Automatic Coffee Machine

CET 4952 - Robotics
By: RJD's Precision Espresso Roasting & Coffee Extraction Technologies

Team Members

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Project Idea: Automatic Coffee Machine

 Our objective is to create an automation and represent how it can be applied in the real world. We're going to make a coffee machine that works automatically without human intervention and have most of the project run through five tasks.

In this project, the customer selects if they want their cup of coffee with or without sugar. The cup will be dispensed by the cup dispenser. Then, the cup is pushed on the conveyor belt and halts by the coffee machine. The machine makes the cup of coffee, depending on the choice of the customer. Finally, the finished coffee cup is handed off to the customer through the conveyor belt.

Automation

Throughout the history of automation, the emergence of newer techniques, processes and machines eventually shaped a path for automation to play a larger role in our society.

The main goals for the evolution of automation in everyday life has been to help improve efficiency, productivity, safety, and convenience. The different stages of automation's evolution have developed and advanced to the technologies we use today.

AutoCAD Drawing
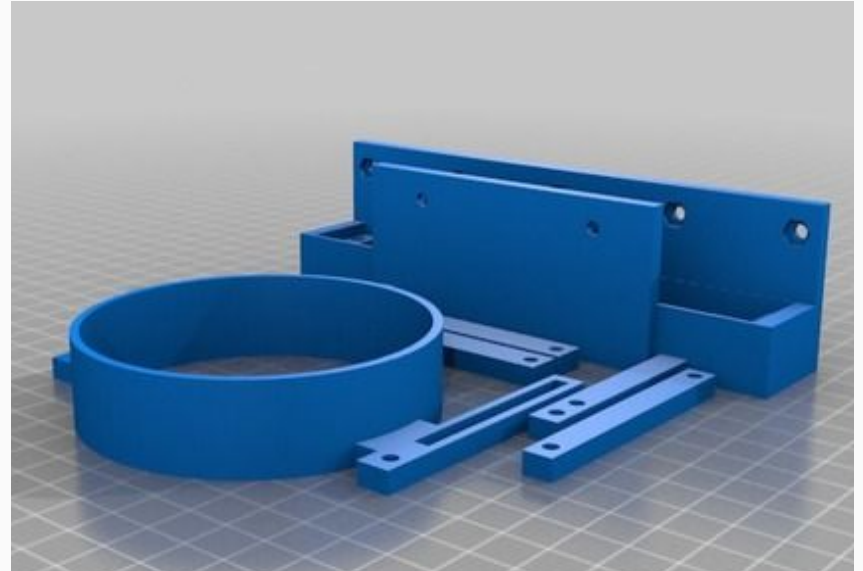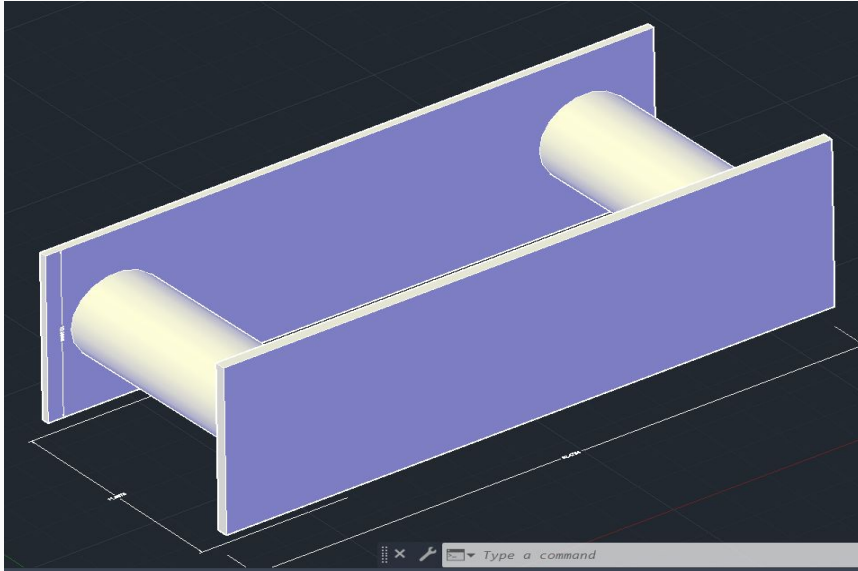
Mechanical Components

A 3D printed robot that dispenses cups one at a time. It has two parts, the cup separator which is a single piece that slides between the cups allowing one to drop through whilst holding the stack of cups, and the robotic arm that moves the stack back and forth into the separator.

The conveyor belt serves as the means to transport the cups throughout the system. It is driven by a motor and controlled by a motor driver circuit.

