




Design Review

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Application Area

We provide an automated bartender with a connected application that allows you to make a drink with just a few taps on your phone.

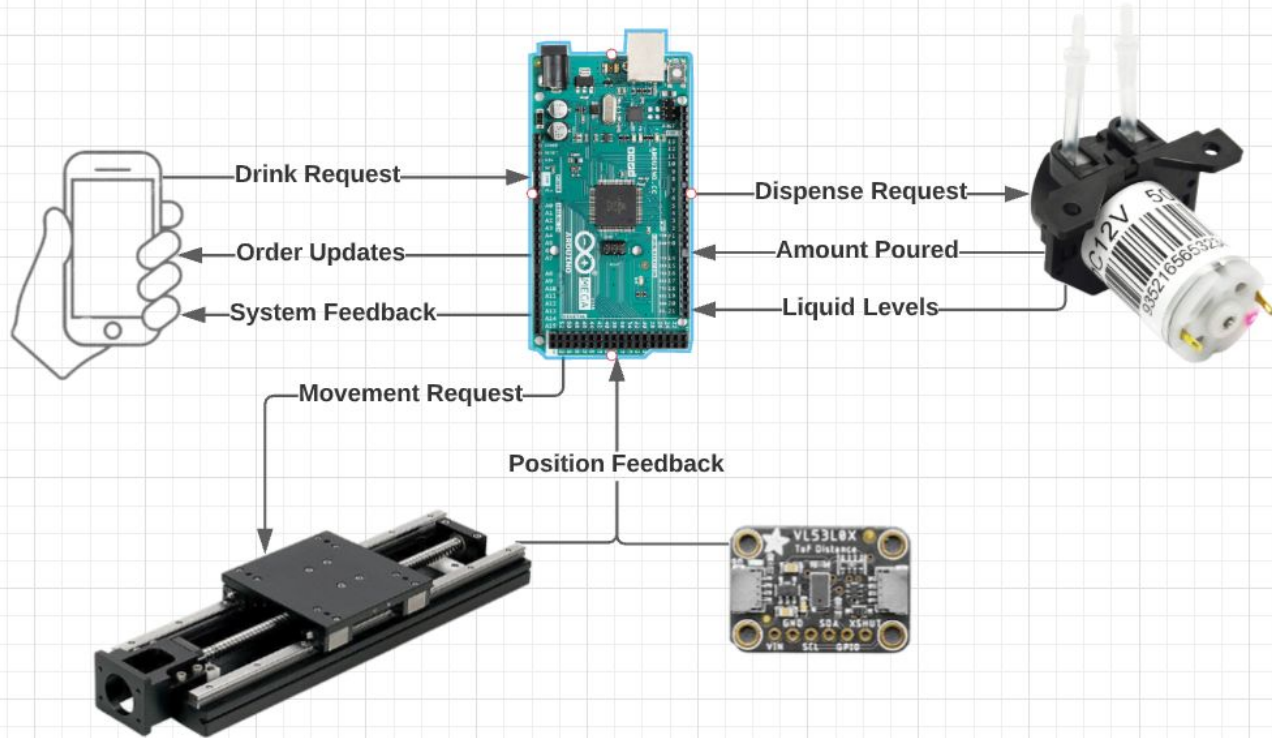
Users will only be responsible for placing their cup and choosing the drink they would like.

Our solution will bring an extra flair to creating a drink, with precise measurements for each required liquid.

Solution Approach

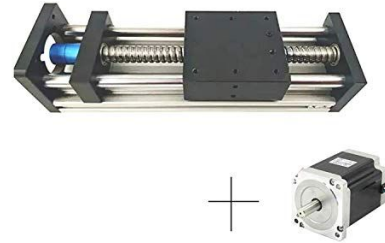
- Hardware/Mechanical
 - Create structure which can support 4 bottles of liquid
 - Arduino
 - Communicate with sensors to determine position and volume dispensed
 - Control stepper motors and timing belt
- Software
 - Create phone application to allow users to request drinks and track liquid levels
 - Communicate with Arduino over Bluetooth

