

**ROCKIN**

**Robot**

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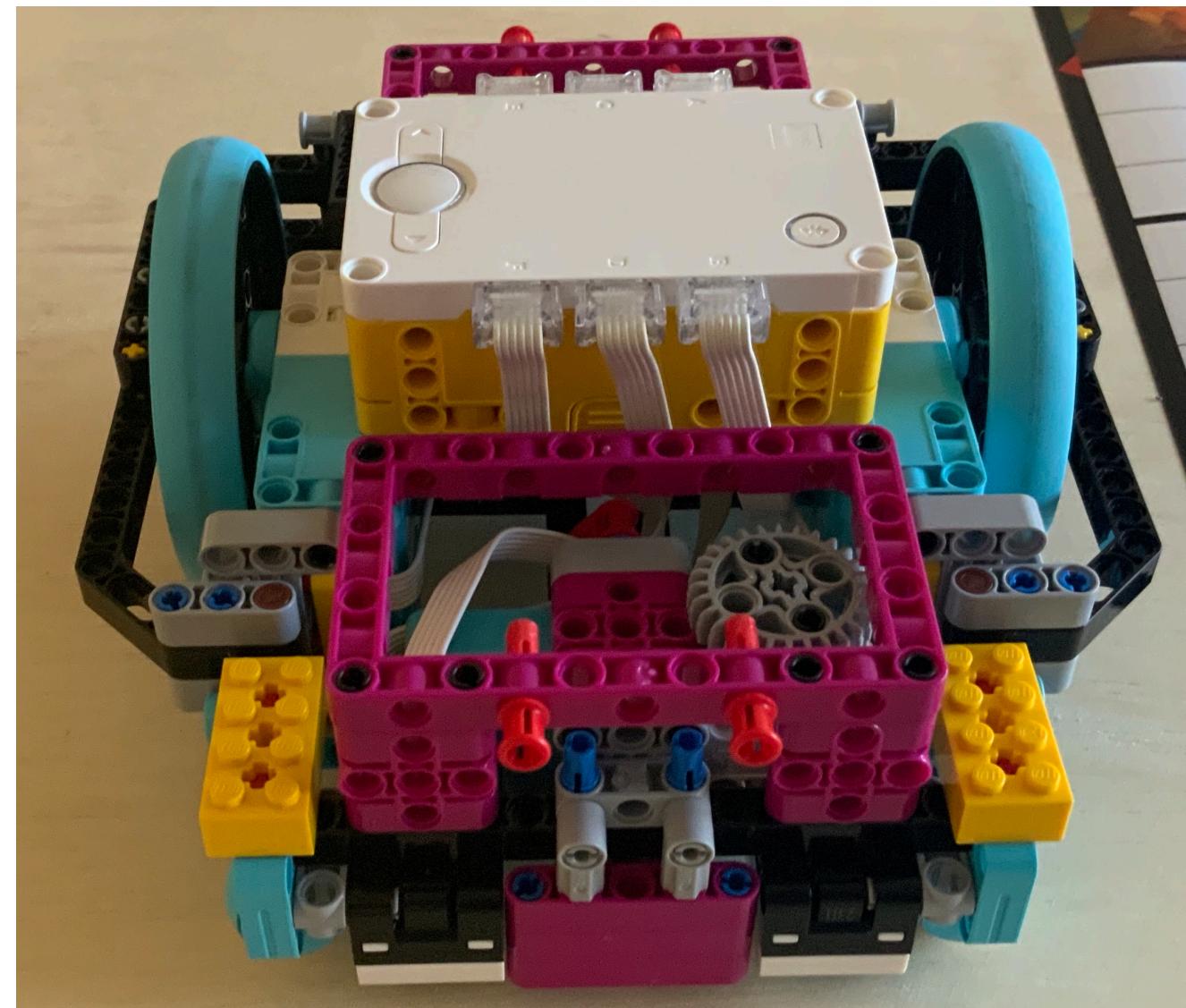
# GROVER

