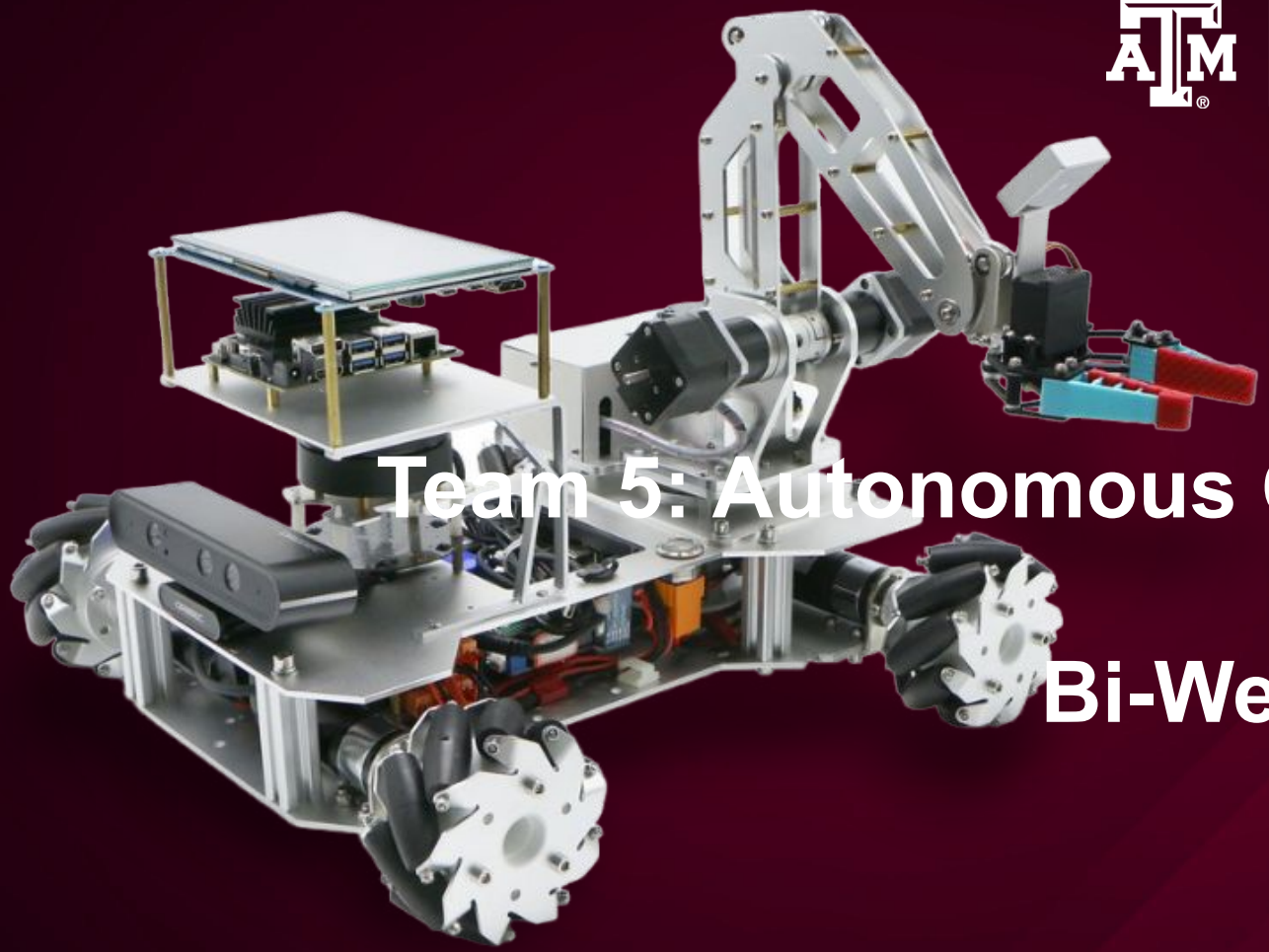


Dwight Look College of ENGINEERING
TEXAS A&M UNIVERSITY

Team 5: Autonomous Object Picking Robot

Bi-Weekly Update 1

Christoffer Cox
James Dickson
Kathy Vo
Sponsor: Swarnabha Roy
TA:Niloofar Borzooei

