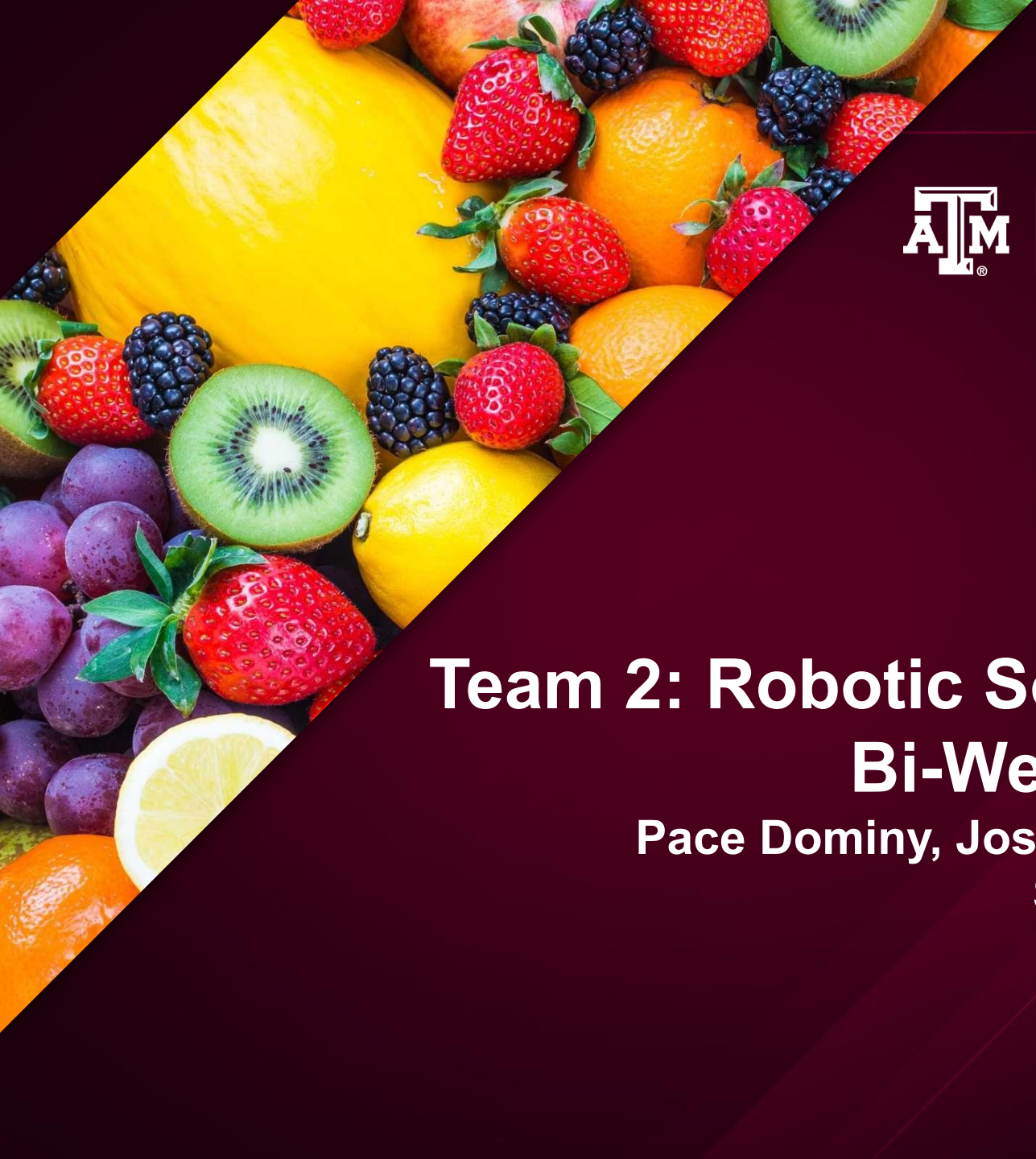

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Team 2: Robotic Sorting System
Bi-Weekly Update 1