Design

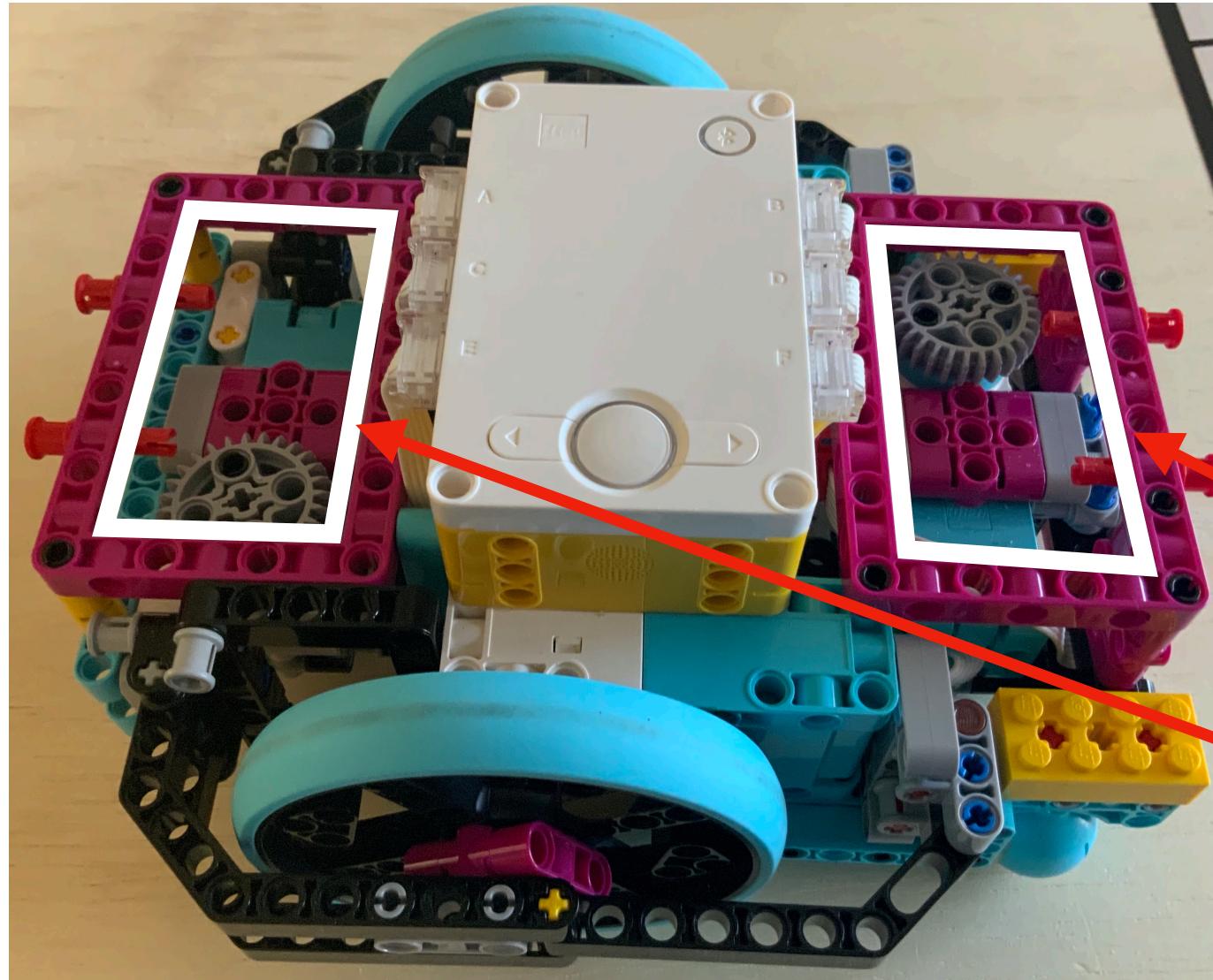
Ian, Alisha, Nidhi, and Luniva

# Robot Design

View from front



View from right

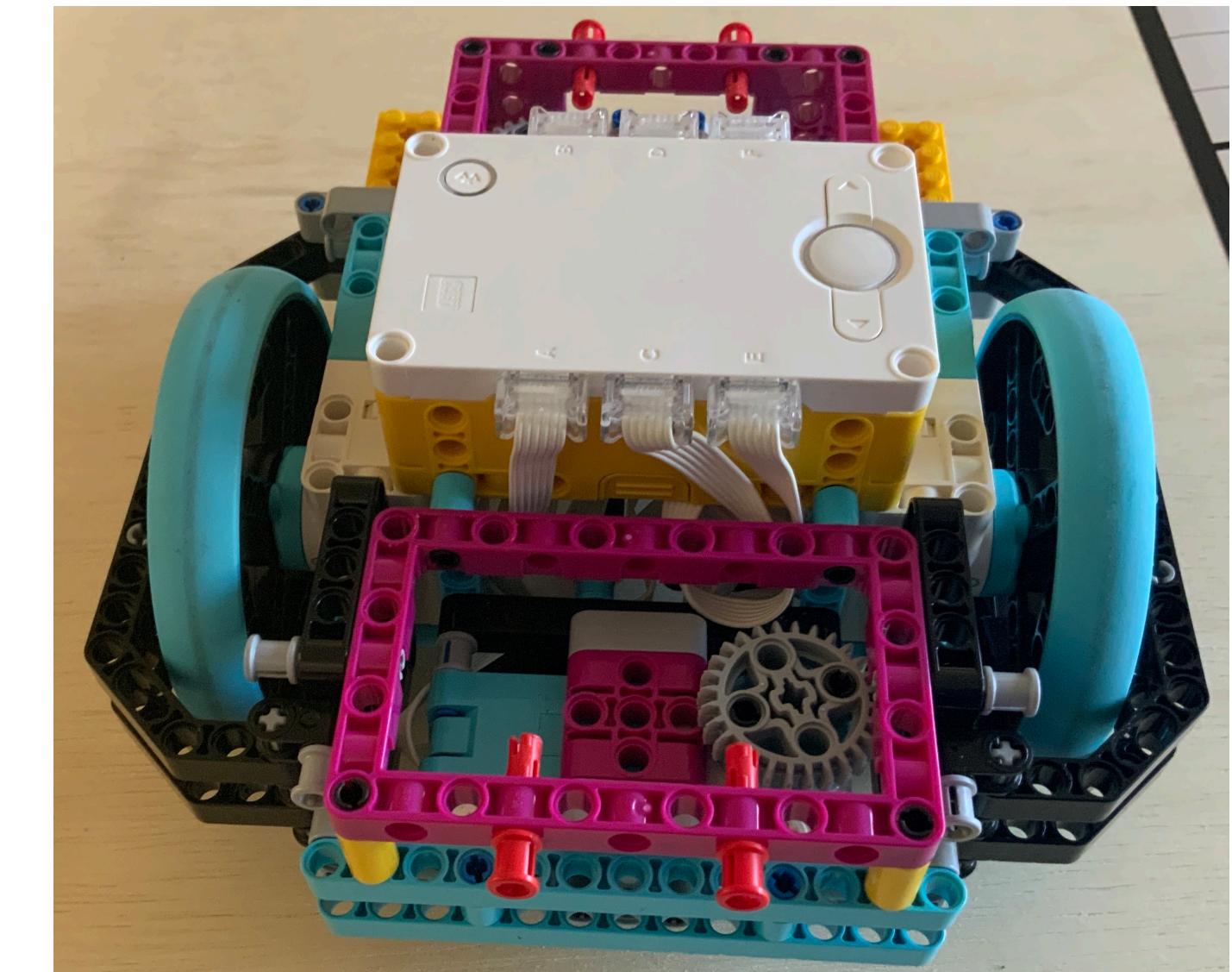


- We started building robots using LEGO EV3. It had issues with the gyro sensor's stability, so we used SPIKE PRIME.
- It has a built-in gyro sensor and the color sensor is more stable.
- The robot base is built from LEGO EDUCATION.
- We designed our own attachments based on the missions.
- The robot base has room in the front and in the rear to put the attachments on.