System Specification

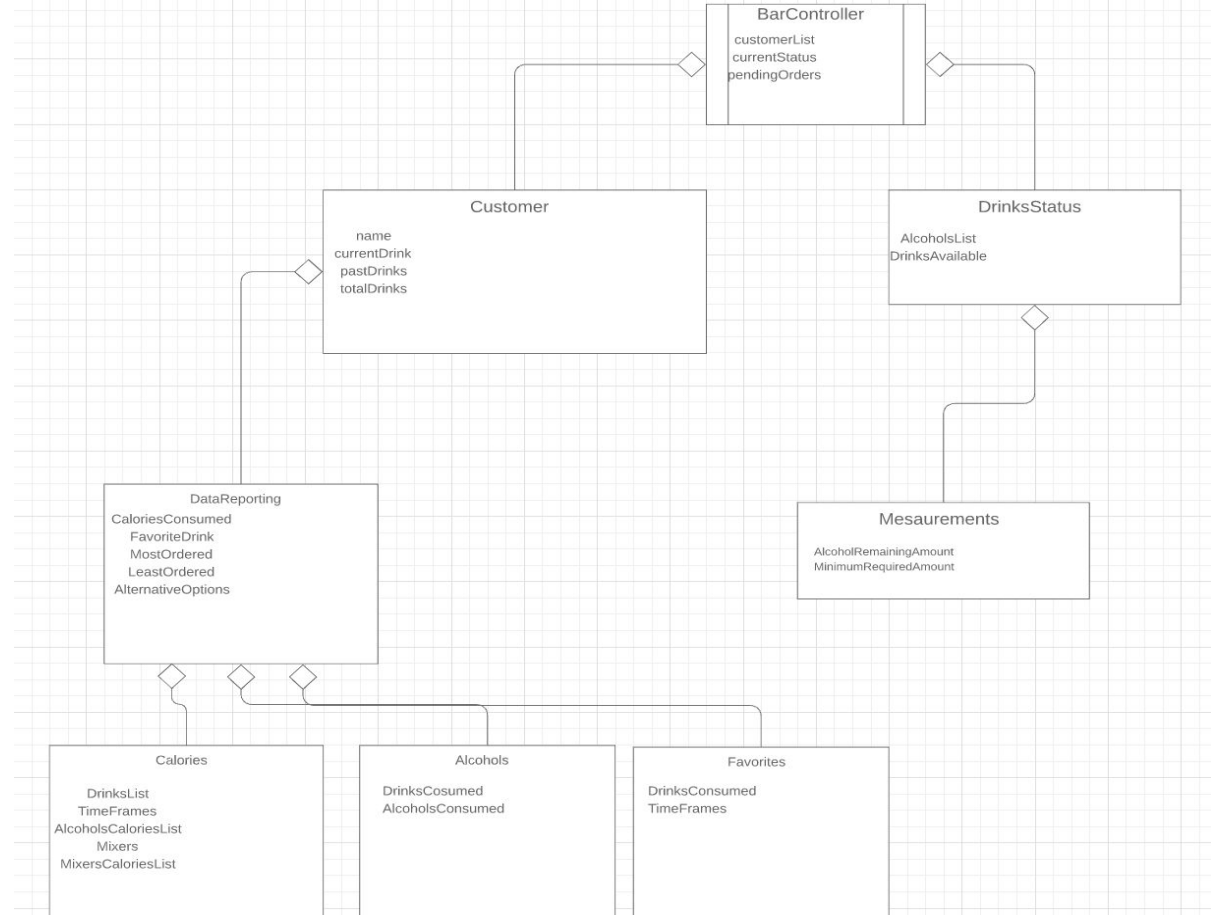


Mechanical / Hardware Layer

- Wooden support structure
- Mounted bottle holders
 - Peristaltic pumps
- Sliding platform
 - Stepper motor
 - DRV8825 stepper motor driver
 - Timing belt (6mm)
- ELEGOO MEGA
- 5V DC power supply



Software Layer



Implementation Plan

We are emulating the design of the structure used in “Barbot: Arduino Cocktail Mixing Robot”, but assembling the pieces on our own. We are buying all the necessary components to build the structure (wood, valves, Arduino, etc...), but are updating the mechanisms for timing belt positioning and liquid dispense measurement. The Arduino breadboarding and phone application will be developed completely on our own.