Executive Summary

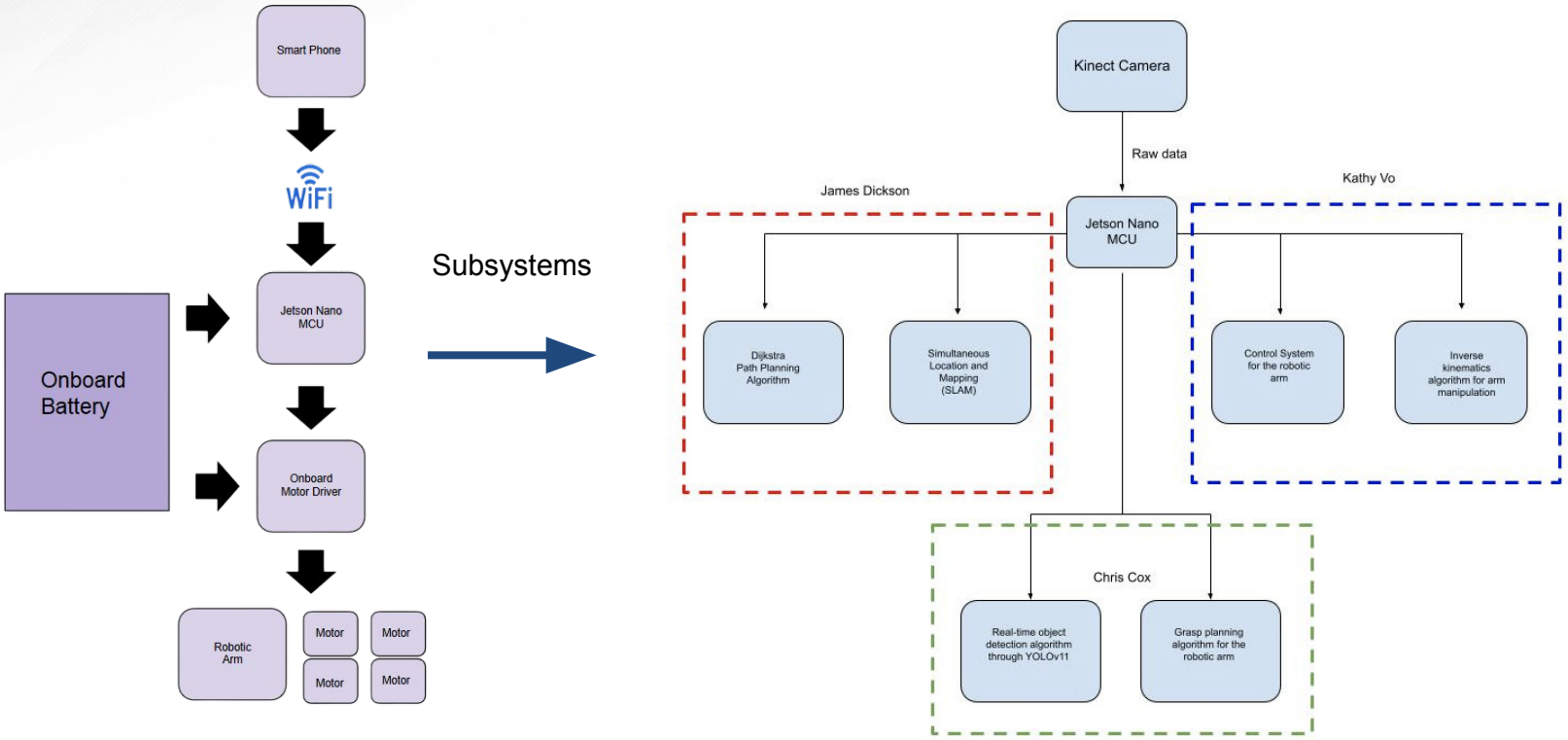
Problem statement:

- 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



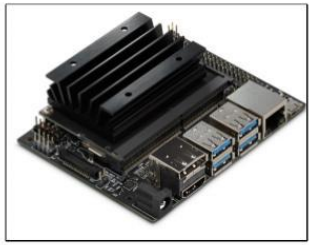
Major Project Changes for 404

- Switch from YOLOv8 to YOLOv11
- New batteries to power the system

Project Timeline

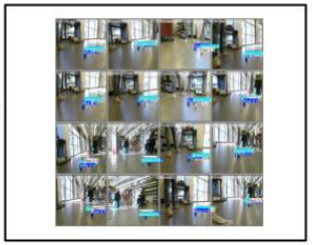
Project Timeline

December (End of 403)



- Object Detection code is able to recognize the dices and its color.
- Navigation of the body thru simulation can detect obstacles in its path.
- Arm manipulation was able to move three out of six motors(elbow, forearm, and wrist) cohesively.

January

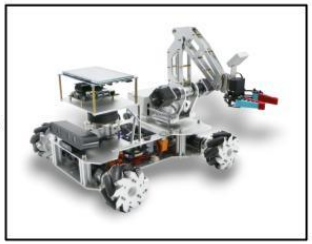


Integrate code for the Kinect camera with the Jetson Nano and Esp32

February

Integrate code for the Kinect camera with the Jetson Nano and Esp32

March



Attach robotic arm and Kinect camera to the body.

April

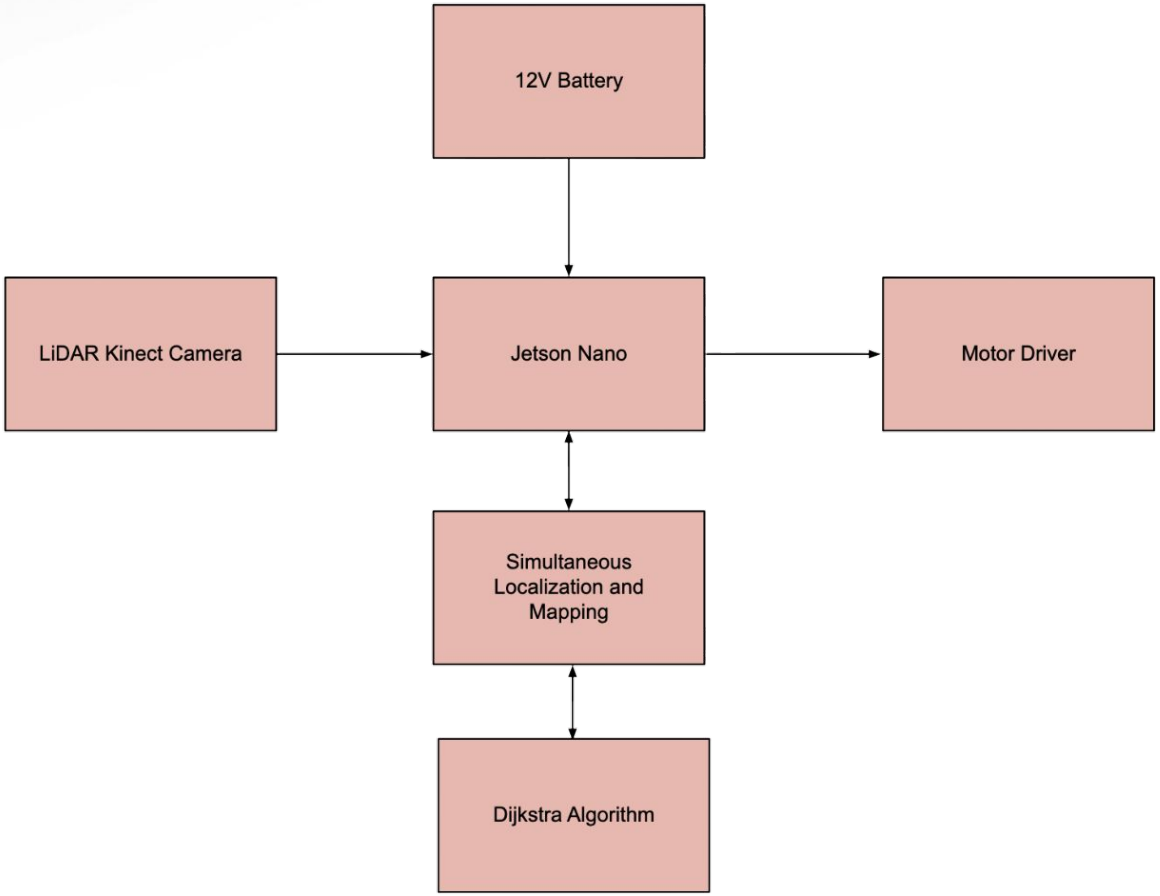
Run trials and measure the accuracy of the autonomous robot. Adjust and debug the code with the new added adjustments.