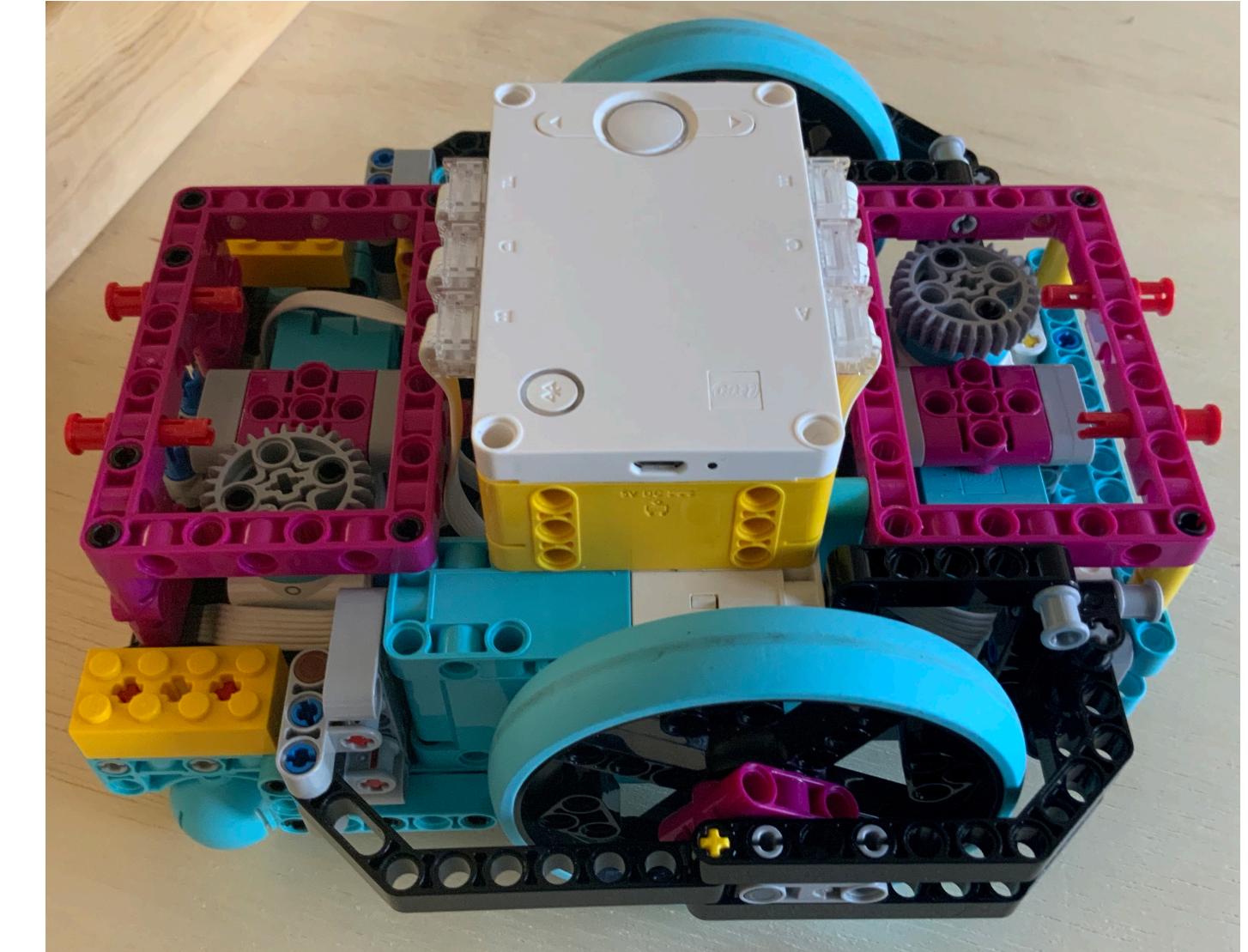
Placement for arm (front)

