

## Abstract

In robotics, there is a need for a cheap, accessible platform for use in education, research, and development. Currently, the Calliope2SP is being used in education. It is designed to be easy to use, but also demonstrate advanced robotic concepts. However, as of December 2014, iRobot has replaced the Create with the Create 2, meaning that the Calliope2SP can no longer be produced. The purpose of this project is to create the Calliope3, an updated version of the Calliope2SP that uses the Create 2 and features new gripper and arm designs, a taller neck, and a higher definition camera.

## Create 2 Changes

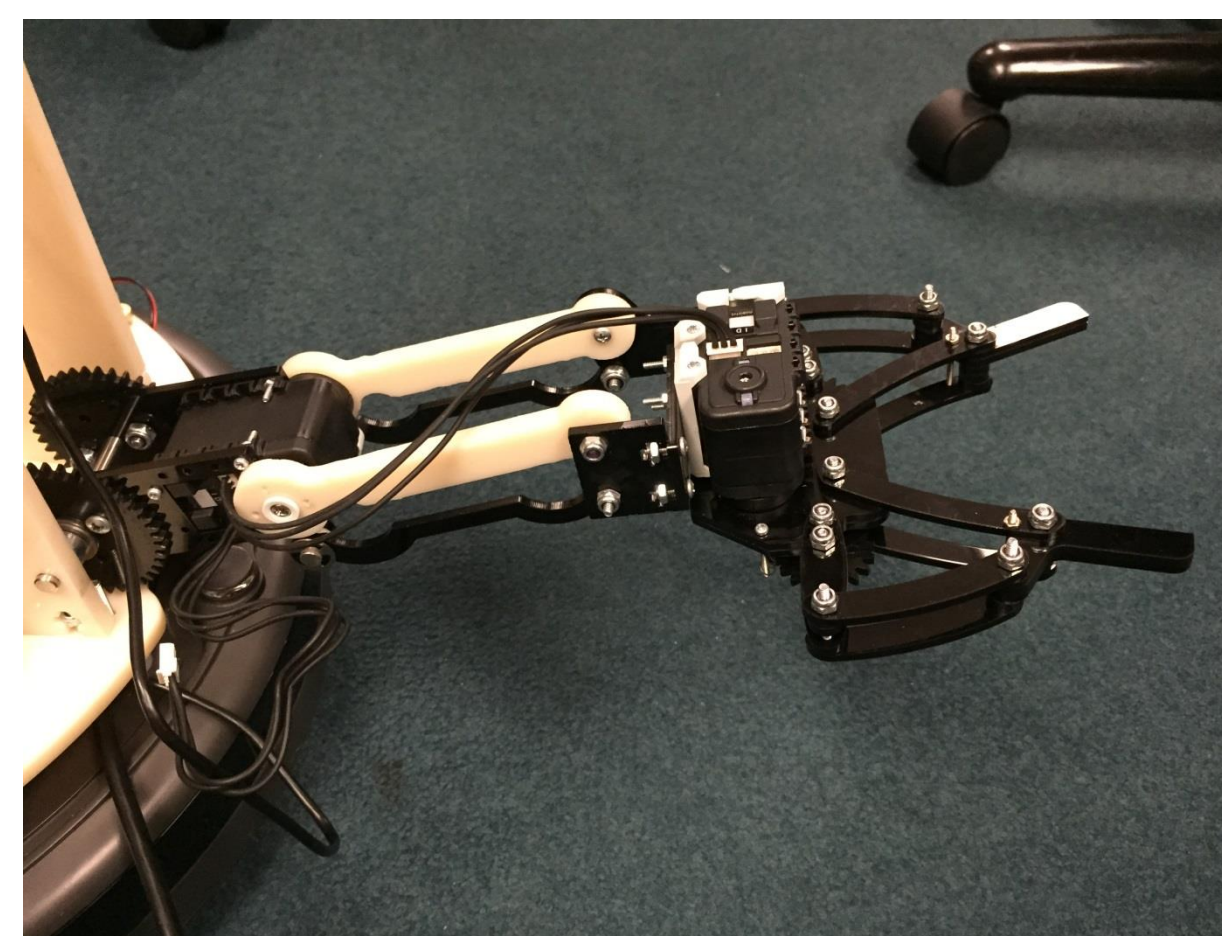
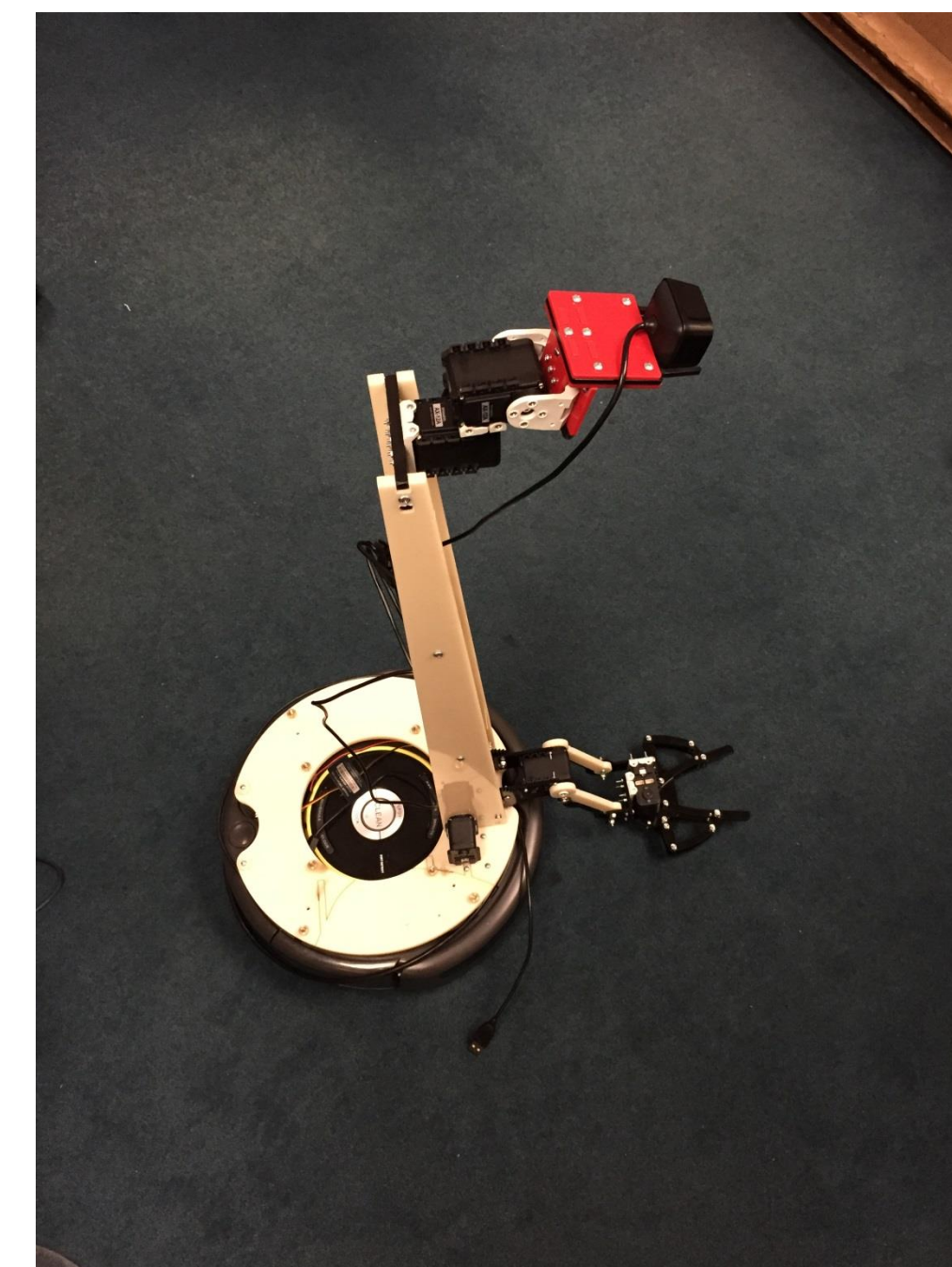
The iRobot Create 2 is a remanufactured Roomba. Compared to the Create, it has