Object Navigation and Object Avoidance

Accomplishments since 403 25 hrs of effort	Ongoing progress/problems and plans until the next presentation
- Streamlined code and tweaked path planning algorithm - Added code for kinect camera support to start connecting to the navigation subsystem.	- Work with Chris to further the object detection and navigation integration

Object Navigation and Avoidance

James Dickson



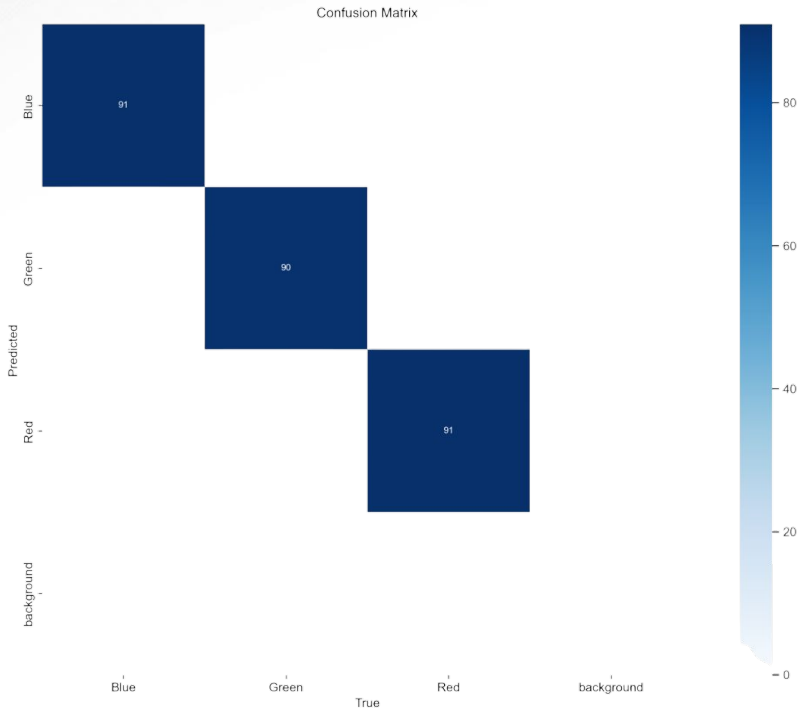
Object detection and Grasping

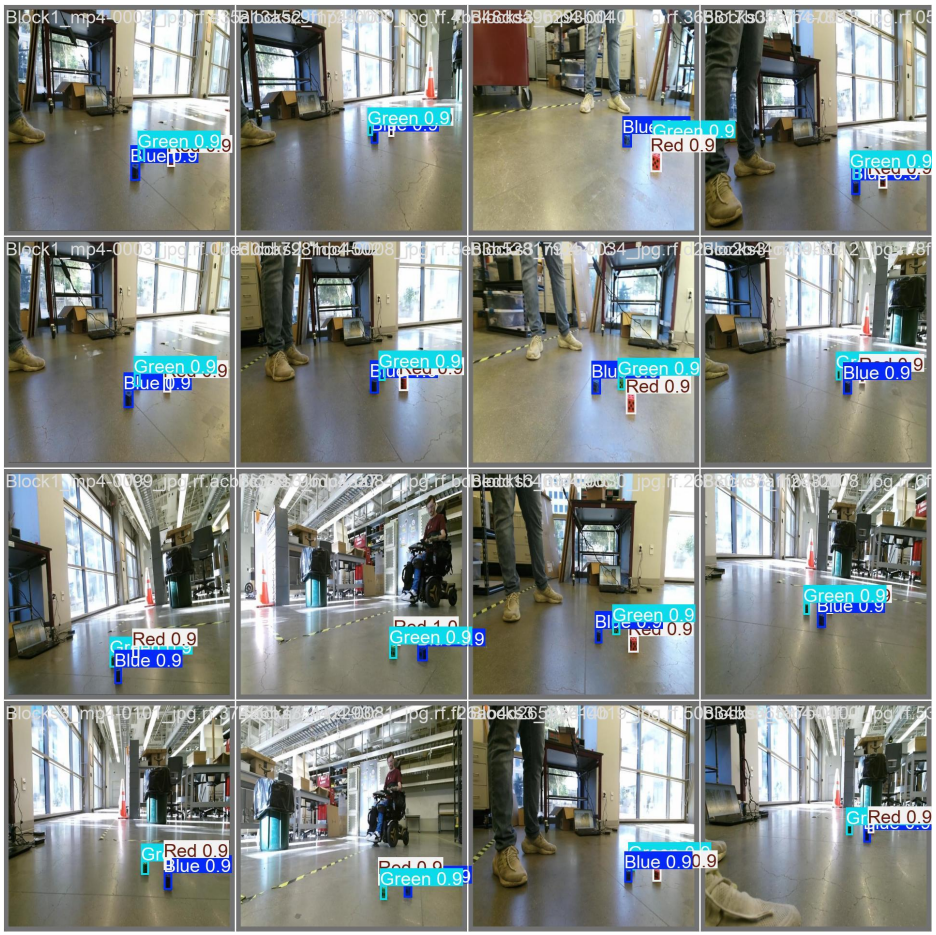
Chris Cox

Accomplishments since 403 30 hrs of effort	Ongoing progress/problems and plans until the next presentation
- Fixed the issue where the Kinect camera wasn't connecting to the python code - Finalized the version 2 dataset and trained a custom YOLOv11 Object detection model with it - Confirmed that the model functions properly	- Integrate object detection program with navigation subsystem for tracking the desired objects - Begin working with the arm manipulation subsystem to create a functional grasping program

Object detection and Grasping

Chris Cox





Arm Manipulation

Kathy Vo

Accomplishments since 403 10 hrs of effort	Ongoing progress/problems and plans until the next presentation
- Move the elbow and forearm into the intended direction with the microcontroller.	- Creating a PCB board for all 6 motors to connect to provided 9V battery supply - Send data from the Kinect camera to the Esp32 microcontroller - Replace two dead motors of the arm

Parts Ordering Status

Received Parts:

- Xbox Kinect Camera
- Objects to be picked up (Colored blocks)
- Jetson Nano
- Robotic Arm

Execution & Plan

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
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
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
Network Requests	Active wifi connection the robot and smartphone	The robot will connecto to the wifi and move	Untested	All
Navigation Speed	speed of at least 1.5 meters per second	Use a timer to measure the speed	Untested	James
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
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
Power Consumption	max peak power shall not exceed 432 Watts	Measure the current and voltage of the battery after fully charged	Tested	All
Input Voltage Level	input voltage level shall be no more than +24V	User multimeter to ensure proper input voltage	Untested	All
Raw Video Output	create a virtual environment of the robot	Use Gazebo for simulating virtual environment	Tested	James, Kathy