# UCF Senior Design I

## *Mr. Pancake-Robotic Arm*


*Initial Projects Document and Group Identification*

Divide and Conquer

**Group 14**

| | | |
|---|---|---|
| Trudy Ani-Asamani | Electrical Engineering | taniasamani@knights.uc.edu |
| Alan Azargushasb | Electrical Engineering | |
| Alonso Ninalaya | Computer Engineering | alonson_95@knights.ucf.edu |
| Chedlyne Valmyr | Computer Engineering | cvalmyr22@knights.ucf.edu |

# *Table of Content*

# *Narrative*

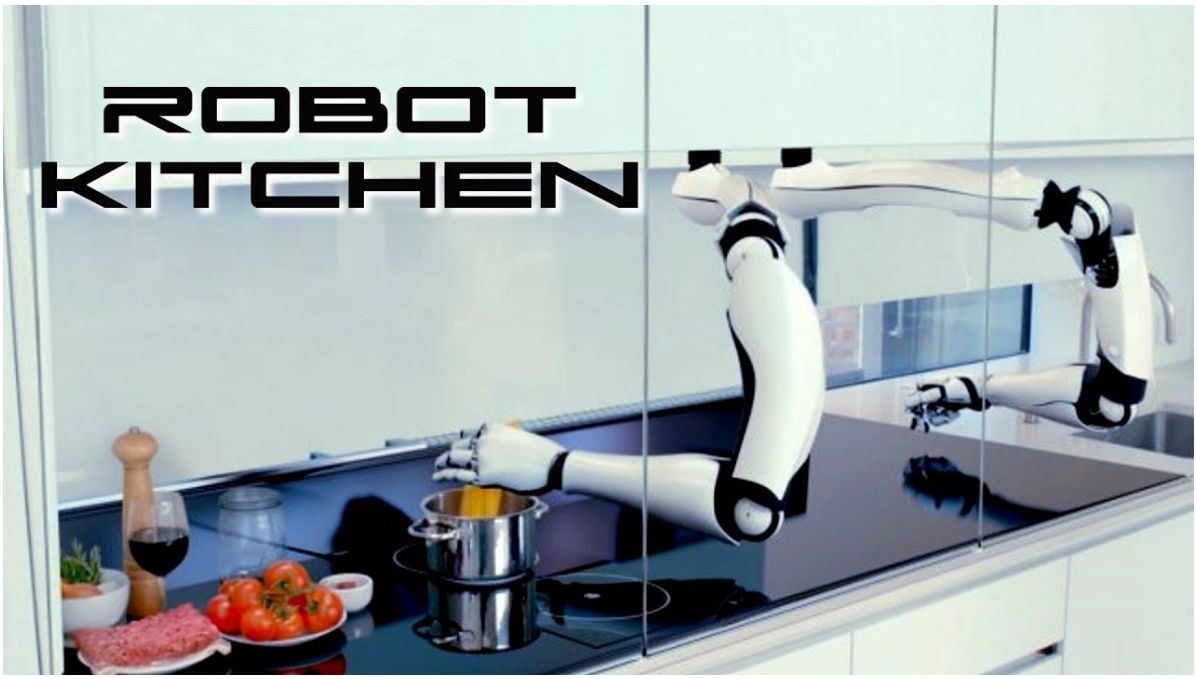
The goal of Mr. Pancake to automate the production of pancakes. To make a lost cost machine that does the job a line cook for them. Why? Well what is the goal of a business? To make money, to maximize profit. Profit is the scorecard of all industry. No business can survive in the long run without it. All businesses are judged by their ability to accumulate profit. A good business is one that makes money. A poor business is one that doesn't or does it slowly. The economic feasibility of a business is decided on the margins or profit. Businesses with high profit yields attract investors, the higher the return on investment the more investors want to invest.
Now what is the quickest way to raise profit? Fire your workers. Do less with more. Whenever a company wants to look good to investors/shareholders what do they do? They fire workers in mass. They trimmed the fat. They got costs down. In the 2008 recession that is exactly what big business did, they fired their employees in mass and never looked back. They learned to do more with less. Profits soared while employment was low. Only after 10 years did big business start hiring again. Is this a bad thing? For the employees, the answer was undoubtedly yes. Many lost their homes, their careers, their families, some even lost their lives. But what of the economy? It grew stronger. Hard times create strong men, to the winner go the spoils.

What is another word for doing more with less? Efficiency, efficiency is how economies grow. The ratio of input to output is the definition or efficiency. What is economics? The study of the marginal utility of scarce resources, or to put it simply; the study of the use of resources that are limited. There are only so many resources in an economy. Only so many trees, so many gallons of petroleum, so much copper, and so many workers. Many of these resources have alternative uses. The same wood that can be used to make houses can also be used to make chairs or baseball bats. When someone figures out how to make houses, or cars, or petroleum more efficiently that leaves more trees to make other things. That is how economies grow.

