Hot Pot Bot - Team 05

The easy way to make sure your hot pot food is cooked perfectly every time

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What is Hot Pot?

- Interactive meal where users drop food in a pot of boiling water
  - Usually a very social experience
- Food usually consists of meat, tofu, fish balls, and a variety of vegetables
  - Each with a different cook time
- Users judge when they think food is done
  - Leads to overcooking or undercooking of food

Use Case

- Want to solve the issue of hot pot food often being overcooked or undercooked
- Pot will be divided into strainers where users will drop food into
  - Use computer vision to sense which food is in which strainer
  - Strainers move up and down on a motor when the food is cooked or dropped in
- Areas: Software, hardware, signals

Requirements - CV

- Computer senses what ingredients are dropped in with 95% accuracy
  - Identification takes place within 5 seconds
- Computer senses what strainer the ingredients are dropped in with 95% accuracy
- Computer can identify 5 different ingredients as they are put into the pot
  - Beef, tofu, bok choy, fish balls, shiitake mushrooms

Requirements - Strainers

- Strainers start to lift out of the pot within 1 second of the food timer finishing
    - Strainers are fully lifted out of the pot within 5 seconds
    - LEDs flash when the strainer starts to move out of the pot
- The strainers react to the manual lowering button within 2 seconds
- Strainers will only lower when the broth's temperature is within 5 degrees of a specified temperature point
- LEDs next to each strainer will say in what state the strainer is in within 2 seconds of it changing state

Requirements - Miscellaneous

- Functionality
  - System runs continuously (no decline in accuracy or speed) for 1.5 hrs
  - The system tracks which food is in which strainer and how long it's been cooking for
- User Experience
  - The strainers and pot are easily cleanable - Dishwashable or manually cleaned in under 5 minutes
  - There is easy assembly and disassembly - the user can do so in under 5 minutes with minimal instruction
 - The system responds to user feedback if the food is under or over cooked

Technical Challenges

- How to get CV to identify food with enough accuracy
  - How to deal with variation in food appearance
- How to make sure all the motors are heat/water safe
- How to deal with steam blocking CV camera
- How to make sure it is easily taken apart for easy cleaning
- How to deal with user feedback on cook time

Solution Approach

- Hot pot will be divided into 3 strainers, each with a motor attached to lift arm up
  - Each strainer has an LED to signify state
  - Each strainer has a button to move the strainer into the pot
- Camera will be placed looking down at hot pot
- Use Jetson Nano to interface between CV and the motors
- User interface for the user to give feedback on a certain strainer - overcooked or undercooked
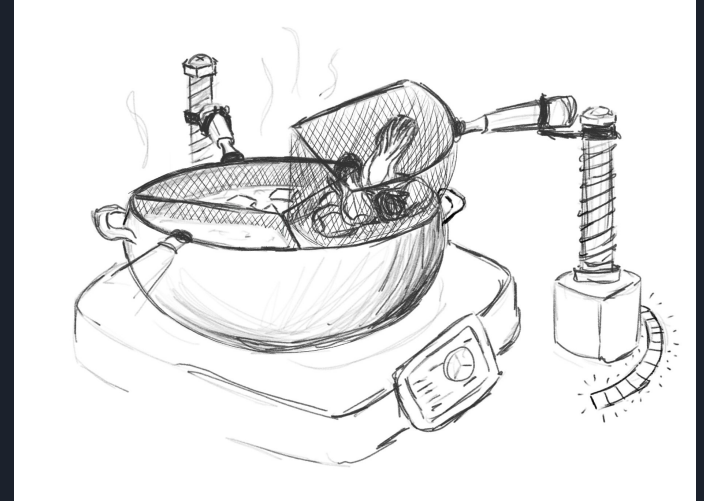
Testing, Verification, and Metrics

- Basic Functionality
  - Confirm that strainer movement functions within specs stated previously
  - Run system for 1.5 hours under hot pot conditions and record accuracy and speed before and after
- User Experience
  - Clean the system and record how long it takes to clean
  - Ask people without knowledge of the system to assemble and disassemble the system and record how long it takes
  - Confirm the UI properly allows the user to correct any misclassification of food and to adjust cook time

