SandWish

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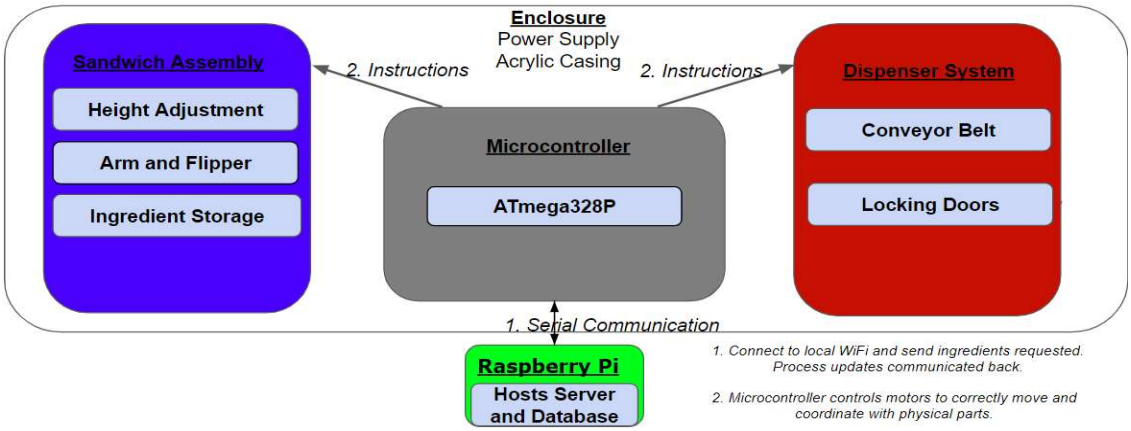
Abstract

From the time of hunter gatherers, humanity has been devoting time to food preparation. Now, in the dawn of the autonomous era, machines can handle these mostly repetitive tasks. Moreover, they can incorporate internet of things technology to seamlessly handle interactions with humans. SandWish, is the marriage of these technologies for the food production industry, representing a step toward fully autonomous food preparation.

Block Diagram

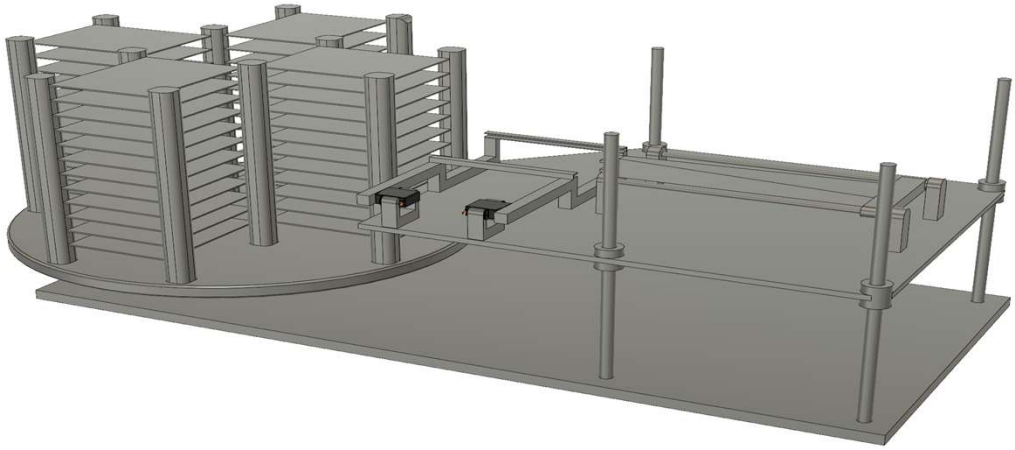


System Overview

The system is the comprised of 2 main subsystems: the website and communication, and sandwich storage and assembly. The website provides a place for the customer to specify what ingredients they want on their sandwich. It then converts the desired ingredients into a list of instructions for the machine. The assembly system takes these instructions and selects the proper ingredients and places them on the assembly area in the correct order to constitute a sandwich.

