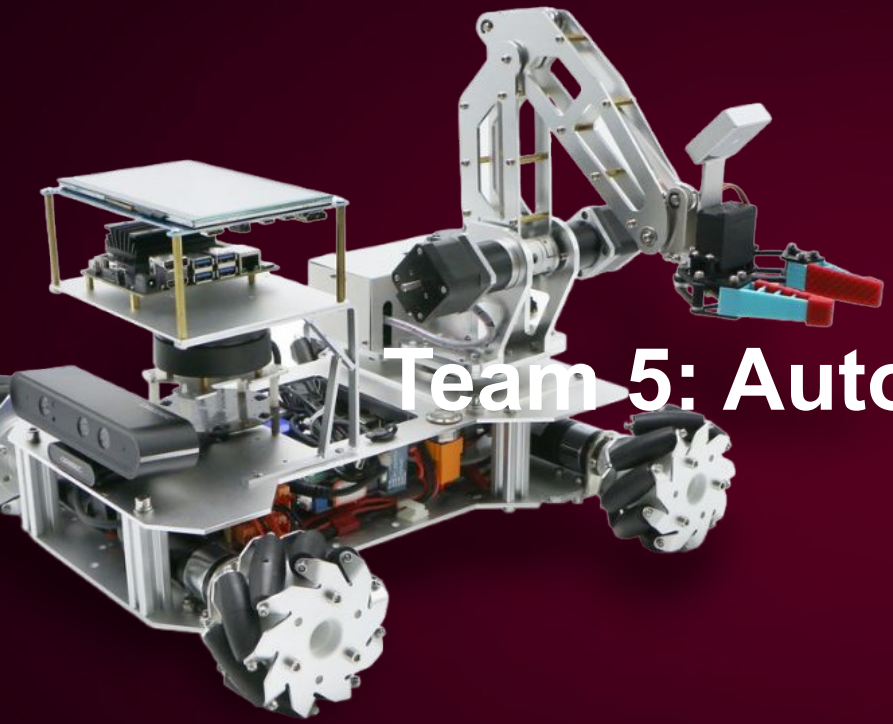

Dwight Look College of ENGINEERING
TEXAS A&M UNIVERSITY

Team 5: Autonomous Object Picking Robot

Bi-Weekly Update 3

Christoffer Cox
James Dickson
Kathy Vo
Sponsor: Swarnabha Roy
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Executive Summary

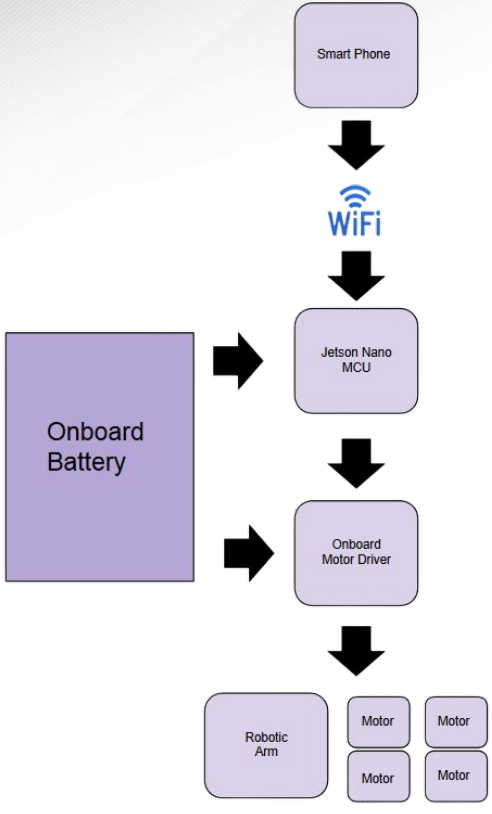
Problem statement:

- With millions of packages processed daily through warehouses, the need for safe and efficient sorting methods is of the utmost importance.
- Workplace injury rates are increasing as the demand grows.

