

Initial Project Document

## Micro Manufacturing Beverage System



**University of Central Florida**  
Department of Electrical Engineering and Computer Science

Dr. Lei Wei  
Senior Design 1

### **Group 11**

Eric Velez Electrical Engineering  
Lance Adler Electrical Engineering  
Ryan Burns Computer Engineering  
Parke Novak Computer Engineering

## Project Description

This project is to design a beverage manufacturing system catered for micro operations. With the small-batch beverage manufacturing space expanding rapidly, demand for automation in the space is growing. This system may be split into two parts for simplicity - beverage dispensing and business tracking. All aspects of the system will be routed to the MCU, which will display parameters via a touchscreen interface.

This system will dispense liquid into cans or bottles proportionately. Each beverage is composed of two parts - the concentrate (which contains all functional ingredients) and water. The system will accurately and reliably dispense the correct water to concentrate ratio, creating a finished product. The system will dispense the liquids via solenoid valves controlled by the MCU. Precision will be ensured via sensors underneath the cans. These sensors will ensure that the containers are filled to the specified weight. If the weight is outside of the tolerance margin, the unit will be rejected.

The system will track various parameters of business operations. The MCU will automatically track batch logs and production logs. Batch logs will include date, quantity, and other details of concentrate production. Production logs will include number of units produced, number of rejected units, and other details. The system will also track critical temperatures using an array of temperature sensors. The temperatures will be displayed on the the touchscreen.

The project is intended for implementation in a small scale beverage manufacturing facility. Typically sensors and various other components would be spread out throughout the facility. In order to display this to the senior design panel, the project will be compacted onto a small mobile unit.

## Requirement Specifications

- Mobile unit to mount project for display.
  - Must be able to hold 100 lbs of weight
  - Approximately 3' x 3' x 5'
  - Constructed out of metal and wood
  - Will contain compartment for keg storage
  - Filling station will be mounted on top
  - Mobile unit will be outfitted with wheels to allow ease of movement
- Interface for measurement display and control inputs
  - Touch screen display
  - MCU capable of handling multiple tasks at once
  - Temperature sensing
- Filling station
  - Station must be able to move up and down
    - Must utilize linear actuator

- Must dispense three drinks at once
  - Will utilize 6 MCU controlled valves
- Include sensors in base to weigh each drink
  - 3 sensors total
- Valves will draw from pressurized kegs
- Kegs will be pressurized using a 5 lb CO2 tank

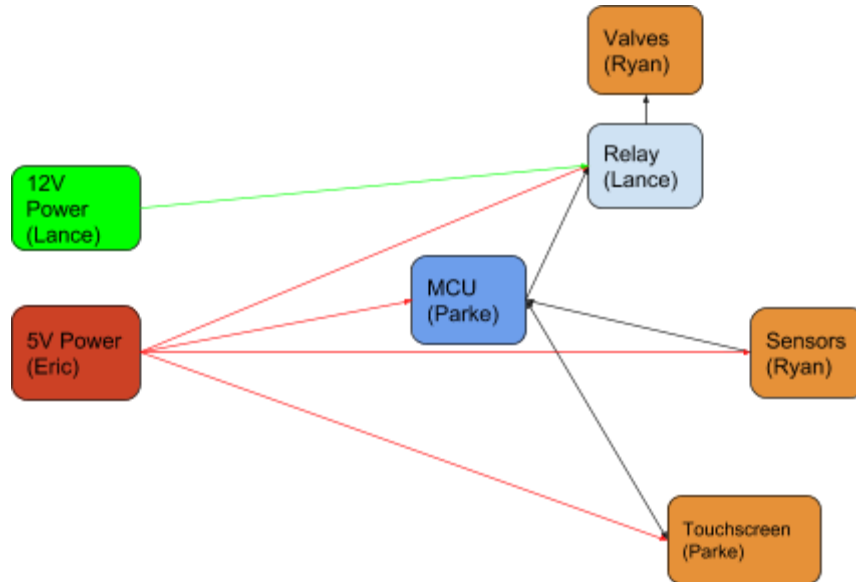
House of quality

			Engineering Requirements			
			Power Use (<200 Watts)	Sensor Accuracy (Temperature) (± 2%)	Sensor Accuracy (Weight) (± 7%)	Ability to Multitask (≥3 Tasks)
			-	+	+	+
User Requirements	Cost	-	↓	↓	↓	↓
	East of use	+	↓	↓	↓	↓
	User Interface	+	↓	↑	↑	↑
	Reliability	+	↑	↑	↑	↑
	Maintenance	-	↑	↓	↓	↓