Metrics and Validation

Requirement	Testing Strategy	Quantitative Metric
Cup positioning	Physical measurement (ruler)	Center of valve is always within 1 inch of the center of the glass
Pouring accuracy	Physical measurement (measuring cups)	Within 5% of expected amount
Arduino and application communication	Send multiple requests and record latency	<ul style="list-style-type: none">- Drink making begins within 3 seconds- 100% accuracy on drink orders (all drinks are correct)
Spillage	Observation (test all 3 cup sizes)	Full drink never spills
UX (user feedback and statistics)	Time latency using software	All user requests and drink updates provided within 3 seconds

Risk Factors and Mitigation

- Cup is not positioned properly under the dispensers
 - Track position of the platform via laser and stepper motor
- Not enough liquid in the bottles to complete the order
 - Track bottle liquid levels via peristaltic pumps
 - Alert users on the application if a bottle is running low
- Drink orders lost or corrupted
 - Queue drink requests to ensure timely completion
 - Alert users the machine is in use
 - Display current queue
 - Prompt user to try again if request is not properly transmitted

Bill of Materials

Item	Price	Quantity
ELEGOO Mega 2560	16.99	1
DRV8825 Stepper Motor Driver	10.31	1
JBtek 8 Channel DC 5V Relay Module	8.99	1
Gikfun 12V DC Dosing Pump Peristaltic	11.59	5
Quickun Pure Silicone Tubing, 2mm ID x 4mm	7.99	1
DSD Tech HC-05 Bluetooth Module	8.99	1
Timing Belt (6mm width)	9.99	1
Timing Belt pulley (6mm width, 5mm bore)	8.98	1
Linear motion rods (12mm x 800mm)	39.99	1
SK12 Aluminum Linear Motion Rail Clamping Rod	12.49	1
Aluminium Pillow Block Housing	9.99	2
Power Adapter for Arduino	8.99	1
Wooden Planks	24.81	4
Shipping for wooden planks	35	1
Wood Screws	5.93	2
Nema 17 Stepper motor	25.99	1
Total:	383.73	

Project Management

	2/22/2021	3/1/2021	3/8/2021	3/15/2021	3/22/2021	3/29/2021	4/5/2021	4/12/2021	4/19/2021	4/26/2021	5/3/2021	5/10/2021	5/17/2021
Deliverables													
Proposal Presentation Slide	AC, TOM, TD												
Proposal Presentation	AC, TOM, TD												
Design Presentation			AC, TOM, TD										
Final Presentation										AC, TOM, TD			
Public Demo												AC, TOM, TD	
Final Report													AC, TOM, TD
Logistics													
Ordering all hardware/software components		TD					TD - Emergency/Backup if reqd.						
Ethics Section					ALL								
Weekly Status Reports	ALL												
Individual Status Reports	ALL												
Design													
Final design work		ALL											
Final design confirmed				ALL									
Building of outer casing					AC, TD								
Building of conveyer belt						AC, TD							
Building of casing for bottles								AC, TD					
Implementation													
Setting of Raspberry Pi		TOM											
Configuring MQTT protocols			AC, TD										
Configuring communications				AC, TD									
Configuring sensors					TOM								
Setting up phone app (SWIFT)						AC, TD							
Testing communications between app/device								ALL					
Refining UI for app								AC, TD					
Creating data reporting modules for user									AC, TD				

Work Distribution

- Mechanical
 - Build enclosure and dispensers- All
- Hardware
 - Coding RPi to control servos, moving platform, valves - Tom
 - Sense where cup is on platform (laser + step count) - Tom
- Software
 - Establish Bluetooth communication with RPi - Tyler, Aryan
 - Add ability to select drink from pre-made list - Tyler, Aryan
 - Queueing system to support multiple users - Tyler, Aryan