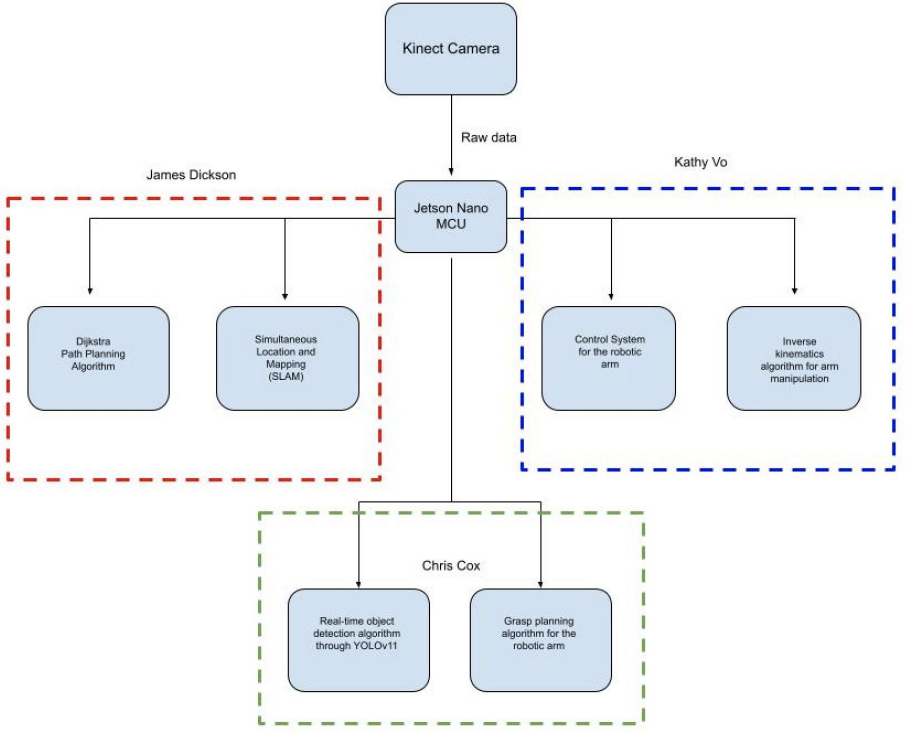
The autonomous object picking robot offers:

- The ability to navigate through indoor environments with no human control
- The ability to differentiate between objects depending on the color
- The ability to grasp and transport designated objects to a given location

Project/Subsystem Overview



Subsystems



Project Timeline

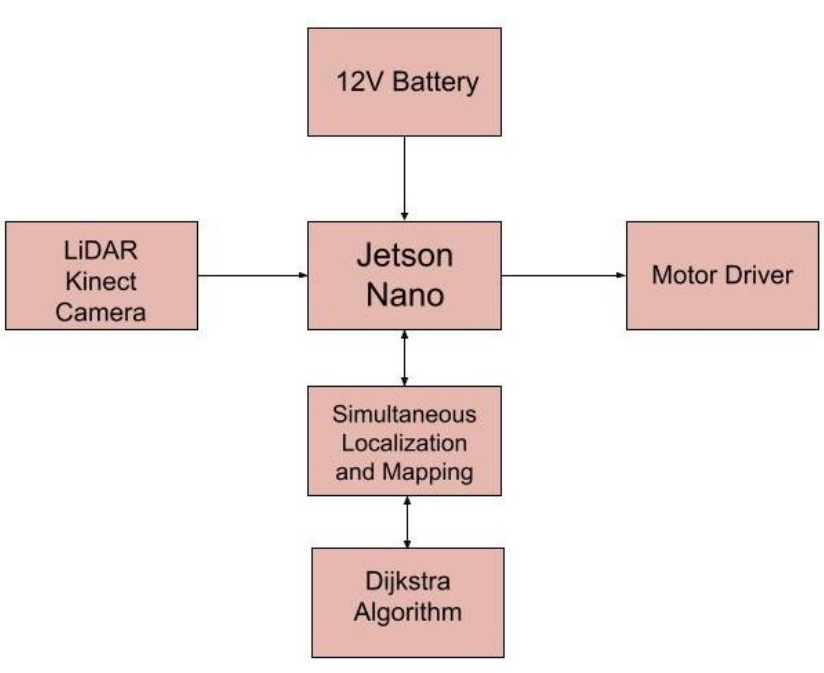
Finalize initial subsystem code (completed 1/20)	Integrate Kinect camera with the Jetson Nano (completed 2/3)	Autonomously move robot and arm using real world detection (to complete by 3/4)	Fully make the robot independent and combine all parts together (to complete by 3/17)	Test system and refine any bugs or issues (to complete by 4/14)	Final Demo and report (to complete by 4/26)

