

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

Week 4 Report

September 30 - October 6

Client: Alexander Stoytchev/Brett Altena

Faculty Advisor: Alexander Stoytchev

**Team Members**Drew 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**

- **Pancake research-** The pancake recipe we use is incredibly important to the project. We need a recipe that will produce consistent results, pour well from our dispenser, produce clearly visible bubbling, and be easy to flip. Progress on the actual creation of such a recipe has been frozen, as certain requirements will only be known after early prototypes have been completed. However, we have found the what ingredients affect various properties of the pancake. These are referred to in the below tables.

Thickening agents	Pros	Cons
Cake Flour (7-8% gluten)	Produces the highest quality pancakes, light and airy	Expensive Produces lighter batter
All-purpose flour (11-12% gluten)	Very cheap Most common flour used for pancakes	
Bread flour (13% gluten)	Relatively cheap Produces much thicker batters	Can create a chewy texture, normally undesirable in pancakes

Other ingredients that are considered for the recipe are

**Milk/milk powder:** The extra protein and fat can slightly thicken the pancakes, and add a better flavor.

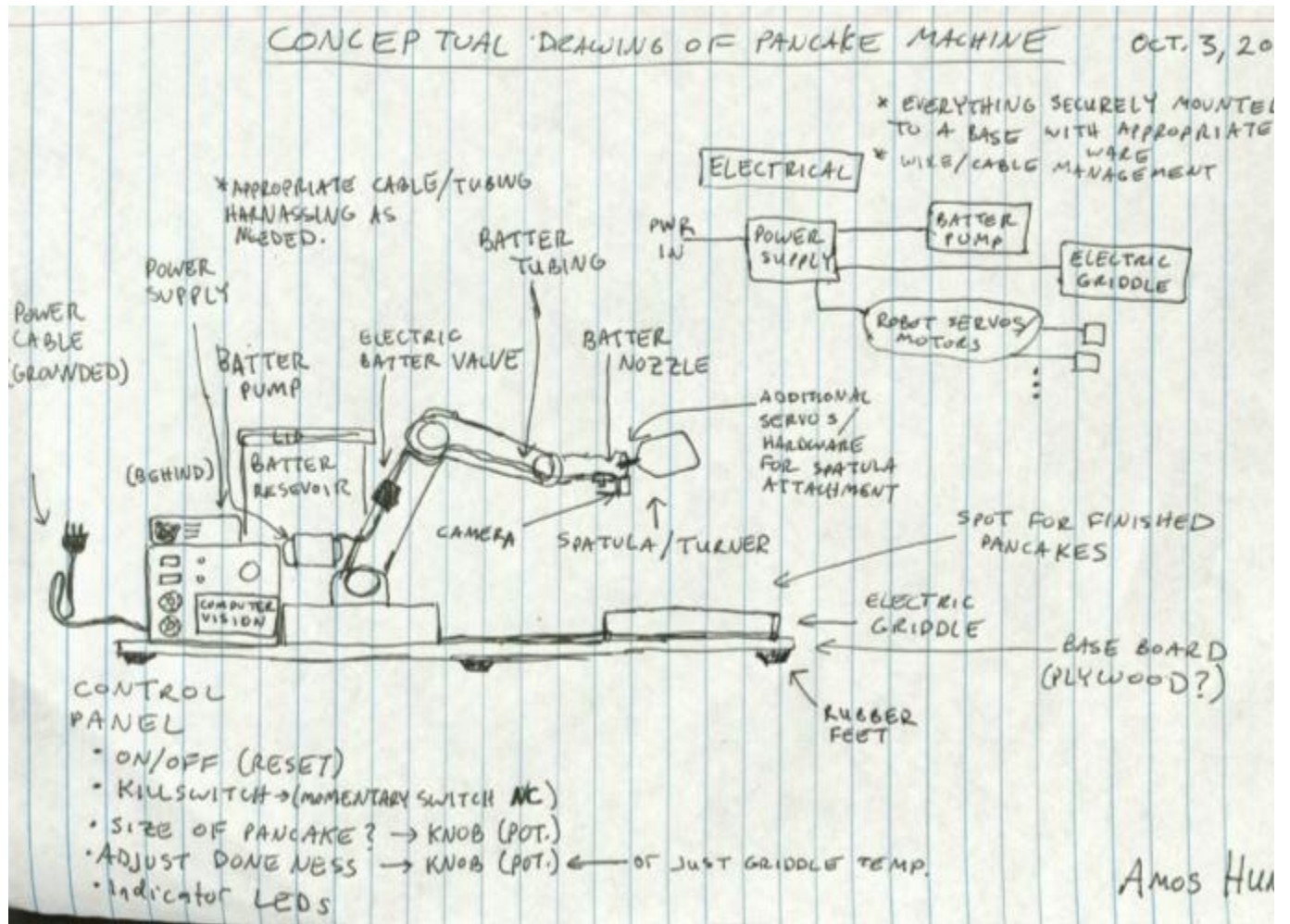
**Eggs:** Acts as an emulsifier, absolutely necessary if oil or butter is used.

