

EE/CprE/SE 491 - sdmay19-31:**Multi-Purpose Automated Robotic Mixer (mpARM)**

Week 15 Report

February 16– February 23

Client: Alexander Stoytchev/Brett Altena

Faculty Advisor: Alexander Stoytchev

Team MembersDrew Caneff — *3D Printer Specialist/CAD Designer/Accountant*Amos Hunter — *Electromechanical Specialist/Meeting Scribe*Brett Altena — *Meeting Facilitator/ Computer Vision Developer*Kristian Wadolowski — *Report manager/Front-end programmer/Computer vision Developer*Jase Grant — *Embedded Systems/ Assignment Manager***Summary of Progress this Report**

- **Arm-** Became aware that approximately two of the for sensors which were included in the BOM used to prevent the robot from overextending are poorly incorporated into the robots design. This is most likely the result of constantly changing designs of the THOR robot arm as I have noticed differences in the 3D prints as the ones shown online. The exclusion of optical sensors is concerning as it may cause the robot to get tangled in its own wires. Currently, the team is emphasizing the importance of the robot being completed quickly, however, since the power supply has yet to arrive I am making plans to install a few pumper switches which should be able to connect to the power board or even directly to the Arduino if that proves to be easier. This is not a very elegant solution as these switches would most likely reside on the robot's exterior, but it should minimize the risk of the robot tearing itself apart.
- **Computer Vision-** OpenCV works for image files and crashes while trying to use video files. Gave the following comments to Kristian and Rahmat about their tasks in the main logic c++ code.
Task 1: Calculate the bubble needed algorithm, we know the radius of the pancake in terms of pixels, your job is to calculate the diameter (cm) of the pancakes using the pixel distance and distance from camera to pancake surface. Should have a hardcoded matrix in the end with radius found and corresponding diameter in cm. Then should go through if else statements to find out which diameter is the current pancake. Recommendation: Cut out circles of specific diameters and trial and error with Hough Circles.
Task 2: Use the background subtraction frame and count the number of unique white dots (connected components) that appear on the screen. Make sure that the same bubble is not counted twice, and increment a variable for each bubble. General Outline: Use the variable fgMaskMOG2, use a filter to clean out any noise found on the frame, and use connected components to count the white circles Use this link for tips: <https://stackoverflow.com/questions/47566093/computer-vision-counting-small-circles-in-an-image>. Keep track of the location of the circles for each frame to make sure not to count a bubble twice. Recommendation: Follow the above notes, do trial and error to find out normal bubble sizes. Possibly use a 2D array to keep track of location and turn the corresponding spot in the array to be a 1 if not there already, if a new 1 was put in then increment bubblesCounted. When the bubble stops showing, turn that value in the array to a zero
- **Frame-** Changes to the frame design included halving the distance between the original camera placement and the griddle. Another change was to change the mounting position of the robotic arm to the bottom of the frame at the base, and to allow the base of the arm to be angled relative to the griddle. This will be accomplished through the use of a hinge and a movable angled platform for the arm.

The aluminum channel purchased was chosen to fulfil the total length needed. Some math was needed to find this figure and to divide it across lengths of channel 8 or 4 feet in the formulation of the shopping list. A suitable pair of hinges was chosen, which would neither be too large nor too small, and were reasonably priced. I carried some materials to the Senior Design Room to get them from my apartment and to campus.

- **FPGA-** I had to change how the go pro is accepted into the pipeline. Having trouble with the camera because I can't test the input with the test bench yet. Might have to change the Baudrate for the image input. Waiting for the J-Tag to come in.

Pending Issues

- Complete Computer vision code
- Assemble the arm
- Assemble frame

Individual Contributions

Team Member	Contribution	Weekly Hours	Total Hours
Drew Caneff	➤ Worked on Arm	8	209
Amos Hunter	➤ Created slides for Instructor review ➤ Purchased materials ➤ Prepared plywood base	10	162.5
Brett Altena	➤ Installed OpenCV ➤ Began debugging of OpenCV code	5	161
Kristian Wadolowski	➤ Worked on slides for instructor review	2	109
Jase Grant	➤ Tested FPGA pipeline ➤ Changed pipeline inputs ➤ Began work on pipeline acceleration	7	85

Plans for Upcoming Reporting Period

Team Member	Plans
Drew Caneff	➤ Continue work on arm ➤ Do 3D modeling for various parts
Amos Hunter	➤ Continue work on frame
Brett Altena	➤ Debug and develop code for video files ➤ Work on FPGA-less code ➤ Create simulated test environment
Kristian Wadolowski	➤ Test the arm ➤ Program the arm motions

Jase Grant	<ul style="list-style-type: none">➤ Test FPGA pipeline further➤ Acquire additional parts
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Gitlab Activity Summary

Action: joined, Tue Sep 04 2018
Author: dvcaneff