- Changed position of the serial port
- 5 additional buttons
- Control of scheduling functionality
- Access to wheel encoders
- Control of the motor currents
- Access to brush (cleaning) motors
- LEDs capable of showing alphanumeric characters
- Four reflectivity sensors (“light bumpers”)
- Removed digital inputs and outputs
- Removed front wheel drop detection
- Removed cargo bay



## Physical Changes

- Tapped holes in the Create 2 to create places to attach the base plate and neck.
- Replaced original two finger gripper with a new design based on the Robotiq 2-Finger 85 Adaptive Robotic Gripper. This design was created by Brian Ferri and Coleman Ellis. The new gripper design allows a wider range of grasp types.
- The gripper is attached to a four bar arm that can fully retract vertically using a geared drive. The design for the geared drive is by Coleman Ellis.
- Used a Microsoft LifeCam to get higher resolution video input.
- Camera is mounted on a taller neck for better viewing angle.
- Added hardware to access power from battery in order to power the servos.



## Software Changes

- Updated the driver for the Create 2 to include new commands and sensors.
- Added driver settings for Microsoft LifeCam.
- Updated the Tekkotsu configuration files to use Create 2 inputs and outputs.
- Defined components for current and future Calliope3 versions.
- Updated odometry calculations make use of wheel encoder values:

$$Distance_{mm} = \frac{72\pi}{508.8} * \frac{(Encoder_{Left} + Encoder_{Right})}{2}$$

$$Angle_{radians} = \frac{72\pi}{508.8} * \frac{(Encoder_{Right} - Encoder_{Left})}{235}$$

## Future Work

- Add speakers for additional interactivity.
- Add stand to hold controlling laptop
- Replace wires connected directly to battery with power drawn from serial port.
- Refine the fabrication steps to increase rate of production for retail release.

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