41028 Mechatronics Product Requirements Document

Group Name & Number	dosLHAMAS - Group 2

OVERVIEW

| Product Description	
Market Need	In a market with a growing willingness to minimise food waste, we've made a solution to save the fruits that would otherwise just be discarded. This is relevant, because each year upwards to 644 million tons of fruits and vegetables end up in waste. (https://toogoodtogo.org/en/movement/knowledge/what-food-is-wasted) Many small micro breweries have emerged and consumers appreciate quality. Moreover, the idea of DIY (Do It Yourself) is becoming more and more trendy. Combining this, we believe that fruit wine will become the next big thing. The ability to brew the wine yourself, in your own garden, with your own fruits, will take your dinner parties and all other wine thirsty nights till the next level.
Key Features/ Functionality	Automating the fruit-wine brewing process, making it easy for the novice winemaker to go from juice to consumable fruit wine. Key features: - Automatically stirring the mixture in the right intervals. - Racking the juice to remove dead yeast cells. - Electronically counting CO_2 bubbles showing yeast activity. - Measuring temperature and notify if too hot or cold.
Other Product Compatibility, Ecosystem, etc.	To be truly smart, the winemaker needs an internet connection, and a smartphone with the ability to download the smartWINERY-app.
Stakeholders	
Target User	The smartWinery is intended for anyone with the desire to brew wine or cider at home, especially people living in houses with gardens and apple trees.. It is also meant for people who care about the environment, as you are able to brew the wine from fruit which would go to waste otherwise.
Other Stakeholders	Stores who could be interested in selling this product - eg. Ikea, supermarkets or brands like Imerco. Manufactures of the components needed for assembling the smartWINERY.

	It would also be possible to make a collaboration with companies like GRIM, Too Good To Go, and Wefood, and suppliers of yeast.

DESIGN

| Brand	The smartWINERY needs to brand itself by the values of: Sustainability, DIY/Hand craft, and zero-waste.
Connectors (Power, USB, Lighting, Audio)	Power through an outlet.
Visual Interface (Screen size and type, LEDs)	The product will have an OLED screen and an app to display the progress/the measured data (alcohol content, bubble rate, and temperature).
Touch Interface (Mechanical actuators/switches, touch sensitivity, haptics)	The product will mostly be automatic from the time you pour the juice in till you get wine/cider out. It is however possible to manually control the stirring and racking from the app.
Audio Interface (Microphones, speakers)	The smartWINERY is not equipped with any audio interface.

SOFTWARE ARCHITECTURE AND DATA PROCESSING

Block Diagram of Data Flow
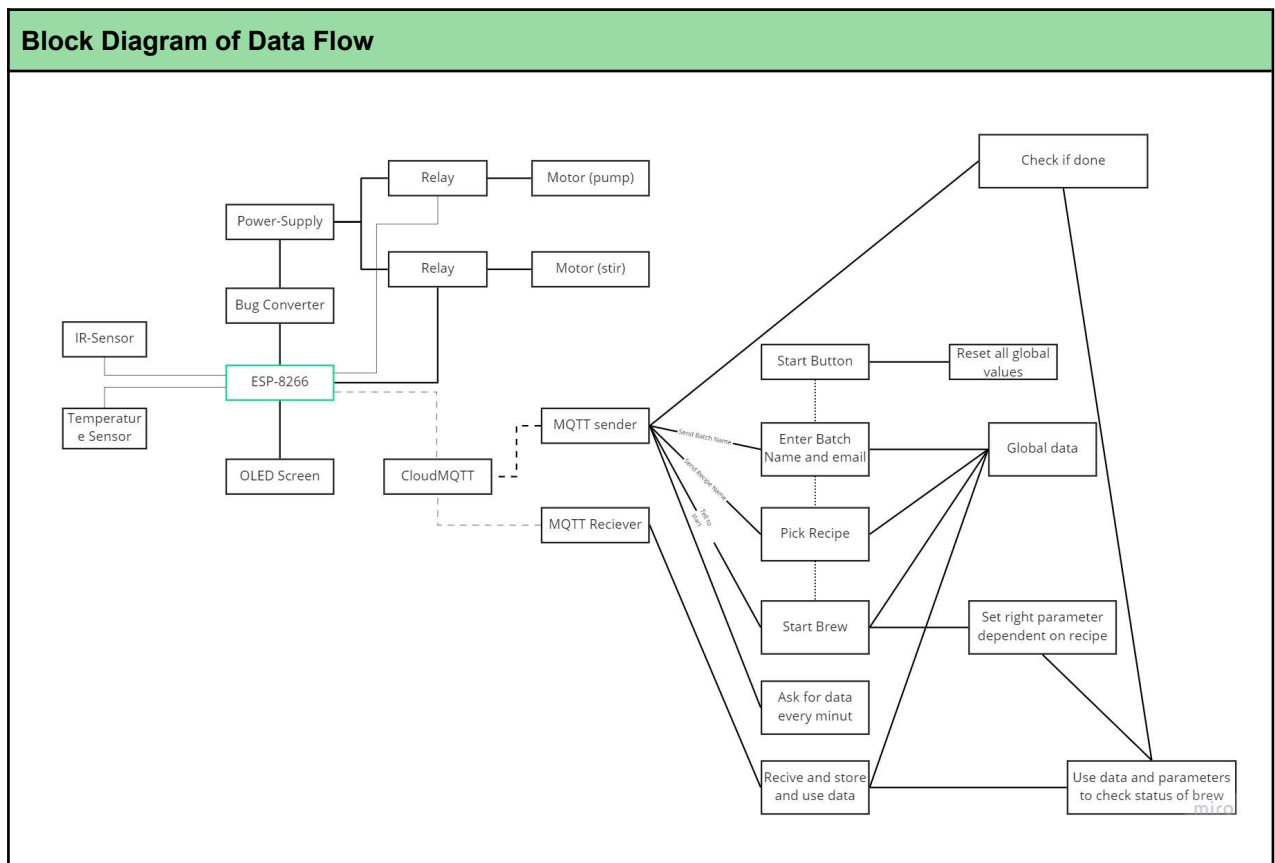
ELECTRICAL, HARDWARE AND SENSORS