Pace Dominy, Joseph Miller, Lam Tran
Sponsor: Dalton Cyr
TA: Swarnabha Roy

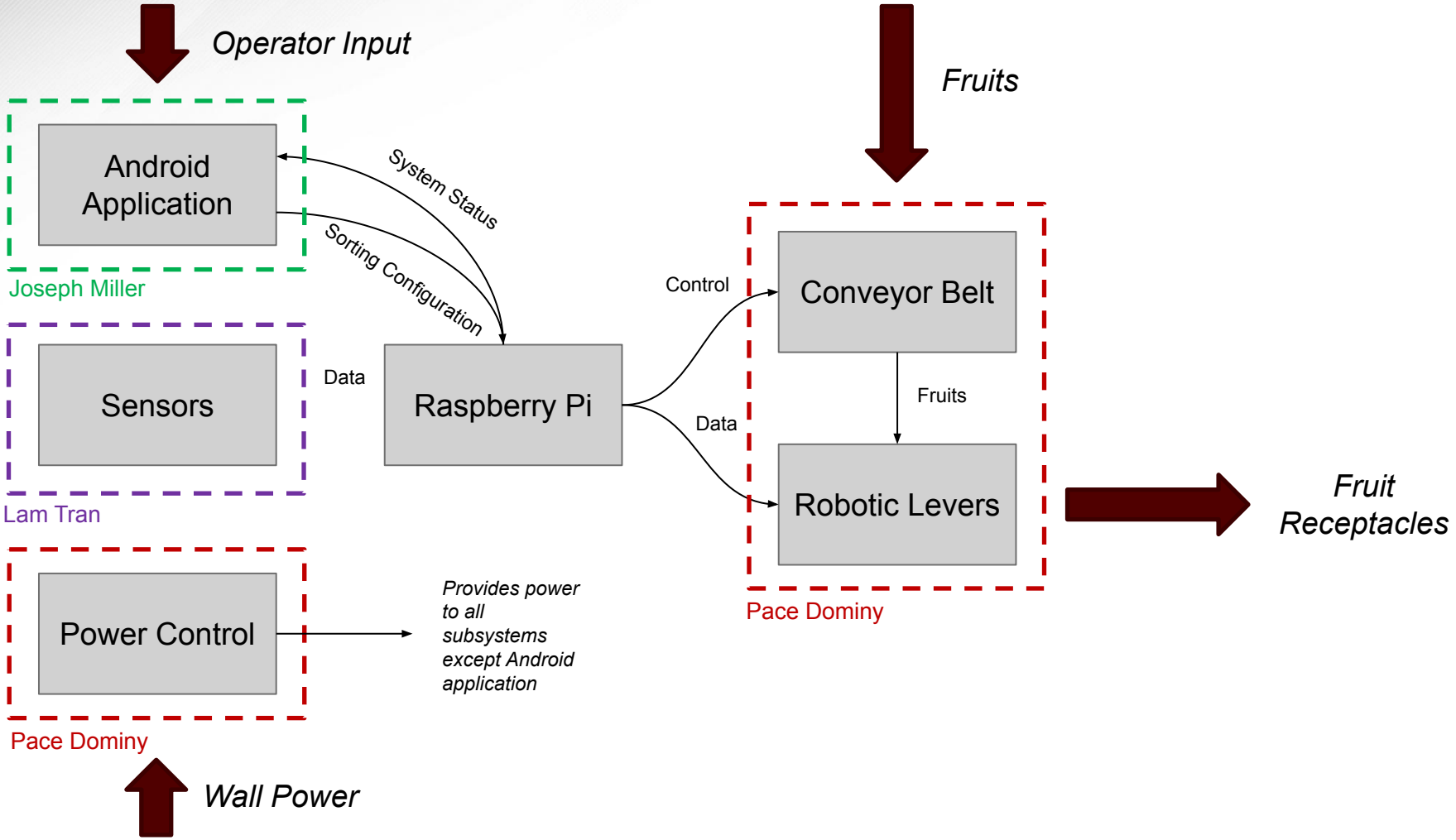
Project Description

Sorting fruit by hand can be tedious and expensive.

The Robotic Sorting System is an automatic sorting system that requires limited manpower/oversight that can accurately sort fruit by their size and quality without the user having to do it themselves.