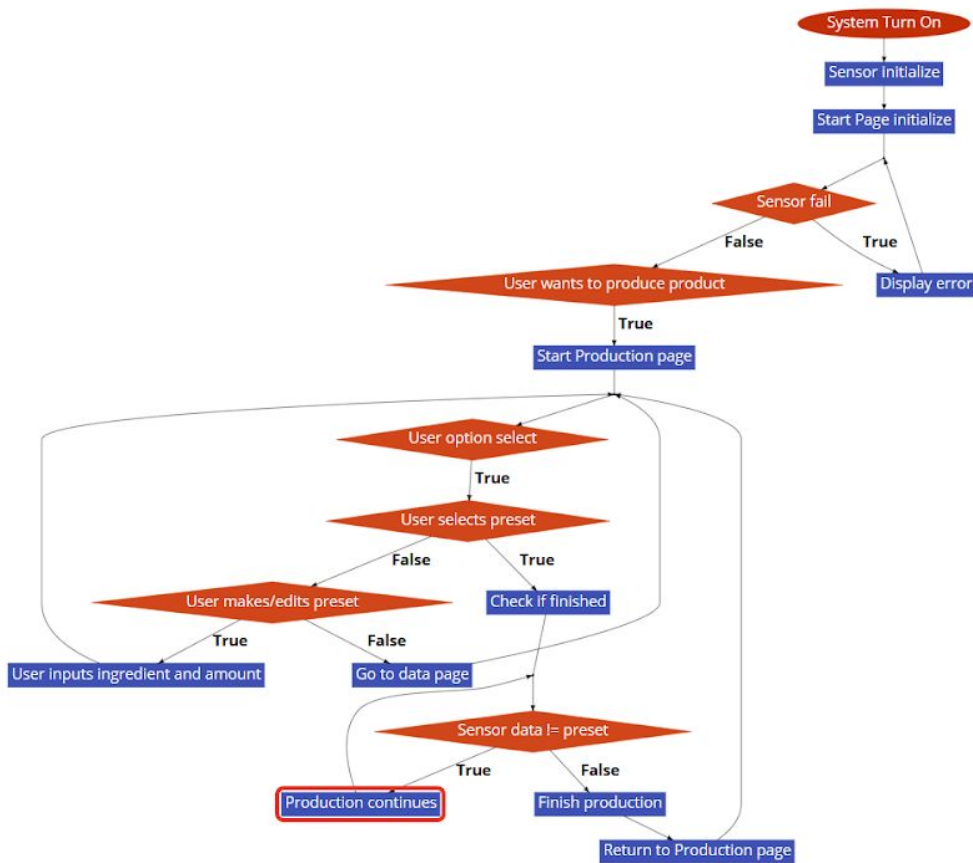
Strong Positive Correlation	↑ ↑
Positive Correlation	↑
Negative Correlation	↓
Strong Negative Correlation	↓ ↓
Positive Polarity	+
Negative Polarity	-

Block Diagrams

Hardware Diagram



Software Diagram



While the above diagrams specifies the “leader” of each hardware part, almost all parts will involve a combination of work between the hardware team (Lance and Eric) and/or the software team (Parke and Ryan).

### Budget/Financing

Solenoid Control Valves x6	20x6 = \$120
Pressure Regulator	\$50
Touchscreen LCD	\$60
Weight sensors x3	10x3 = \$30
Temperature sensors x2	5x2 = \$10
Linear Actuator	\$110
Keg x2	2x50 = \$100
Raspberry Pi 3	\$35
PCB	\$70
<b>Total</b>	<b>\$585</b>

Milestone Senior Design 1

Milestone	Completion Week
Project Idea Decided	1/20/2019
Project Divide and Conquer Rough Draft	2/1/2019
Project Divide and Conquer Approved	2/5/2019
Project Research - Components	2/15/2019
Project Research - Operating Systems	2/25/2019
Project Research - Hardware/Software Agreement	3/5/2019
Project Design - PCB software tutorial complete	3/15/2019
Project Design - PCB Simulated	3/25/2019
Project Design - PCB Constructed and Tested	4/25/2019

Milestone Senior Design 2

Milestone	Completion Week
Project Building - Casing/Non-Sensor Hardware	5/5/2019
Project Building - Software for sensors completed	5/10/2019
Project Building - Valve System and Sensors	5/15/2019
Project Building - All Hardware combined	5/20/2019
Project Building - Software interface completed	5/25/2019
Project Testing - Initial testing completed w/ Adjustments	6/5/2019
Project Testing - Fine-Tuning Testing	6/15/2019
Project Testing - Finished Product	6/20/2019
Project Presentation	TBD (Final week)

Stretch Goals

- Phone app
  - Phone would get updates on drinks, set up potential presets, get alerts if sensors return inoperable conditions
  - Alerts if production is halted
- Product Quality check
- Automated queueing
  - Conveyor belt for drink cans