Now what is the ultimate resource? Man, man is the ultimate resource, when jobs are automated, workers are freed up to work in other fields of industry. It was increases in efficiency that led people out of the farms and into the factories, and from the factories into the cubicles. Every major increase in efficiency facilitated a new phase of capitalism; for what is capital? The machines that increase efficiency, from the primitive plow to the industrial factor to the office computer. What is Mr. Pancake? A machine, capital, to be used to facilitate the automation of pancakes. Automation is not the future of capitalism, automation is capitalism. A world so efficient men need apply.

So far, from what we have seen, the robots that automate cooking have been large and or bulky and or expensive. Some resembling more the machines used in car factories than in a kitchen while others sleek and stylish. For example, the Moley robot kitchen, while similar to Mr. Pancake, is $15000. By the looks and design of their robot cooking machine you can tell it is intended for civilian use. But at the price point of $15,000 who would buy it? Only the rich, and why would a rich person by it when they can hire their own privet chef? At best it's a novelty and its too expensive to0be novel. Moley, and their robotic design has been around for 3 years and have still gotten no-ware because they have priced themselves out of the market.

What can be learned from this? If Mr. Pancake is to succeed it is too be lightweight, cheap, and portable and most importantly cheap.




Look at the Moley robot arm. As a piece of engineering it is quite impressive. It has an app that you can use to tell it what to cook, it has a premade list of ingredients that are too be used with recipes that come on the app. Those recipes were designed by famous 5-star chefs. These chefs were all motion captured when cooking. The cooking motions the chefs used were captured by the engineers and then programmed into the robot so the robot would cook exactly like the 5-star chef did, the robot arm captures the chefs mannerisms perfectly.

Sounds awesome, but was it worth inflating the price? It has tons of utility the cost of never being able to enter the market. Mr. Pancake is the opposite. Mr. Pancake aims to be concise, focused on doing one thing really well, making pancakes. It is in the name. By narrowing the focus we have given ourselves the ability to be cost effective. Our robot doesn't need to mimic the mannerism of a five star Italian chef, it just needs to be able to flip pancakes.

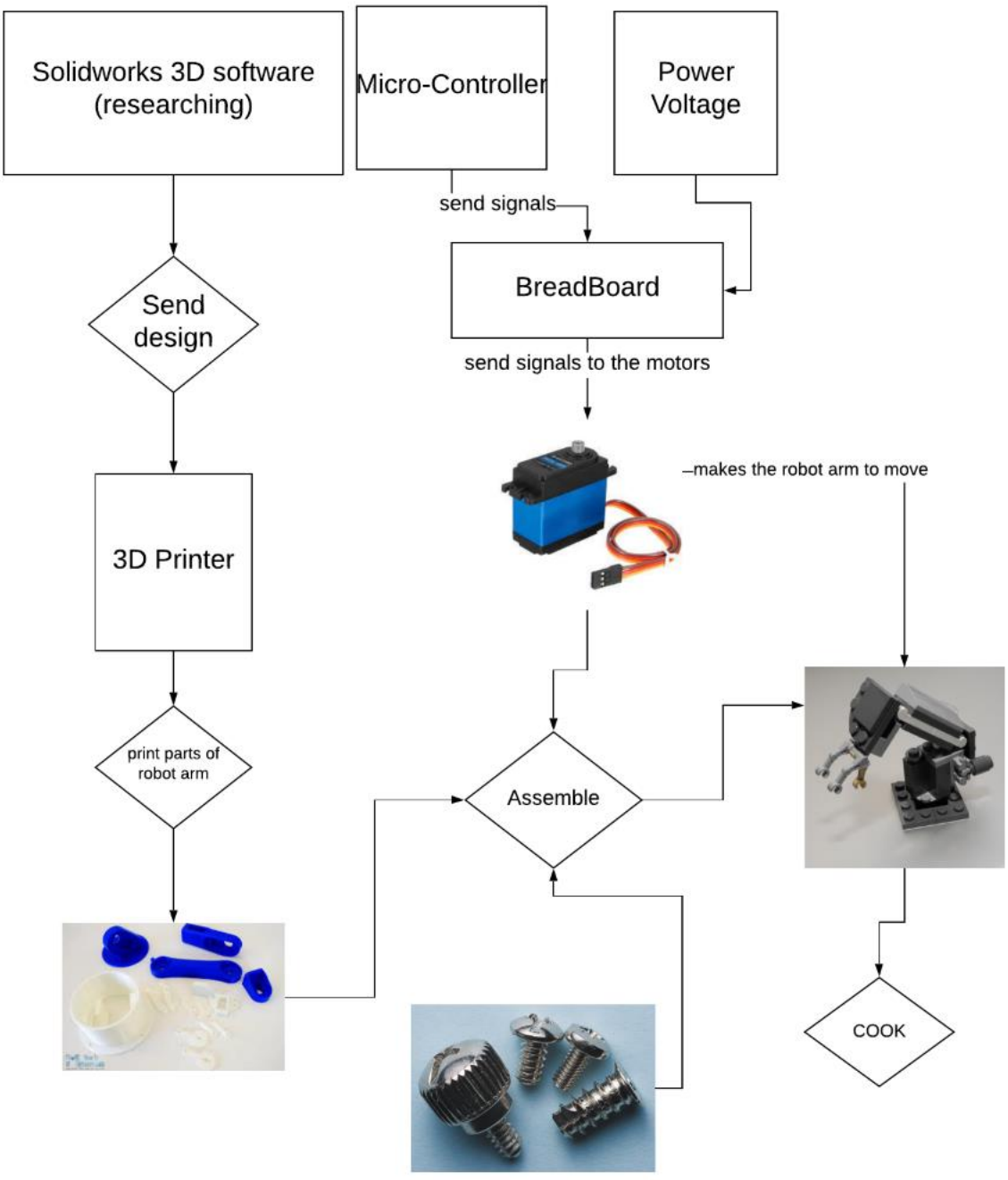
What can our robot do? Cook pancakes, thanks to that I don't need an app with premade recipes and I don't need to program all the complexity that comes with that. I just need an robot that dispenses batter onto a pan and flips. The aim of Mr. Pancake is to be $500 or less. At a price point of $500 dollars it would be 3.33% of the Mosley robot arm. Cheap enough so that every diner in America can buy one.