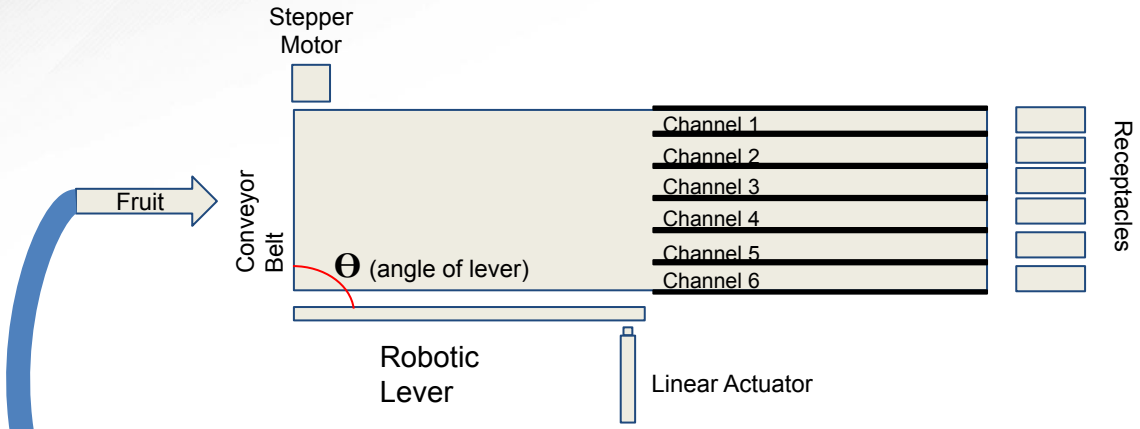
System Diagram

Maroon arrows denote physical inputs and outputs

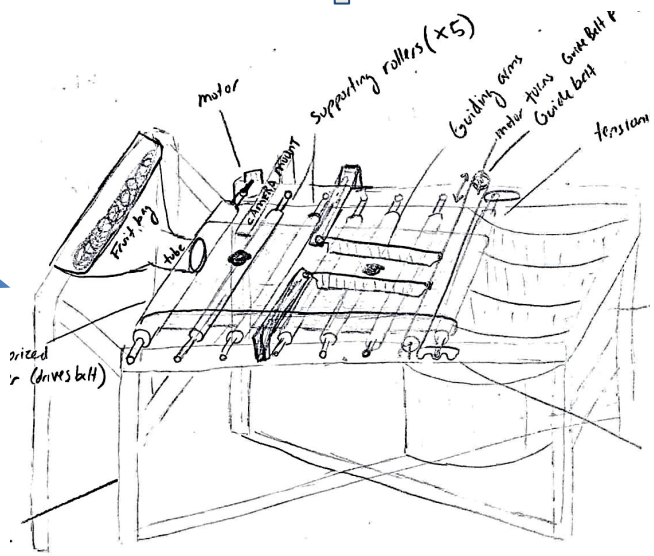


Major Project Changes for 404

No major changes to the project at this stage



Initial design



Current design

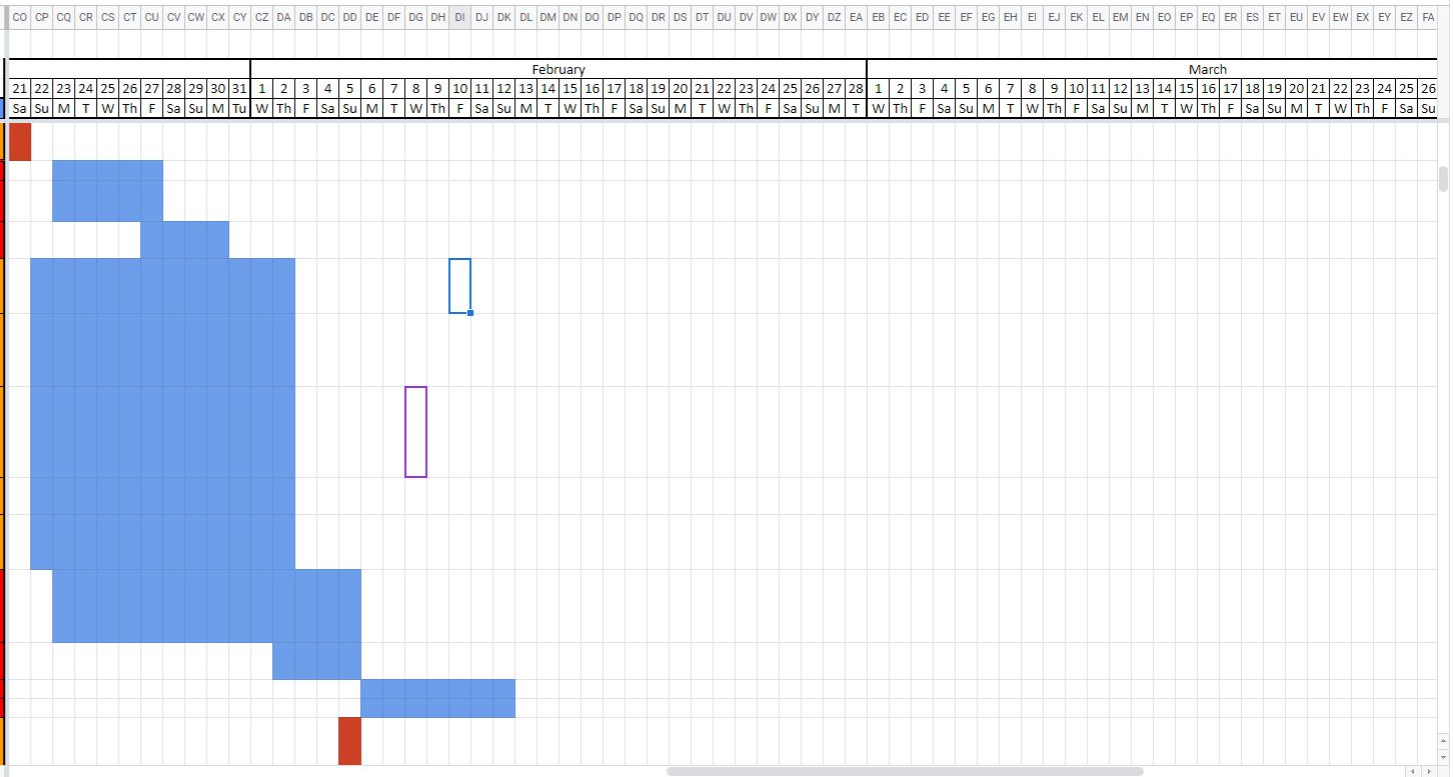
Project Timeline

Robotic Sorting System

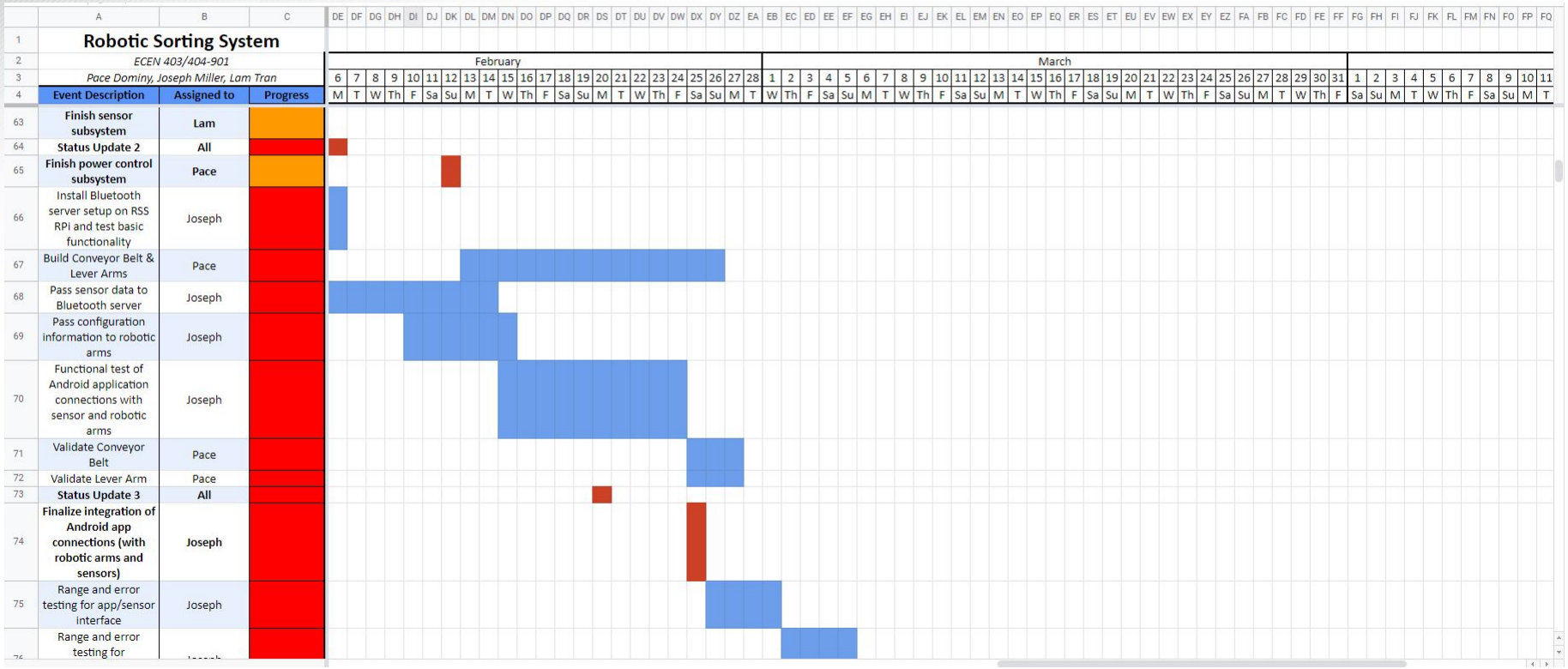
ECEN 403/404-901

Pace Dominy, Joseph Miller, Lam Tran

Event Description	Assigned to	Progress
Status Update 1 (Start of ECEN 404)	**All**	
"Debug" PCB Design	Pace	
Update PCB Design in Altium	Pace	
Order New PCB & Components	Pace	
Intergate color and size sensor code to RasPi	Lam	
Set up and test functionality of the RasPi camera with the color and sizer sensor	Lam	
Implement faulty configuration protection in app (subsystem functional/error test)	Joseph	
Increase Bluetooth read/write width	Joseph	
Expand app to two "bin conditions" for size and color	Joseph	
Finalize Design & Create Part Drawings for Conveyor Belt & Lever Arms	Pace	
Order Conveyor Belt & Lever Arm Parts	Pace	
Solder New PCB	Pace	
Validate PCB	Pace	
Finish Android application subsystem	**Joseph**	



Project Timeline



	Event Description	Assigned to	Progress
1	**Robotic Sorting System**		
2	*ECEN 403/404-901*		
3	*Pace Dominy, Joseph Miller, Lam Tran*		
63	**Finish sensor subsystem**	**Lam**	
64	**Status Update 2**	**All**	
65	**Finish power control subsystem**	**Pace**	
66	Install Bluetooth server setup on RSS RPi and test basic functionality	Joseph	
67	Build Conveyor Belt & Lever Arms	Pace	
68	Pass sensor data to Bluetooth server	Joseph	
69	Pass configuration information to robotic arms	Joseph	
70	Functional test of Android application connections with sensor and robotic arms	Joseph	
71	Validate Conveyor Belt	Pace	
72	Validate Lever Arm	Pace	
73	**Status Update 3**	**All**	
74	**Finalize integration of Android app connections (with robotic arms and sensors)**	**Joseph**	
75	Range and error testing for app/sensor interface	Joseph	
76	Range and error testing for		