Block Diagram of Electrical Hardware	
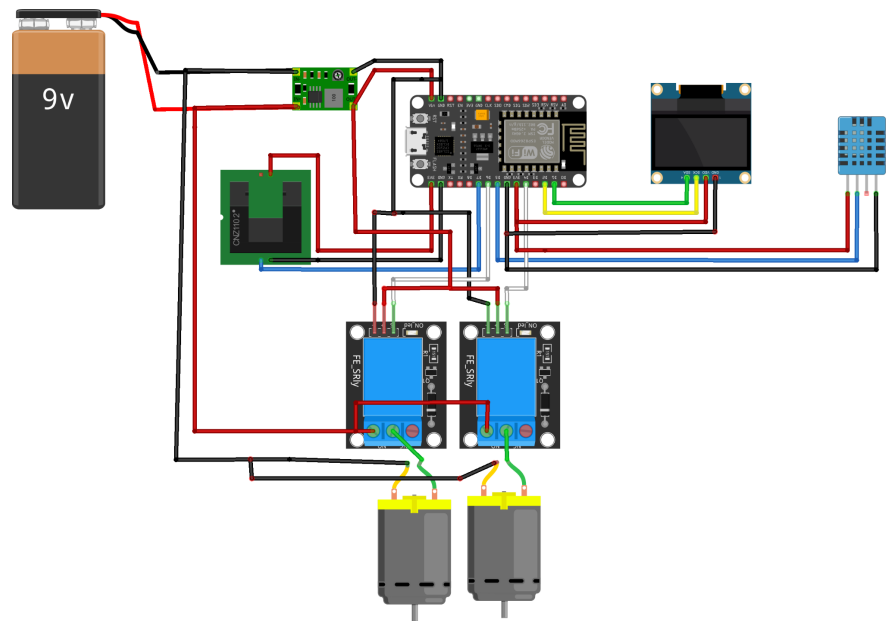
Input/Sensor Requirements	We want to be fairly accurate at measuring: - Temperature - Amount of bubbles produced each minute, hour and in total - Alcohol percentage
Output/Actuator Requirements	To secure an evenly distributed fermentation an actuator is added in the lid with an attached stirrer, which will create a circular movement of the mixture.
Critical BOM Components	Electrical: - ESP8266 - IR Optocoupler - OLED screen - Actuator - Peristaltic pump Physical: - Glass gallon - Lid - Air lock - Stirring stick - Filter - Tubes

	Ingredients: - Yeast - Fruit (mainly apples) - Sugar
Communication Requirements	User interface, letting the user interact and follow the process on their mobile through an app. The user will be able to see live information about the smartWinery. Moreover it will let the user know when the fermentation is done and the wine is ready to drink. This is created using Node-RED.
Power Requirements	The mechanism is connected to an outlet combined with fitting resistors. In total it will run on 9V, which will be stepped down to 5V which will be run into the ESP and to the relays. The two motors will run on the 9V.