Specifications

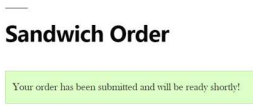
- Autonomous sandwich assembly
- Sanitary
- User specified ingredients
- Interface through a mobile application
- 3’ x 4’ footprint
- Sandwich assembly will take max 5 minutes
- Bread, meat, and cheese available
- Enough ingredients for 7 sandwiches
- Completed sandwich has no ingredient between bread sticking out further than 1”



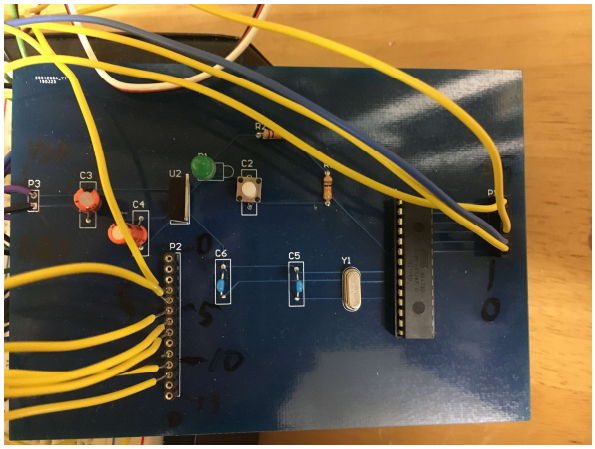
Website

- The website provides a choice of ingredients
- It checks to make sure there are enough ingredients available
  - If not, it notifies the machine to request a refill
- Raspberry Pi sends 6 bytes of order information through serial communication to the Atmega 328p

- The website has registration and authentication features
- To place an order it is required that the user logs in



Control

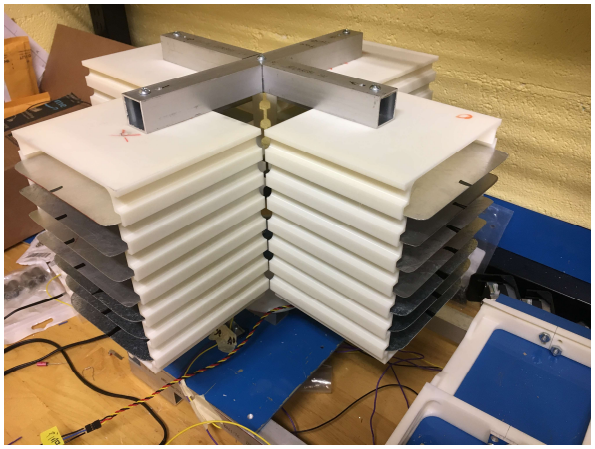


- Each byte corresponds to one type of sandwich ingredient
- The Atmega 328p drives all 8 motors to retrieve corresponding ingredient located in the storage system
- It can queue up to 7 sandwiches at once

Cost

Part	Development	Production
PCB	1.6	0.67
Voltage Regulator	0.95	0.756
Motor Drivers	8	4
RaspberryPi	35	35
Capacitors	1.2	0.46
Resistors	0.4	0.095
Aluminium Extrusion	Free	30.82
Stepper Motors	70.36	52
Servo Motors	43.16	22.99
Nuts and Bolts	29.67	20.25
Printed Parts	Free	42
Machining Costs	Free	675
Rods and Bearings	81.98	54.65
Lead Screws	57.16	38.11
Sheet Metal	Free	22.17
Total	329.48	998.971

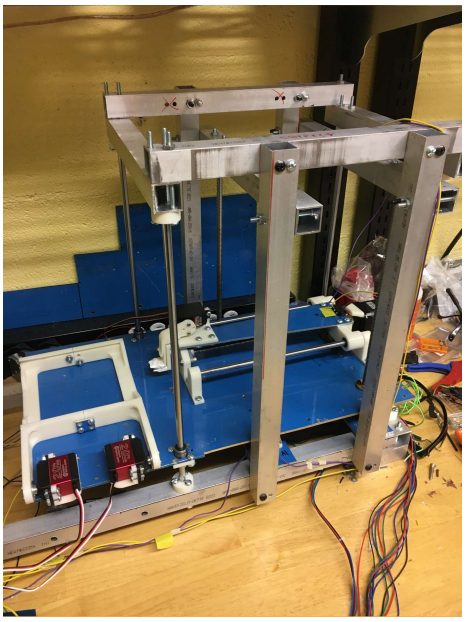
Storage



- Individual ingredients are stored on food safe, non-stick metal trays
- Servo Motor provides precise rotational control to access different shelves
- Limit switches keep the machine calibrated

Assembly

- Three servo motors allow the main platform to index up and down
- A fourth allows the arm to extend to retrieve ingredients from storage
- A servo motor helps grab ingredients



- Flipper has a one-way slot to house tray and ingredient
- Two servo motors can flip the ingredient onto the assembly area
- The tray can finally be ejected for cleaning

Acknowledgements

Special thanks to Professor Christopher Hollot. Thank you to professors Csaba Moritz, Tilman Wolf, and Do-Hoon Kwon. Also thanks to Fran Caron, Alan Rakouskas, Richard Winn, Colby Norwood, and Shira Epstein.