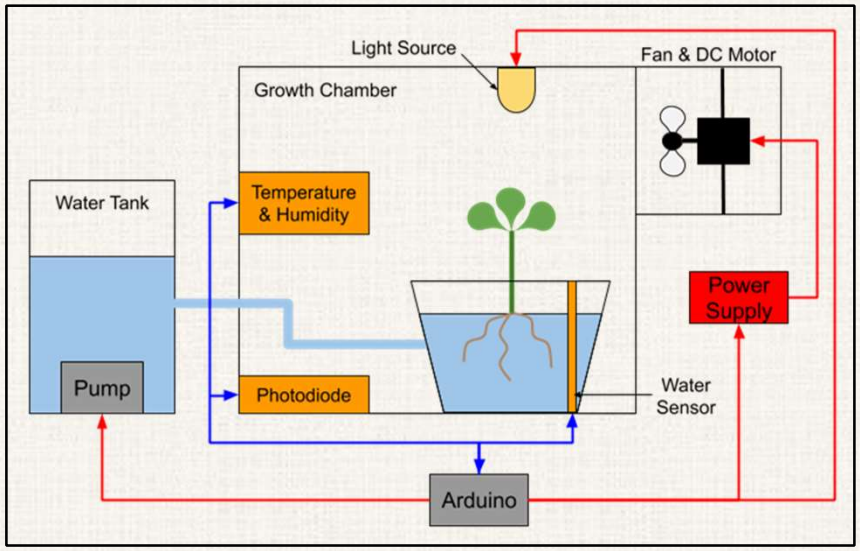
Hydroponic Chamber

Yu-Hsuan (Teddy) Chao
Lauren Grice
Jordan Weaver

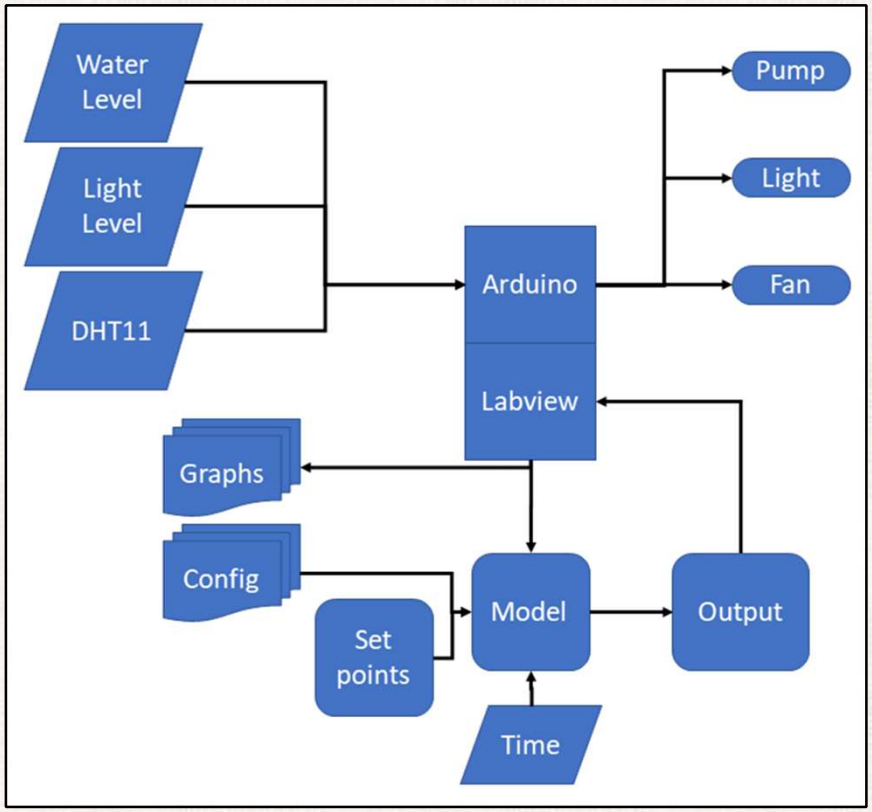
Background

Project: One Plant Hydroponic Chamber



- Maintain control of:
  - Water level
  - Light exposure
  - Temperature
  - Relative humidity
- Seeks to address problems with current hydroponics