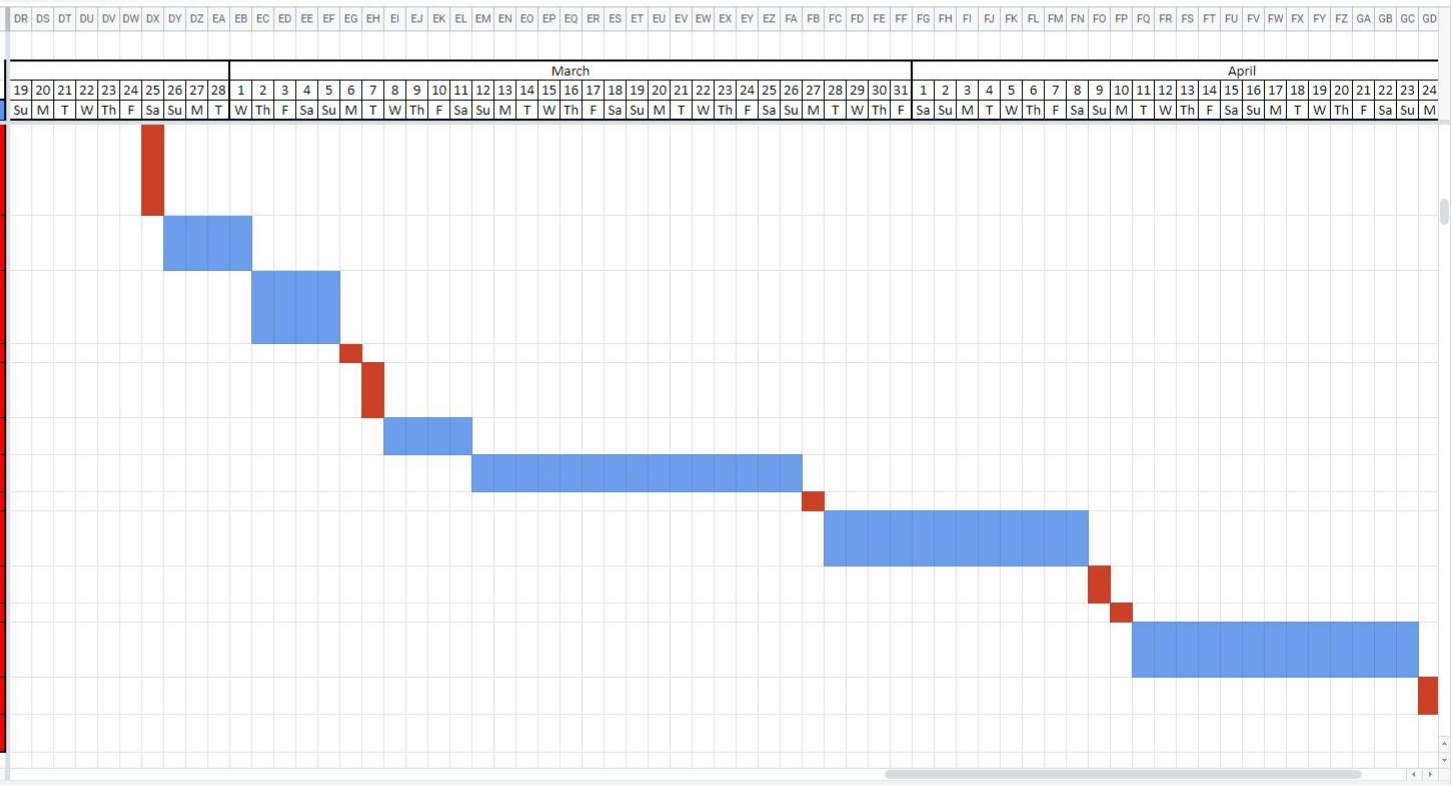
Project Timeline

Robotic Sorting System

ECEN 403/404-901

Pace Dominy, Joseph Miller, Lam Tran

Event Description	Assigned to	Progress
Finalize integration of Android app connections (with robotic arms and sensors)	**Joseph**	
Range and error testing for app/sensor interface	Joseph	
Range and error testing for app/robotic arm interface	Joseph	
Status Update 4	**All**	
Finish basic Robotic Sorting System functionality	**All**	
Develop and assign test scenarios	All	
Execute and debug test scenarios	All	
Status Update 5	**All**	
Finalize testing and functionality (buffer time)	All	
All subsystems integrated	**All**	
Final Presentation	All	
Finalize testing and functionality (buffer time)	All	
Final Project Demonstration	**All**	
Final Report (end of ECEN 404)	**All**	



Subsystem 1, Android Application

Joseph Miller

Accomplishments since 403 ~40 hours of effort since 403 demo	Ongoing progress/problems and plans until the next presentation

• All 403 work is still functional
• New Bluetooth additions over the break
  • Improved BLE server
  • Integrated Bluetooth control into user interface
  • User can write values for color- and size-based sorting
	• Determine and implement what the possible “sorting values” will be
	  • Required to prevent faulty configuration of the RSS (Subsystem FSR, paragraph 3.2.5.1.1)
	• Transmit more than one byte of data over the connection