**Oil/butter:** The extra fat not only improves the flavor, but makes the pancakes rise better, and makes them stick less.

**Baking powder:** Needed to make the pancakes bubble and rise.

**Sugar/salt:** important for taste.

- **Concept drawings/diagrams-** The diagram was based off of some decisions made in early meetings as well as information gathered from research. The circuit diagram showed an early understanding of power flow in the machine. Some capacitors for switch debouncing and some LEDs for indicator lights have been included.



- **Circuit considerations-** Research was done on how to prototype circuitry relevant to the project. Several techniques for “lean prototyping”, essentially a minimalist approach to design and manufacturing, were discovered.
- **Image processing research-** The first research paper read was based on image processing for bubble detection in microfluidics. The goal of the team was to determine effective methods to correct skewness and translation on raw images captured by a high-speed camera. The team was measuring whether bubbles were in the foreground or background of a moving bubble utilizing various algorithms. They developed an algorithm to optimize the angular deviation problem using Least Square SVM. They discovered that a tilt angle of fewer than 20 degrees provided optimal results and it was able to distinguish between moving bubbles and the background. This paper is semi-relevant to our project due to the similar goal of image processing of bubbles. However, their team focused on the bubbles produced within micro fuel cells. The techniques used can be beneficial to our team if we choose to go the route of detecting bubbles by using the EM algorithm.  
<http://cs229.stanford.edu/proj2007/Fang-ImageProcessingForBubbleDetectionInMicroFluidics.pdf>
- FPGA research-

### Pending Issues

- Circuit considerations
- Detailed budget of parts
- Complete prototype design
- Figure out the process for 3D printing
- Acquire the materials needed to begin prototyping

### Plans for Upcoming Reporting Period

- Work on design document.
- Create sketches and designs for project design
- Improve the team website

### Individual Contributions

Team Member	Contribution	Weekly Hours	Total Hours
<b>Drew Caneff</b>	<ul style="list-style-type: none"> <li>➤ Participated in group meetings</li> <li>➤ Researched and wrote parts of project plan paper</li> <li>➤ Reviewed Thor arm designs</li> <li>➤ Started concept drawings of robot arm</li> <li>➤ Helped develop design documents</li> </ul>	10.5	33
<b>Amos Hunter</b>	<ul style="list-style-type: none"> <li>➤ Participated in group meetings</li> <li>➤ Wrote parts for project plan paper</li> <li>➤ Made diagrams of electrical and mechanical systems</li> <li>➤ Researched prototyping techniques</li> <li>➤ Researched circuit considerations</li> <li>➤ Debated machine layout options</li> </ul>	10	23.5
<b>Brett Altena</b>	<ul style="list-style-type: none"> <li>➤ Participated in group meetings</li> <li>➤ Facilitated meetings</li> <li>➤ Wrote parts for project plan paper</li> <li>➤ Researched image processing of bubbles</li> <li>➤ Created gantt chart</li> <li>➤ Communicated with advisor, and charted progress</li> </ul>	5	23
<b>Kristian Wadolowski</b>	<ul style="list-style-type: none"> <li>➤ Participated in group meetings</li> <li>➤ Wrote parts for project plan paper</li> <li>➤ Researched pancake recipes</li> </ul>	6	17
<b>Jase Grant</b>	<ul style="list-style-type: none"> <li>➤ Researched interface between computer vision and FPGA</li> <li>➤ Discussed FPGA and hardware with professor</li> <li>➤ Started designing program module for FPGA</li> </ul>	5	16

### Gitlab Activity Summary

-----  
 Action: joined, Tue Sep 04 2018

Author: dvcaneff  
 -----