A minimum wage worker makes $7.50 an hour. Lets say in that hour he makes 15 pancakes. It would take Mr. Pancake making 1000 pancakes for the machine to pay itself off. In an American dinner can easily go through that in a week. So, in a week Mr. Pancake pays for itself.

# *Specifications*

- 3D Printer
- Software used for the design (SolidWorks 3D)
- 5V 2A DC Power Supply
- MG996 Servo Motor (6 or less units)
- SG90 Micro Servo Motor
- HC –5 Bluetooth Module (optional), Input Voltage: 3.6 V - 6V
- Arduino Board (MEGA 2560 REV3), Operating Voltage = 5V
- Screwdriver and screws
- Camera (optional)
- Flip Frying Pan
- Fryer
- Pancake mixer

# *Block Diagram*



# *Budget*

| Part | Budget | Purchased | Actual Price |
|---|---|---|---|
| Flipper | $20 | Yes | $14.99 |
| Dispenser | $20 | No | N/A |
| Griddle | $40 | No | N/A |
| Controller | $50 | No | N/A |
| Servos | $100 | No | N/A |
| Wires | $10 | No | N/A |
| Joints | $50 | No | N/A |
| Power Supply/ Electrical Components | $50 | No | N/A |
| Camera | $50 | No | N/A |
| Sensors | $30 | No | N/A |
| Other | $80 | No | N/A |

Total $500
Money Spent so far: $14.99.

# *Initial Project Milestones*

| Number | Task | Start | End | Status | Responsible |
|---|---|---|---|---|---|
| **Senior Design 1** | | | | | |
| 1 | Ideas | 01/13/2020 | 01/17/2020 | Completed | Group 14 |
| 2 | Project Selection & Role Assignment | 01/20/2020 | 01/24/2020 | Completed | Group 14 |
| **Project Report** | | | | | |
| 3 | Initial document-Divide and Conquer | 01/26/2020 | 01/31/2020 | In Progress | Group 14 |
| 4 | Table of Content | 02/03/2020 | 03/06/2020 | In Progress | Group 14 |
| 5 | First Draft | 02/17/2020 | 03/16/2020 | In Progress | Group 14 |
| 6 | Final Document | 01/26/2020 | 04/26/2020 | In progress | Group 14 |
| **Research, Documentation, &Design** | | | | | |
| 8 | Schematics | 03/16/2020 | 03/27/2020 | Researching | Alan &Trudy |
| 9 | Solidworks 3D software (Research) | 03/30/2020 | 04/03/2020 | Researching | Group 14 |
| 10 | 3D Printing | 04/06/2020 | 04/17/2020 | Researching | Group 14 |
| 11 | Microcontroller | 04/20/2020 | 04/24/2020 | Researching | Chey & Alonso |
| 12 | Power Supply | 04/27/2020 | 05/01/2020 | Researching | Alan &Trudy |
| 13 | Servo Motors | 05/04/2020 | 05/15/2020 | Researching | Alan &Trudy |
| 14 | PCB Layout | 05/18/2020 | 05/22/2020 | Researching | Alan &Trudy |
| 15 | Bluetooth module (Optional) | 05/25/2020 | 05/29/2020 | Researching | Chey & Alonso |
| 16 | Camera (Optional) | 05/25/2020 | 05/29/2020 | Researching | Chey & Alonso |
| 17 | Packaging | 05/25/2020 | 05/29/2020 | Researching | Group 14 |
| 18 | **Order & Test Parts** | 05/25/2020 | 05/29/2020 | Researching | Group 14 |
| **Senior Design 2** | | | | | |
| 19 | **Build Prototype** | 06/01/2020 | 06/05/2020 | Researching | Group 14 |
| 20 | **Finalize & Redesign** | **TBA** | **TBA** | Researching | Group 14 |
| 21 | **Finalize Prototype** | **TBA** | **TBA** | Researching | Group 14 |
| 22 | **Peer Presentation** | **TBA** | **TBA** | Researching | Group 14 |
| 23 | **Final Report** | **TBA** | **TBA** | Researching | Group 14 |
| 24 | **Final Presentation** | **TBA** | **TBA** | Researching | Group 14 |