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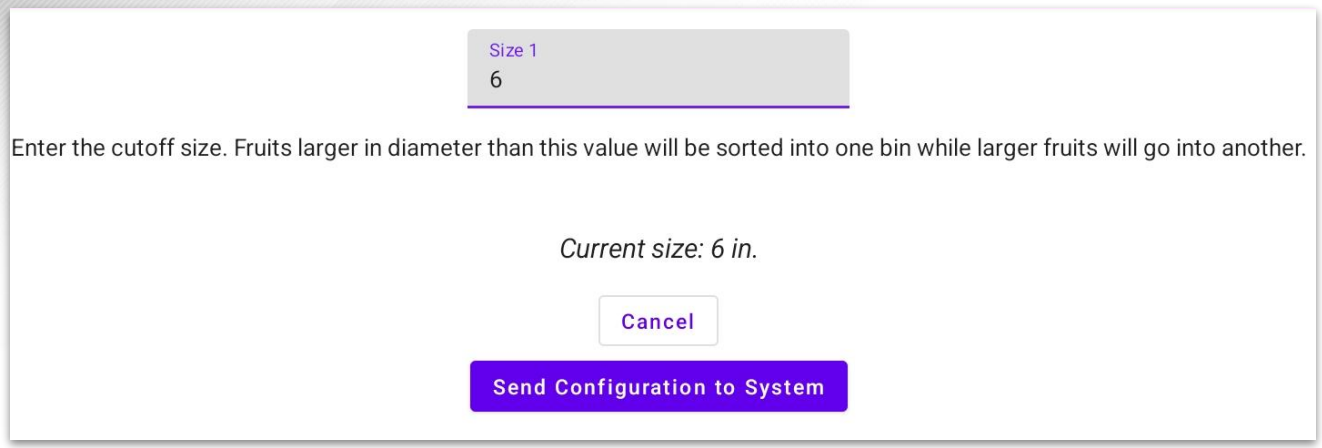
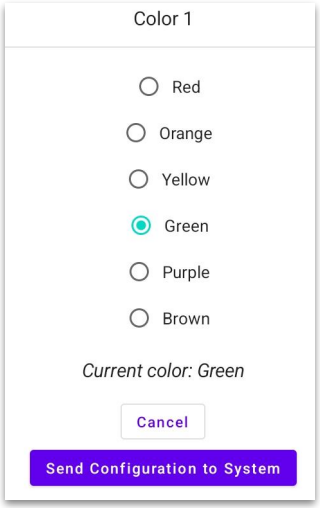
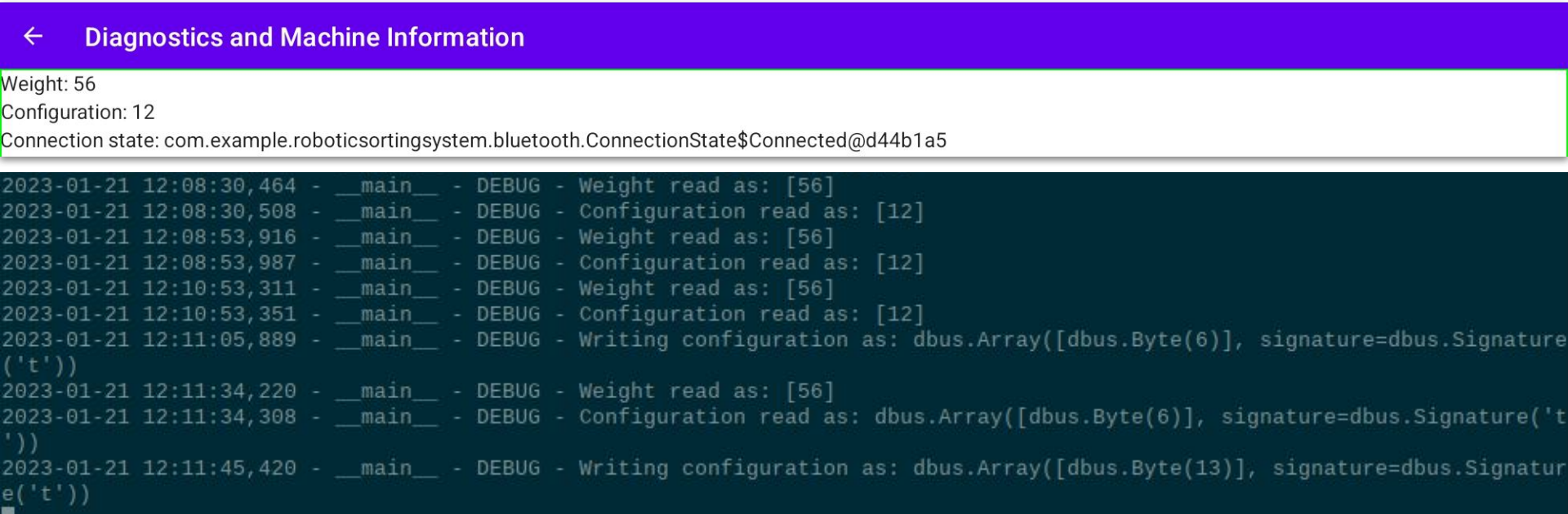
Subsystem 1, Android Application

Joseph Miller







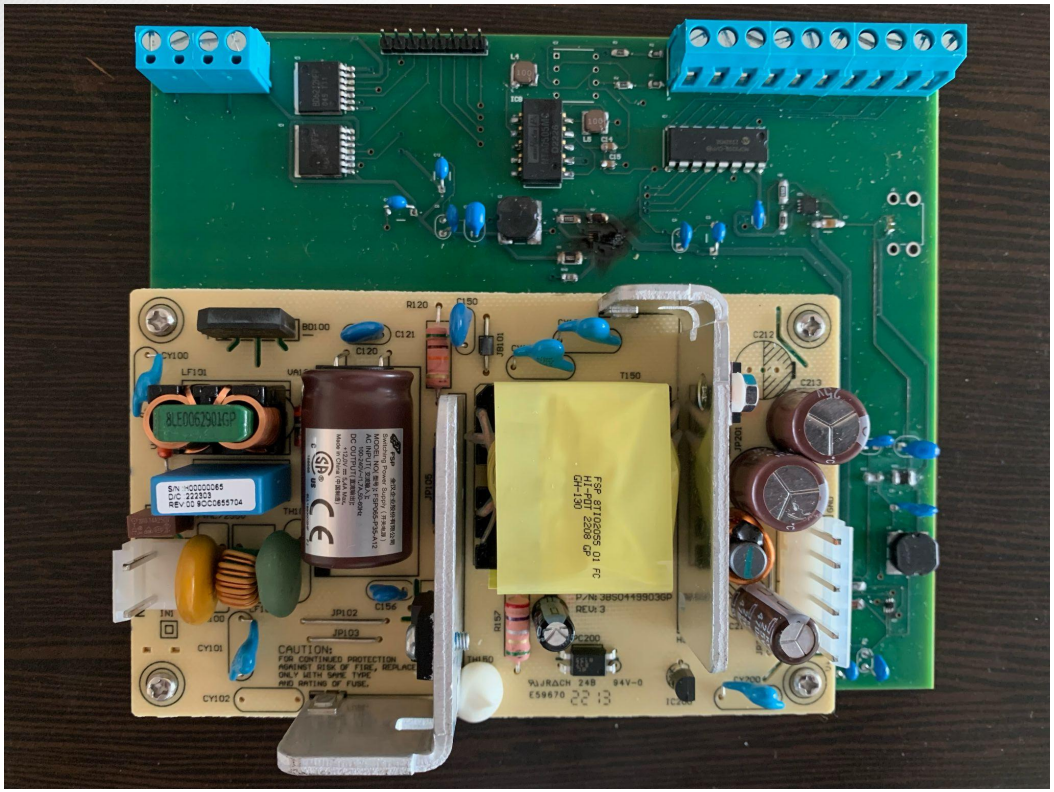
Power, Conveyor Belt & Lever Arm Subsystem