Electronic Components

A few key components that we chose to do for our project are: the continuous servo motor and a dedicated DC powered water pump paired with an H bridge to control it.

The continuous servo is for our conveyor belt where the cup will land on, giving precise stopping control when detected by the ultrasonic sensor.

The water pump is DC powered, where the coffee will will be placed in a bag and pumped through some tubing into a funnel that will land in the cup. It is powered and control by an H bridge.

Troubleshooting

Issues Faced:

- The circuit would not be getting enough voltage to run all of the components without dimming the LCD.
- The arduino microcontroller would overheat and only run twice before being inoperable for a while.

Solutions:

- We had opted to use the AC adapter for the arduino that would solve the issue with power being inconsistent.
- The coding was unoptimized during testing, which resulted in the microcontroller overheating, but was later optimized and the issue did not persist.

Software Code

- Since there were so many components being used, the idea was to split up the components to their own functions and have those functions called in the needed order/time
- The functions were:
  - Cup dispenser, coffee dispenser, and sugar dispenser
  - Running and stopping the conveyor belt
  - Ultrasonic sensor
 - LCD display with buttons

Financial report

	Component name / description:		Per unit Cost ($):	Quantity:	Item Cost ($): (per unit cost X quantity)
1	*Arduino Mega board*		$20.99	1	$20.99
2	Conveyor belt		$43.99	1	$43.99
3	Continuous servo motor		$6.50	1	$6.50
4	Ultrasonic sensor		$3.50	1	$3.50
5	Pack of 4 servo motors		$11.99	1	$11.99
6	Hbridge I9110S		$1.56	1	$1.56
7	Water pump		$8.99	1	$8.99
8	Cup dispenser		$10.00	1	$10.00
		Total cost estimate:			$107.52

Financial report continued

- The prototype cost about $107
- Finished product with specialized parts can be done about half the price of $55
- By setting a profit of 10% profit margin we considered the retail price of the item to cost $180
- The gross profit per coffee machine is $73
- The net profit is $36, with additional expenses costing $36
- Insurance warranty for 2 years for $150
- By selling 20 units our revenue $3600, making our total profit $1040

Financial report continued
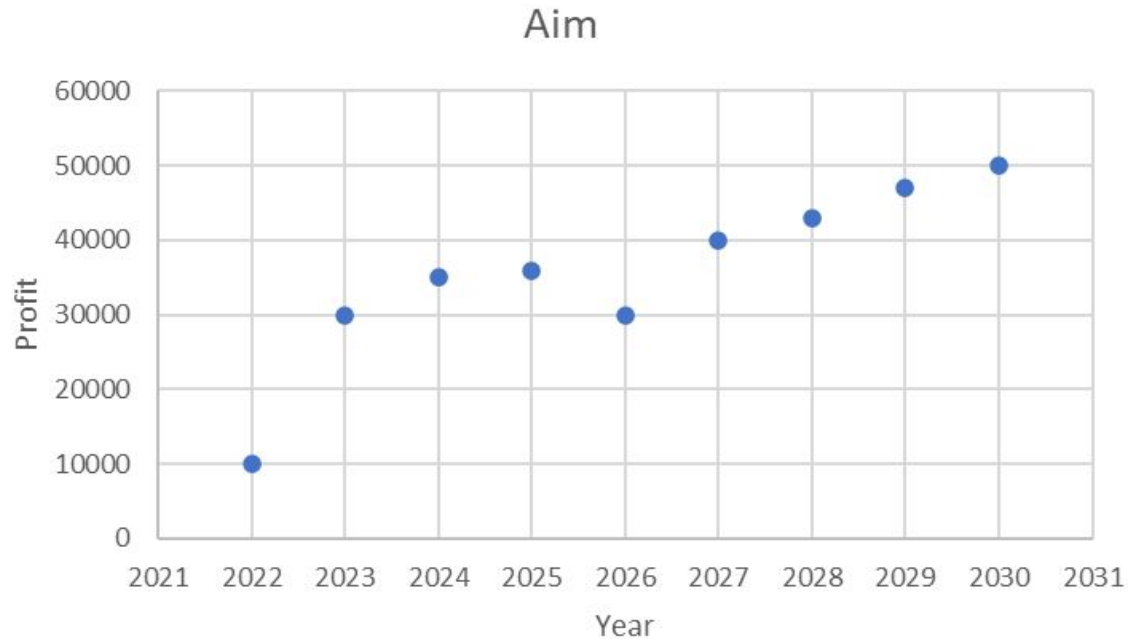
Thanks!

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