be directly connected to the inverter provided in the bloom box for off the grid usage.

4. Setting up the Mezzanine Board and connecting Sensor

Detailed instructions provided on this link:

<https://www.96boards.org/documentation/mezzanine/sensors-mezzanine/#example-project---temperature-and-humidity-display>

5. Setting up the code files for execution

All the necessary code files are provided in the repository as well as the USB drive. For this project we will use read_dht.ino and humid_temp.py. The code can also be found on this link with detailed execution instructions:

<https://www.96boards.org/documentation/mezzanine/sensors-mezzanine/#example-project---temperature-and-humidity-display>