Pace Dominy

Accomplishments since 403 ~21 Hours Since 403 Demo	Ongoing progress/problems and plans until the next presentation
• Initial PCB Design is fully soldered but it is not operational. At least one of the ICs caught fire and one of the traces burnt up.	• Determine what caused the initial PCB design to fail • Redesign the PCB and reorder destroyed components • Order Revision 1 of PCB Design • Finalize Design of Conveyor Belt & Lever Arm

Subsystem 2 (45 seconds)

Owner of Subsystem 2



PCB does not work and the initial design will be revised to prevent catastrophic failure (i.e. catching fire)

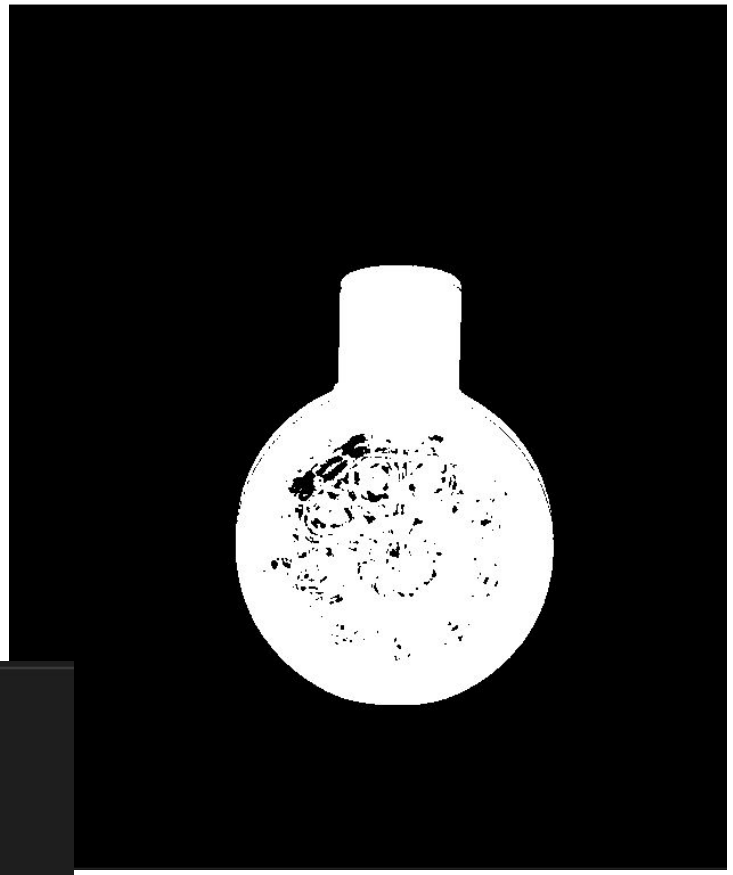
Subsystem 3, Sensors

Lam Tran

Accomplishments since 403 25 hrs of effort since 403 demo	Ongoing progress/problems and plans until the next presentation
• Color sensor and size sensor are programmed • Creating test images for the color sensors and size sensor • Testing and validating the color and size sensor with these images	• Integrating codes to the Raspberry Pi • Figuring out how to adjust the camera to take image/video with even lighting and little distortions • Revising codes if necessary

Subsystem 3, Sensors

Lam Tran



```
PROBLEMS  OUTPUT  TERMINAL  DEBUG CONSOLE

24.0
YELLOW
height by pixels:  385
width by pixels:  278
height by inch:  4.215777718829627
width by inch:  3.0441200151548995
```

Parts Ordering Status

- New PCB needs to be ordered after design is revised.
- Might need to order specific components of the Conveyor Belt or Lever Arm subsystems
- Expect to have new PCB ordered by January 30th
- Expect to have Conveyor Belt/Lever Arm Parts Ordered by February 6th

Execution & Plan

ECEN 404						
Subsystem	*Test Name*	*FSR Reference*	*Success Criteria*	*Methodology*	*Status*	*Responsibility*
App	Basic write test	Subsystem 3.2.4.1.1 Project 3.2.3.1	A configuration value chosen by the user using the Android application will be written to the Bluetooth server. That value can then be read by the Android app.	User puts "6" into Sort by Size screen input box. The terminal on the Raspberry Pi will show that the number corresponding to a 6-inch sorting cutoff was written to the device. The user will then navigate to the "Diagnostics and Machine Information" screen, which will show a written sorting configuration of 6 inches.	Complete: wrote 6, then read 6 in the Diagnostics screen	Joseph
App	Basic read test	Subsystem 3.2.4.1.2 Project 3.2.3.4	The application will read the configuration and weight values from the Bluetooth server and display those values on the Diagnostics and Machine Information screen.	A "default" test value of 56 for the weight characteristic and 12 for the write characteristic will be configured on the Bluetooth server. The user will launch the application, connect to the Bluetooth server, and read the "default" test values.	Complete: read 56 for weight and 12 for configuration	Joseph
App	RSS RPi integration test	Subsystem 3.2.4.1.1, 3.2.4.1.2 Project 3.2.3.1, 3.2.3.4	The results from the Basic Write Test and Basic Read Test will be successfully replicated on the RSS Raspberry Pi.	The Basic Write Test and Basic Read Test will be repeated using the actual Raspberry Pi that will be attached to the Robotic Sorting System.	Incomplete	Joseph
App	Faulty configuration protection	Subsystem 3.2.3.1, 3.2.5 Project 3.2.5	The faulty configuration values 30, 0, and -1 will not be written to the Bluetooth server and will result in a popup error.	The Sort by Size screen will be used to write a faulty value of 30, then the Send Configuration to System button will be pressed. The user will be notified that this configuration is invalid and the value will not be written to the Bluetooth server. This will be repeated with a value of 0 and -1.	Incomplete	Joseph
Sensor	Intergating the sensors with the RPI and the RasPiCam	Subsystem 3.2.2.3, 3.2.2.4	The Raspberry Pi is able to use the RasPiCam to take a image/video, and use it to determine the size or color of the fruit.	Program the Raspberry Pi to take an image/video. Impledement the color/size sensors code. Test it with objects of varying size and colors.	Incomplete	Lam