# *Conclusion*

The overall purpose of this device is to simplify and decrease cost and time. Whether it's for the home or a breakfast restaurant this device can help decrease labor.

Often with the morning rush it seems impossible to squeeze a healthy breakfast in on your way out from home. Having to stop at a drive-thru for breakfast is also an exhausting task every morning. This device will also decrease the amount of money consumers spend and time wasted in drive thru lines. with this device because it will save consumers more time and money.

With this current economy a device that is cost effective and time sensitive is a necessary commodity. We all want something that makes our lives easier. This robotic arm is both. For instance, for less than $500 dollars the robotic arm is put together and making pancakes. This can save homes and restaurants a fortune on buying frozen pancakes, eating drive thru breakfast, labor, and time.

We have taken the time to carefully layout the budget for this robotic arm, estimating that at $500 dollars the robot will be properly put together. We have split the cores into electives. The electrical components of the robot will be designed by the electrical engineers while the programming and software components will be designed and set up by the computer engineers in the group. We have organized and decided we want to have a working module by May of 2020. We have set this date for our group being that we graduate August of 2020. That way we will have enough time to test and properly correct any bugs that need to be fixed.

There are multiple steps that are in place to make sure we meet our personal deadline. Such as, upon project approval we will start designing the base on SolidWorks to then get it 3D printed in order to put it together. We have researched types of servos we will need as well as calculated how powerful and strong they have to be in order to support the many movements the robot-arm will have to accomplish.

All in all, we are ready to face any bugs, are troubles that come our way. We have a solid plan put in place so that we can successfully accomplish our goal of designing Mr. Pancake. Our main personal goal is to have this robotic-arm squeeze pancake mix into a hot pan. Once the mix is in the pan the robotic arm will then close the lid of the pan so that it can wait a few moments before it successfully flips the pan to cook the pancake already through.

The few concerns we have for this robotic arm on the electrical aspect is fusing the breadboard. While on the software side of things, our concern is getting the robot arm to rotate at 360 degrees to flip the pan.

# *Citation/Researching*

- **Similar robotic arms**

https://howtomechatronics.com/tutorials/arduino/diy-arduino-robot-arm-with-smartphone-control/

https://youtu.be/cZBtzuyKoHM

A robot made my omelette! (Links to an external site.)

- **Camera Recognition**

Nerf OpenCV Sentry Turret (Links to an external site.)

- **Robot Kitchen image**

  http://www.moley.com/

- **Amazon servos**

https://www.amazon.com/RioRand-MG995-Metal-Speed-Torque/dp/B00M8TXSBO/ref=asc_df_B00M8TXSBO/?tag=hyprod-20&linkCode=df0&hvadid=312163458633&hvpos=&hvnetw=g&hvrand=12548449236026 0540&hvpone=&hvptwo=&hvqmt=&hvdev=c&hvdvcmdl=&hvlocint=&hvlocphy=9052410 &hvtargid=aud-864832253277:pla-570673494636&psc=1

- **Amazon similar robot-arm**

https://www.amazon.com/diymore-Aluminium-Mechanical-Robotic-Arduino/dp/B01LW0LUPT/ref=sr_1_11?crid=1NCUTJYAF7KBM&keywords=robot+arm+kit&qid=1580476791&s=toys-and-games&sprefix=robot+arm%2Ctoys-and-games%2C183&sr=1-11