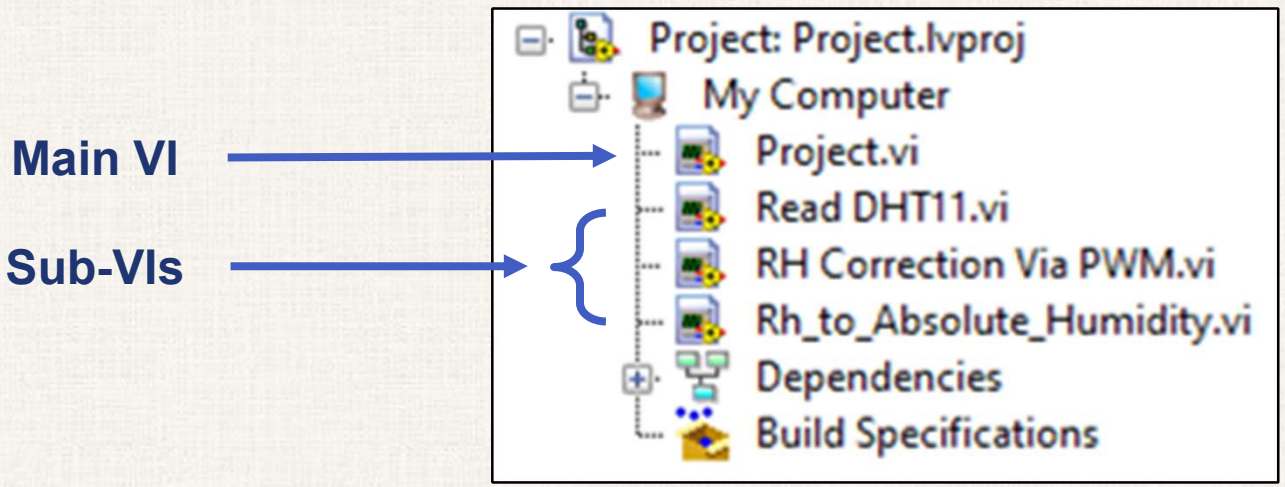
Flow Chart


Water Level
Light Level
DHT11
Arduino
Pump
Light
Fan
Labview
Graphs
Config
Set points
Model
Output
Time