Tasks and Division of Labor

- Shane - Hardware / Mechanics and UI
  - Strainer mechanism design and construction
  - Strainer testing
  - Creating UI that contains strainers and allows for user adjustment
- Christina - Computer Vision
  - Food identification algorithm
  - Integrating CV to rest of the components
- Isabel - Software/Hardware Interfacing
  - ingredient database
  - motor & CV interfacing
  - LED setup

Schedule
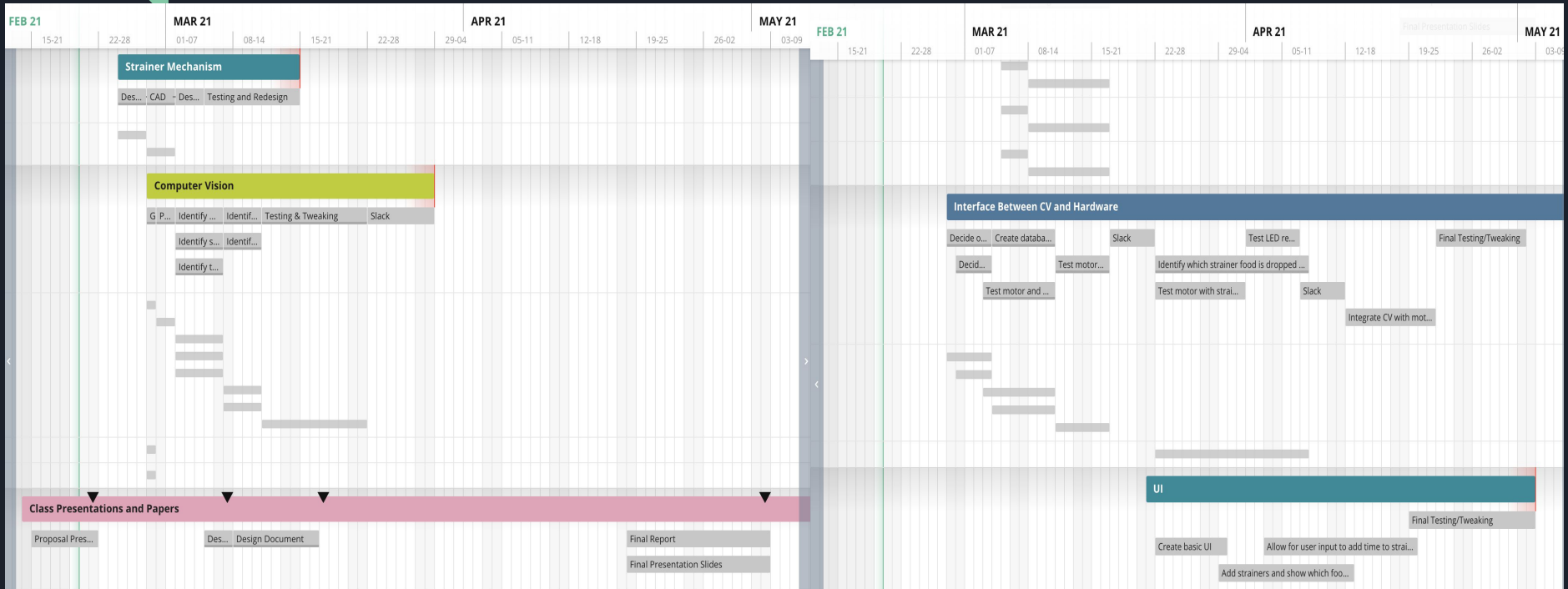
Conclusion

- Hot Pot Bot will make hot pot a more social event for everyone involved

  - Take the stress out of cooking

  - Make it easier to find ingredients within the pot

  - Less focus on the cooking and more focus on talking with friends

- Adaptable for use in homes and in restaurants alike

  - System is easy to set up and use

  - Improve the satisfaction of users

- Give Hot Pot Bot a shot!