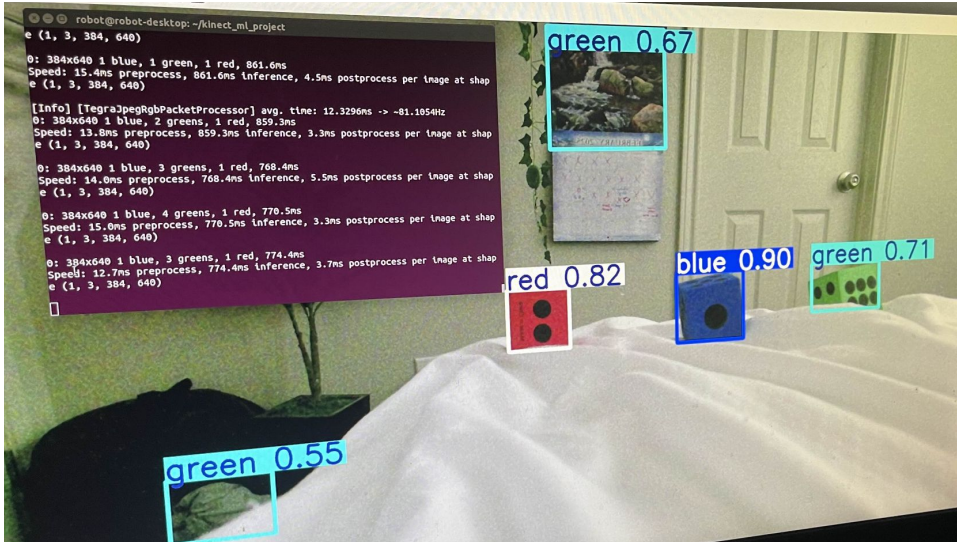
Object Navigation and Object Avoidance

Accomplishments since last update 15 hrs of effort	Ongoing progress/problems and plans until the next presentation
- Along with Chris, uploaded and got the machine learning algorithm functional on the Jetson Nano - Completed first steps for GPIO integration.	- Ongoing integration with obstacle detection system. - By next review, obstacle detection and navigation system are expected to be integrated.