Goals

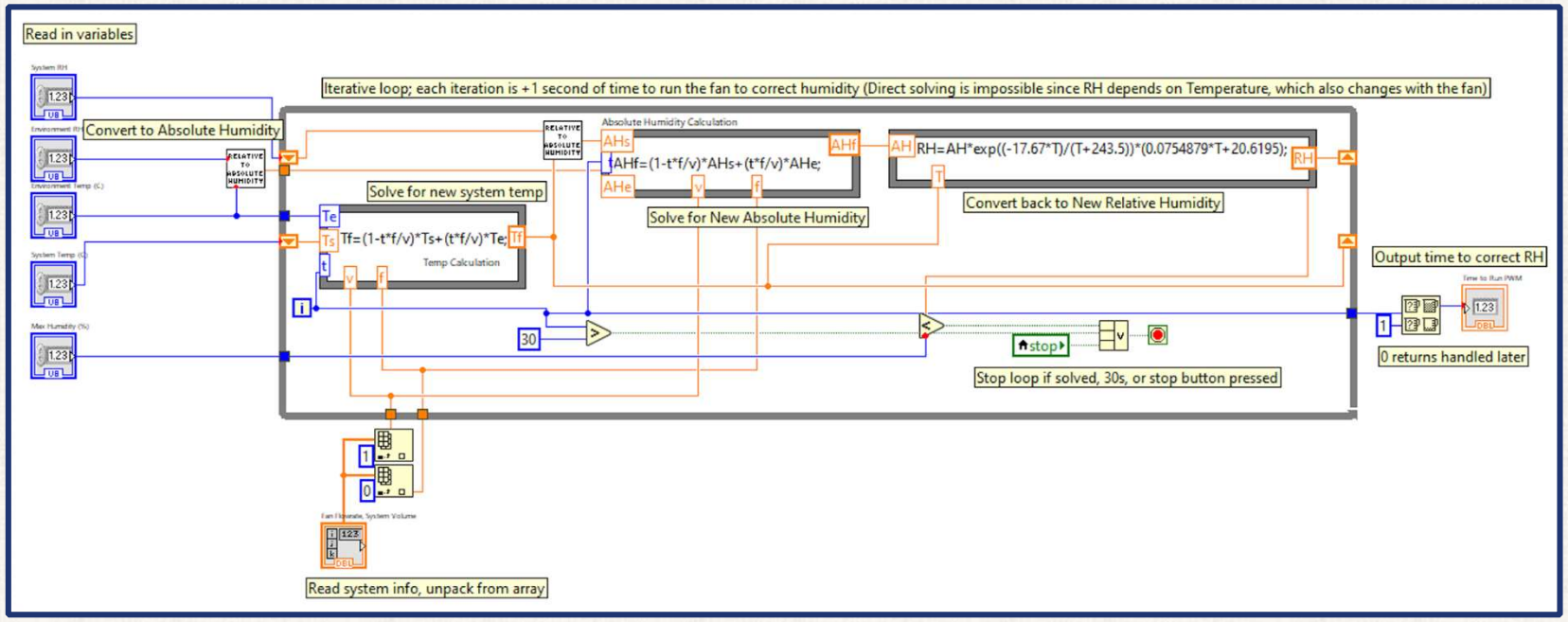
Initial Goal	Achievement Status
Maintain Water Level	50% - Needs relay, pump, reservoir, & piping
Maintain Temperature	**100%**
Maintain Humidity	**100%**
Maintain Light	75% - Needs relay and grow light
Operate Continuously without PC	0% - Would require laptop running LabView full time
Implement DHT11 + Custom Firmware	**100%**
3D Print Something	**100% - Motor mounting bracket**

VI Breakdown



Sub VIs

RH Correction Via PWM



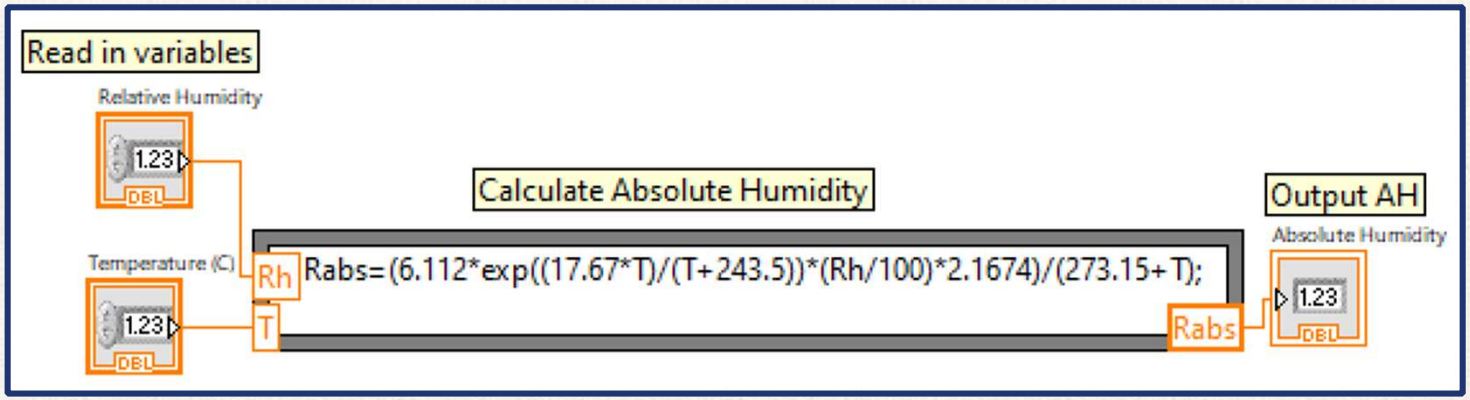
Inputs:

1. System's and environment's relative humidity & temp.
2. Maximum allowed RH

Output:

Number of seconds to run fan

RH to Absolute Humidity



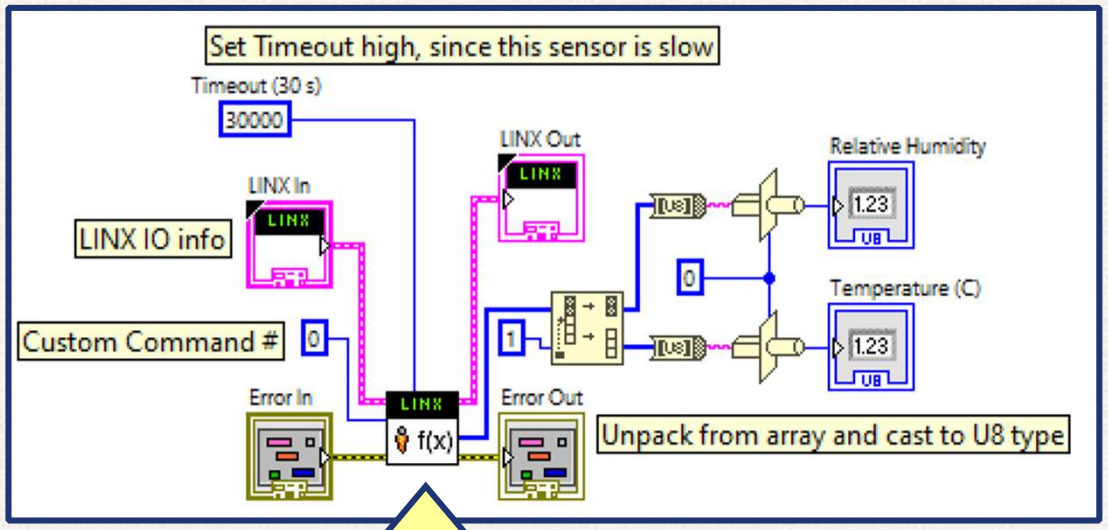
Inputs:

1. Chamber temperature (C)
2. Chamber relative humidity (%)

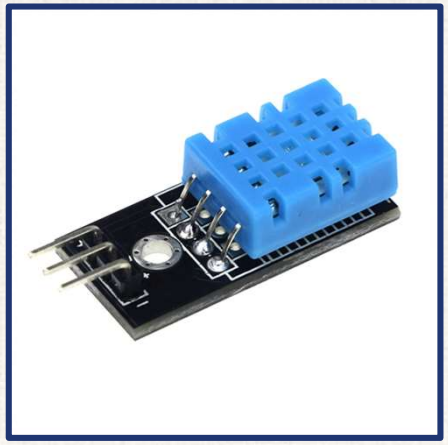
Output:

Absolute humidity

DHT11



Custom LINX Command

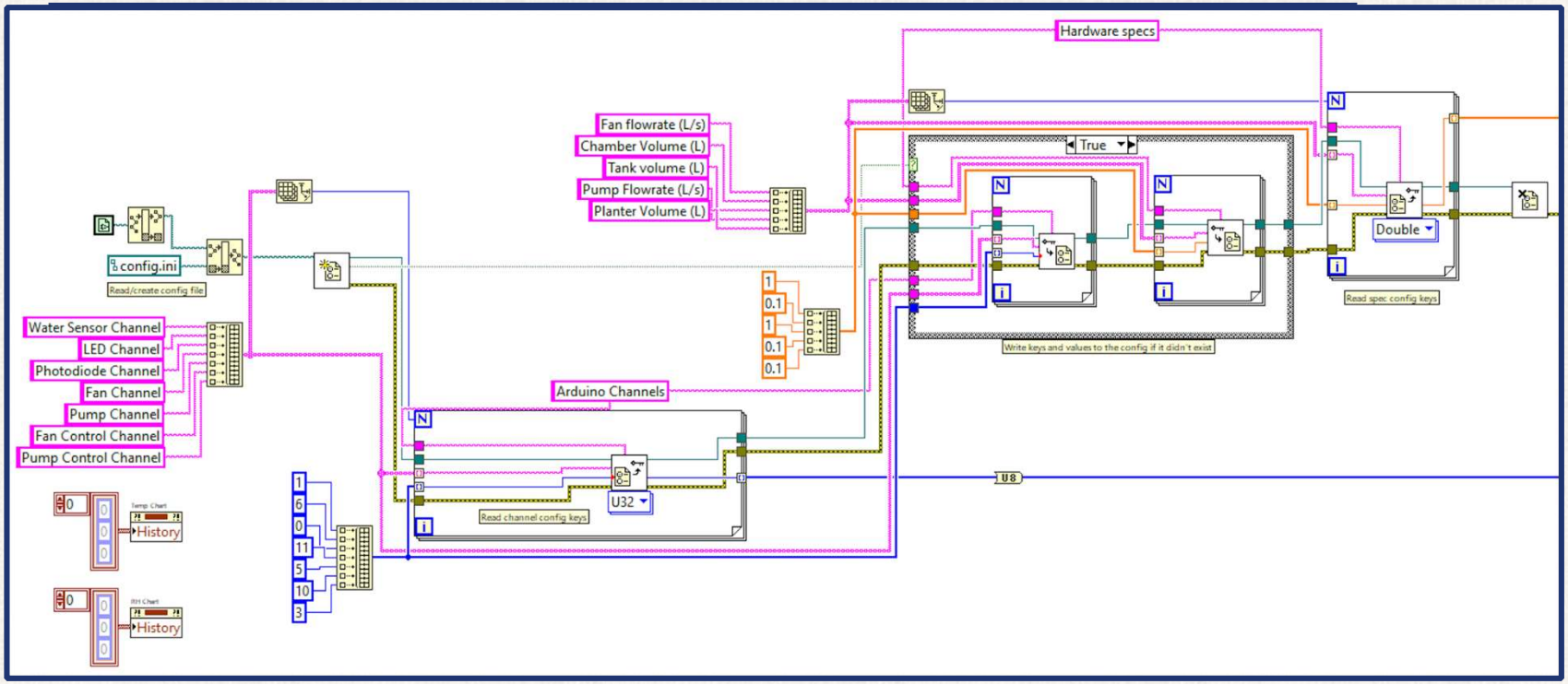


DHT11 Hardware

- Requires custom firmware on the Arduino
- Call a LINX custom command from Labview