Execution & Plan

Lever Arm	Position Validation	Subsystem 3.2.1	Lever arm moves to correct position based off of the data from the sensors	Lever arm will be timed and the angle of the arm will be checked for accuracy. Lever arm must not only "aim" toward one of the channels but it must also aim toward the correct one based off of what fruit, and the quality of the fruit	Incomplete	Pace
App/Sensors	App/Sensor Integration	App Subsystem 3.2.1.4.2 Project 3.2.3.4	The weight value passed from the sensor to the Raspberry Pi is shown on the Diagnostic screen of the Android app.	The sensor will pass a value of 10 to the Raspberry Pi, overwriting a previous value of 11. The user will monitor the Weight section of the Diagnostic screen on the app to ensure that this change is reflected.	Incomplete	Joseph/Lam
App/Lever Arm	App/Lever Arm Integration	App Subsystem 3.2.4.1.1 Project 3.2.3.1 Robotic Arm Subsystem 3.2.1.2	The robotic arm moves to Bin 1 based on the configuration passed in via the Sort by Size screen.	The application will pass a sorting cutoff of 1 to the Raspberry Pi. The lever arm will then read this test value and move to guide fruit to Bin 1.	Incomplete	Joseph/Pace
Lever Arm & Conveyor Belt	Timing Validation	Subsystem 3.2.1	Lever arm moves to correct position and stays there. Conveyor belt then turns on and lever arm does not move until it is required to do so again	Lever arm will be told a specific fruit and quality. From there, the timing will be checked to make sure that the subsystem waits for the information before moving. The lever arm will also be validated as staying at the correct position for the amount of time needed to move the fruit to the correct channel on the conveyor belt.	Incomplete	Pace
Lever Arm/Sensors	Lever Arm/Sensors Intergration	Project 3.2.3.4.3, Sensor Subsystem 3.2.2.4.1	Lever arm moves a certain the position based off of the sensor output.	The sensor will determine the color/size of the fruit. The lever arm will moves to a certain channel based on the output from the sensor.	Incomplete	Pace/Lam

Execution & Plan

App/Conveyor Belt	Belt Start/Stop	Project 3.2.3.1	The app passes a command to stop and start the belt.	A test function will be added to the app that allows the app user to directly stop and start the belt. This system will then be tested to ensure that stopping/starting the belt in the app results in the appropriate action on the conveyor belt.	Incomplete	Joseph
App/Sensors	Sensor Error Testing	Project 3.2.5.1.3	The sensor indicates a fault, causing an error message on the Diagnostic screen.	The sensor will pass a FAULT value to the Raspberry Pi, which will be sent via Bluetooth to the Android app. The Diagnostic screen will show FAULT in the Weight category.	Incomplete	Joseph/Lam
App/Conveyor Belt	Belt Movement Error	Project 3.2.5.1.1, 3.2.5.1.2	The app returns an error if the belt is obstructed or the power to the machine is cut off (stopping the belt).	The belt will be set to run, then the power will be disconnected at the wall. The test will be successful if the app returns a notification that the belt has stopped.	Incomplete	Joseph
App/System	Full Functionality	App Subsystem: All Project: 3.2.1.4, 3.2.3.1, 3.2.3.4.1, 3.2.3.4.2, 3.2.5	The app passes a configuration to the machine and starts the belt. When sorting is complete, the app stops the belt and returns a notification.	The sorting configuration from the Specification Sorting test will be passed to the sorting machine via the app. Two fruits (one for each bin) will be scanned on the belt and sorted. When 15 seconds have elapsed since the last fruit was scanned, the belt will stop and push a notification to the app.	Subsystem-complete (need to build RSS to connect to)	Joseph
Power	PCB Voltages	Subsystem 3.2.3.1	Input power is correct (120V at 15A), conveyor belt & guidng arms respective motor drivers receive correct voltage, ADC receives correct voltage, RasPi recevies correct voltage. Test efficiency and noise of all 4 buck converters.	PCB will be tested with a voltmeter to check for the correct max voltage. This test will be done for all power inputs and outputs to validate that all the converters work correctly.	Incomplete	Pace
Power	Raspbery Pi Power	Subsystem 3.2.3	Validate Raspberry Pi receives correct voltage and turns on. Also validate that raspberry pi camera turns on.	Voltages will be tested with a voltmeter to ensure the correct max voltage	Incomplete	Pace

Thank you!