Object Navigation and Avoidance

James Dickson





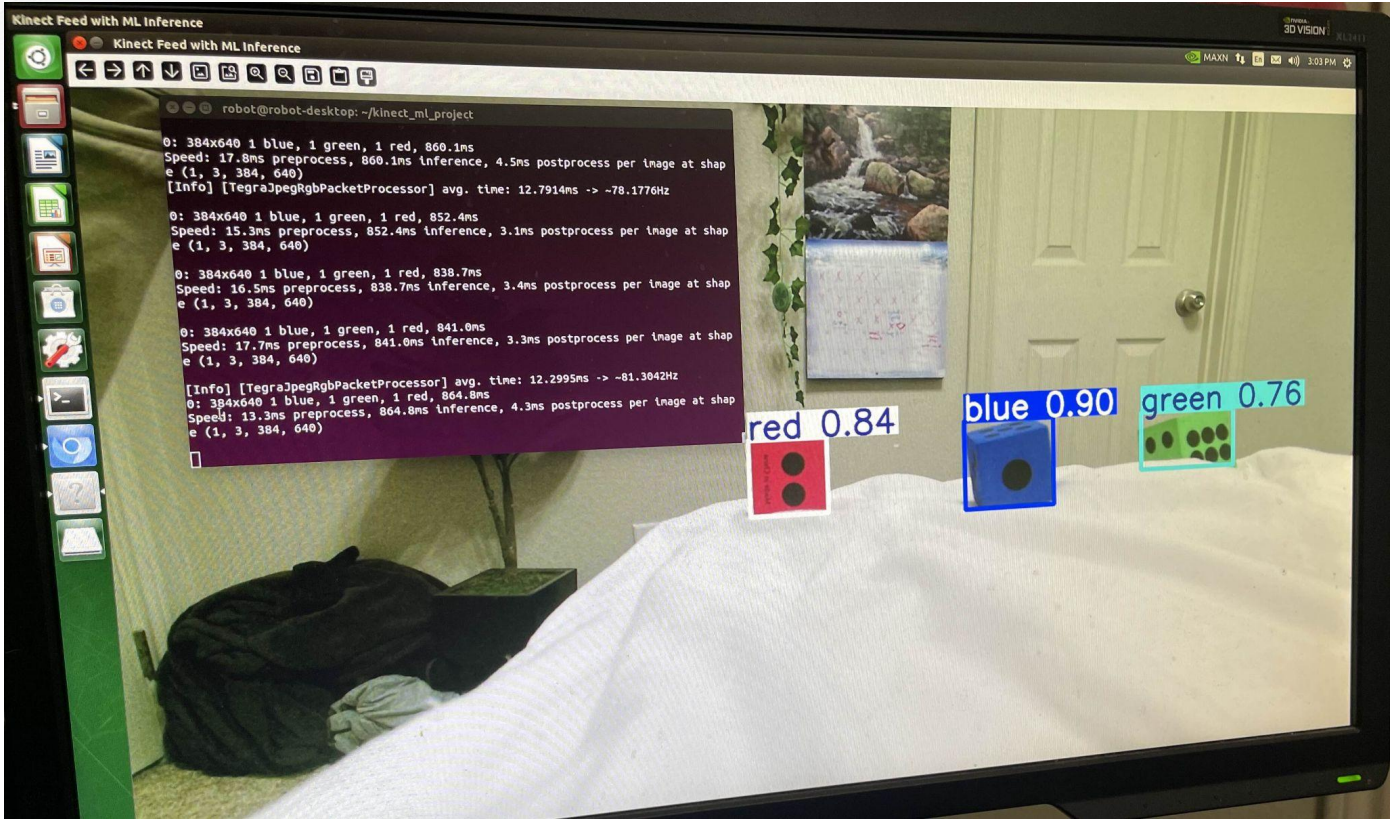
Object detection and Grasping

Chris Cox

Accomplishments since last update 15 hrs of effort	Ongoing progress/problems and plans until the next presentation
- Fixed issue where Kinect camera would not open on Jetson Nano - Collaborated with Object navigation subsystem to create a program that extracts block information from object detection code	- Apply new program to microcontroller to allow robot and robotic arm to autonomously move

Object detection and Grasping

Chris Cox



Arm Manipulation

Kathy Vo

Accomplishments since last update 10 hrs of effort	Ongoing progress/problems and plans until the next presentation
- Tested robotic arm and all motors are functioning and at least 180 degrees.	- Ongoing testing with sending commands from an arduino to the arm's microcontroller - Test sending commands from Jetson nano to the arm's microcontroller

Validation Plan

Paragraph #	Test Name	Success Criteria	Methodology	Status	Responsible Eng
3.2.1.1	Object Recognition Time	Detect objects of various colors in a reasonable timeframe	Run multiple tests and see the average time it takes to detect an object	Tested	Chris
3.2.1.2	Object Detection Success Rate	Have a 95% success rate of object detectic	After a series of multiple tests, calculate how often the robot detected an object	Tested	Chris
3.2.1.3	Battery Life	Expected runtime of 2.7 hours with the 36Ah batteries	Allow the robot to run for a certain amount of time then measure the amount of voltage left in the battery	Tested	James
3.2.1.4	Network Requests	Active wifi connection the robot and smartphone	The robot will connecto to the wifi and move	Untested	All
3.2.2.1	Navigation Speed	speed of at least 1.5 meters per second	Use a timer to measure the speed	Tested	James
3.2.2.2	Object Pickup Precision	pick up objects with 90% success rate and error margin of 2 centimeters	Measuring the distance, after a series of tests	Untested	Chris, Kathy
3.2.2.3	Object Placement Accuracy	place objects within a 5 centimeter radius of the designated location	Measuring the distance, after a series of tests	Untested	Chris, Kathy
3.2.3.1.1	Power Consumption	max peak power shall not exceed 432 Watts	Measure the current and voltage of the battery after fully charged	Tested	All
3.2.3.1.2	Input Voltage Level	input voltage level shall be no more than +24V	User multimeter to ensure proper input voltage	Tested	All
3.2.3.1.6	Raw Video Output	create a virtual environment of the robot	Use Gazebo for simulating virtual environment	Tested	James, Kathy

Execution Plan