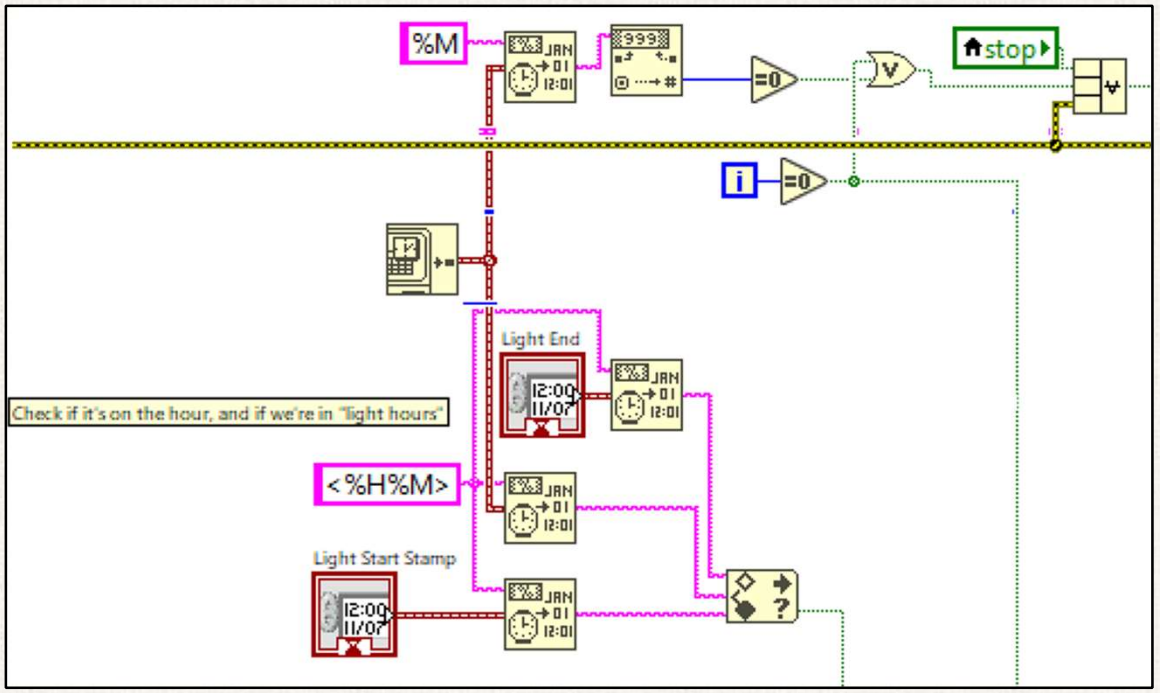
Main VI Elements

Configuration File Use

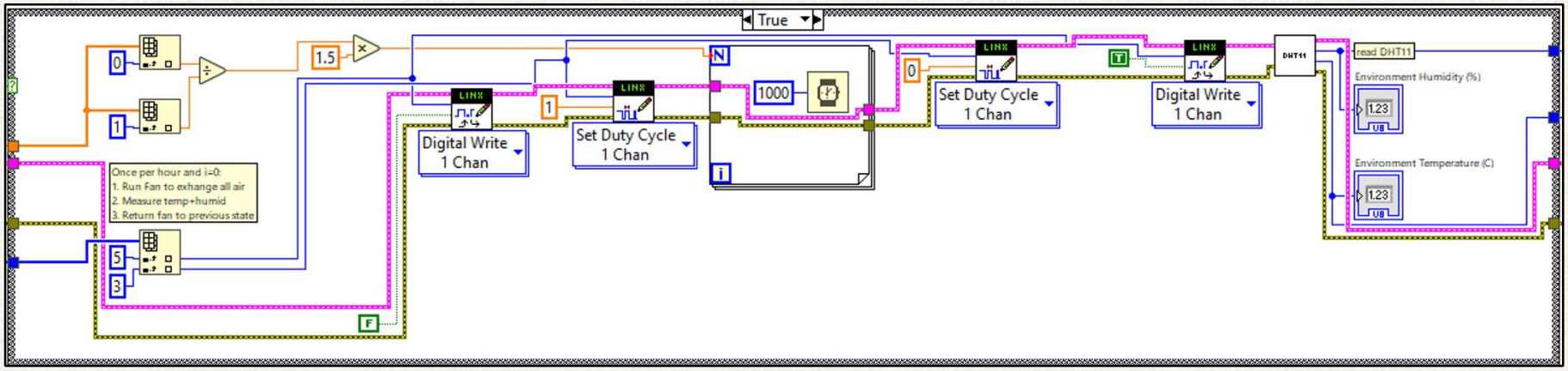


Configuration File Reading, Creation, Writing, and Chart Clearing

Control of Grow Light

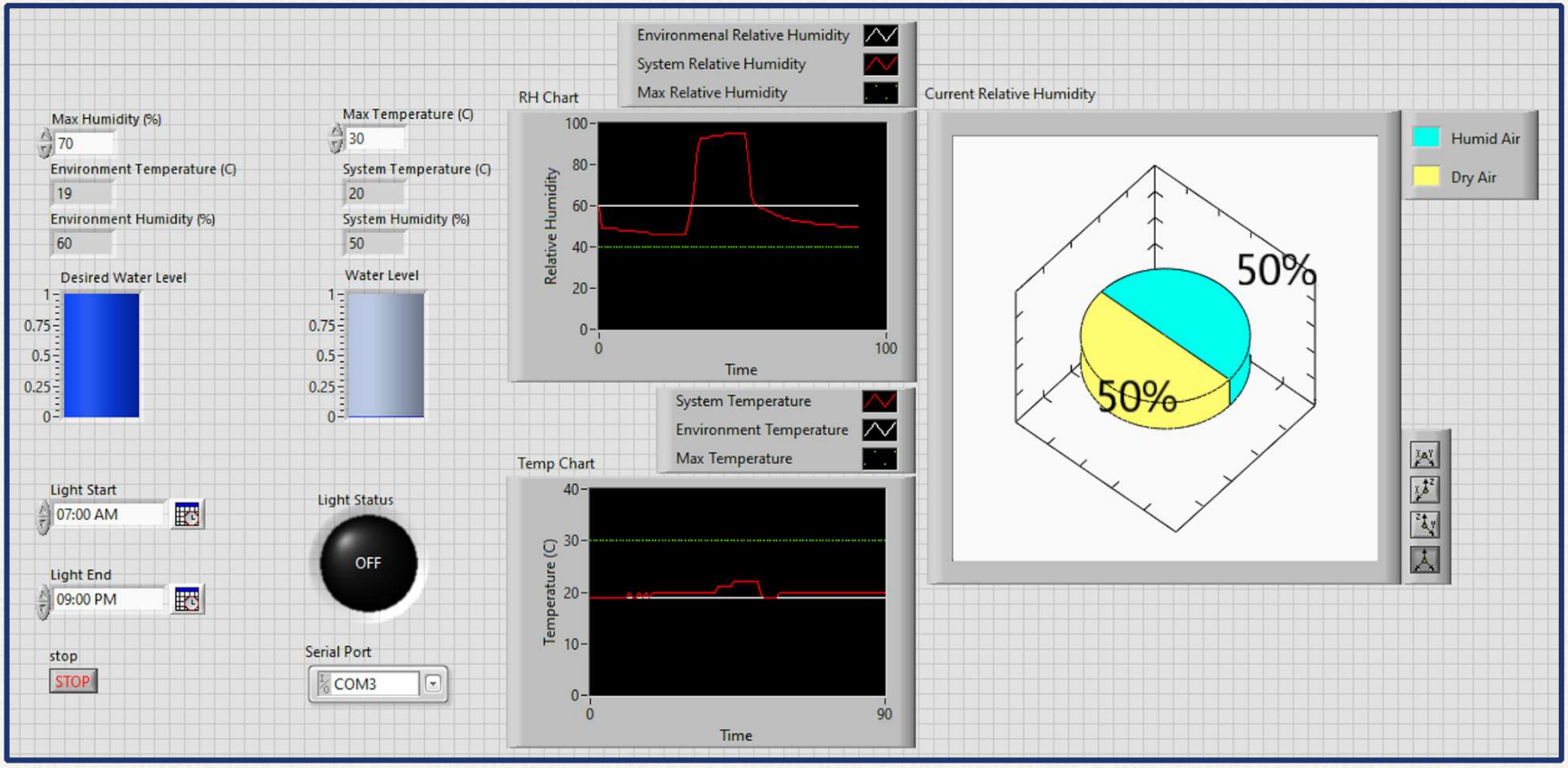


Checking for iteration 0 on the hour and within light hours

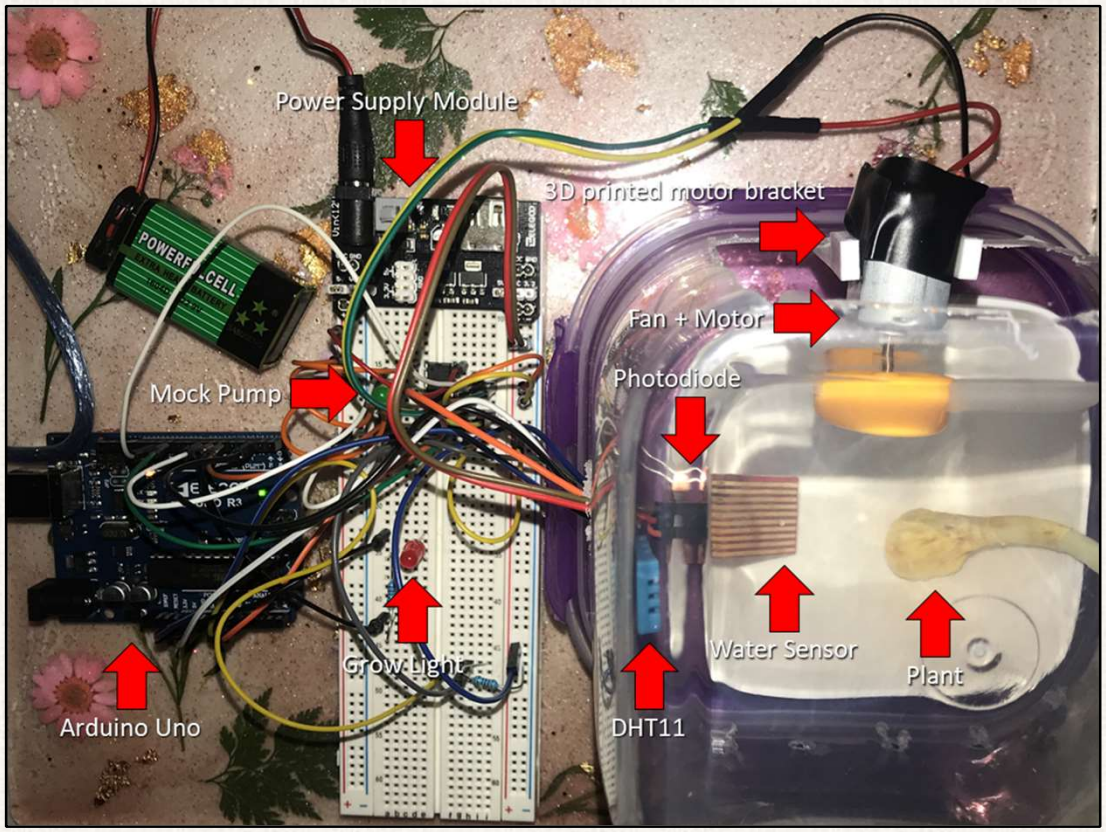


Hourly and Iteration 0 air exchange and DHT11 reading

Results: User Interface



Results: Final system



Testing Results

- Limitations:
  - Lacking water
  - Proximity to window
- Grow light and indicator worked as designed
- DHT11 sensor worked… but fan function was not ideal

Future work

- Use a relay and line-level voltage to control a real Grow Light (400 W+)
- Add a relay, power supply, water pump, and external water reservoir
- Use a better Fan (3D printed replacement possible)
- Calibrate photodiode based on light exposure from actual sunlight
- Add pH, Total Dissolved Solids (TDS) meters and correction methods
- Make code to Arduino-only, or implement remote Labview connection
- Permanently wire and enclose the system