Placement for arm (rear)

View from back

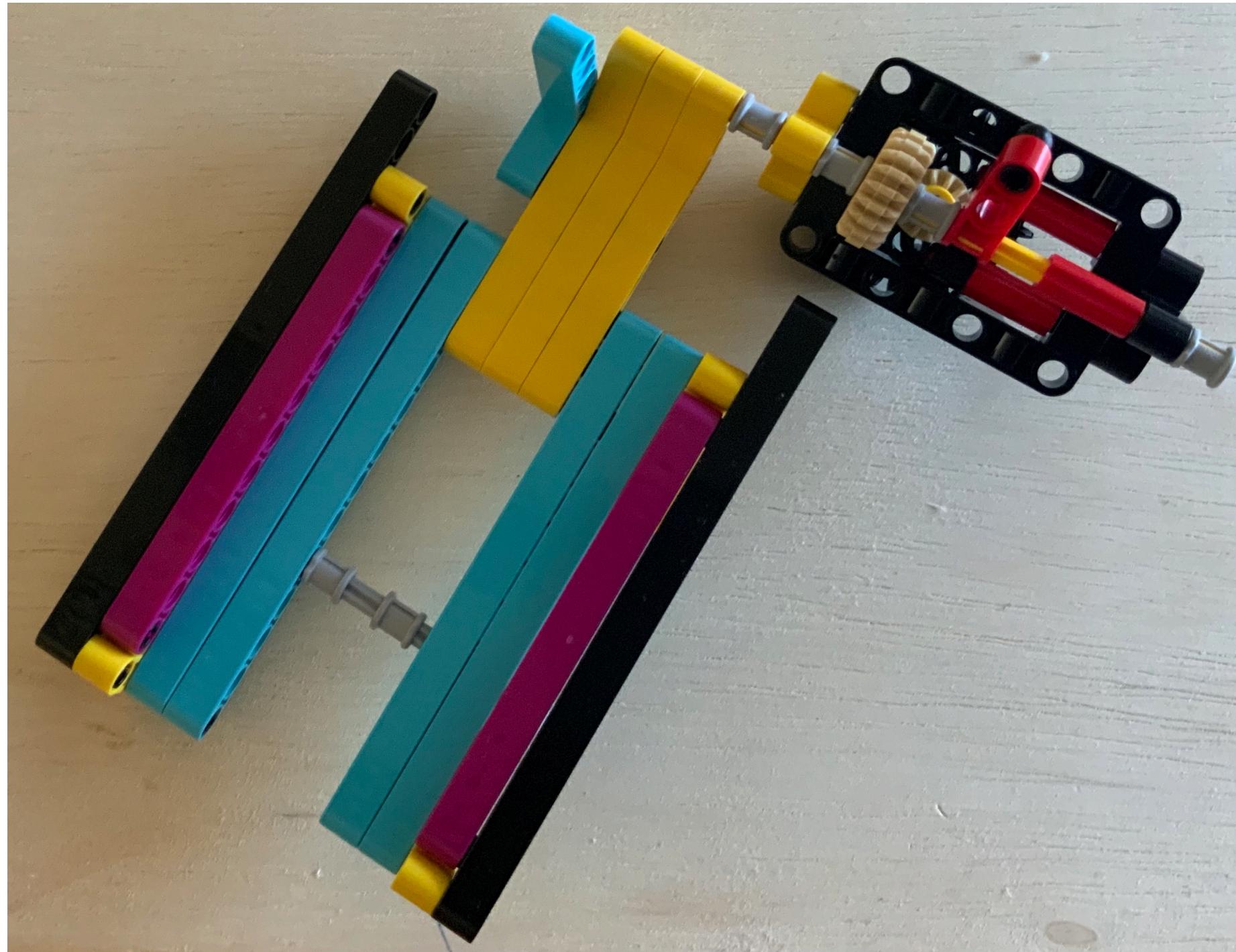


View from left



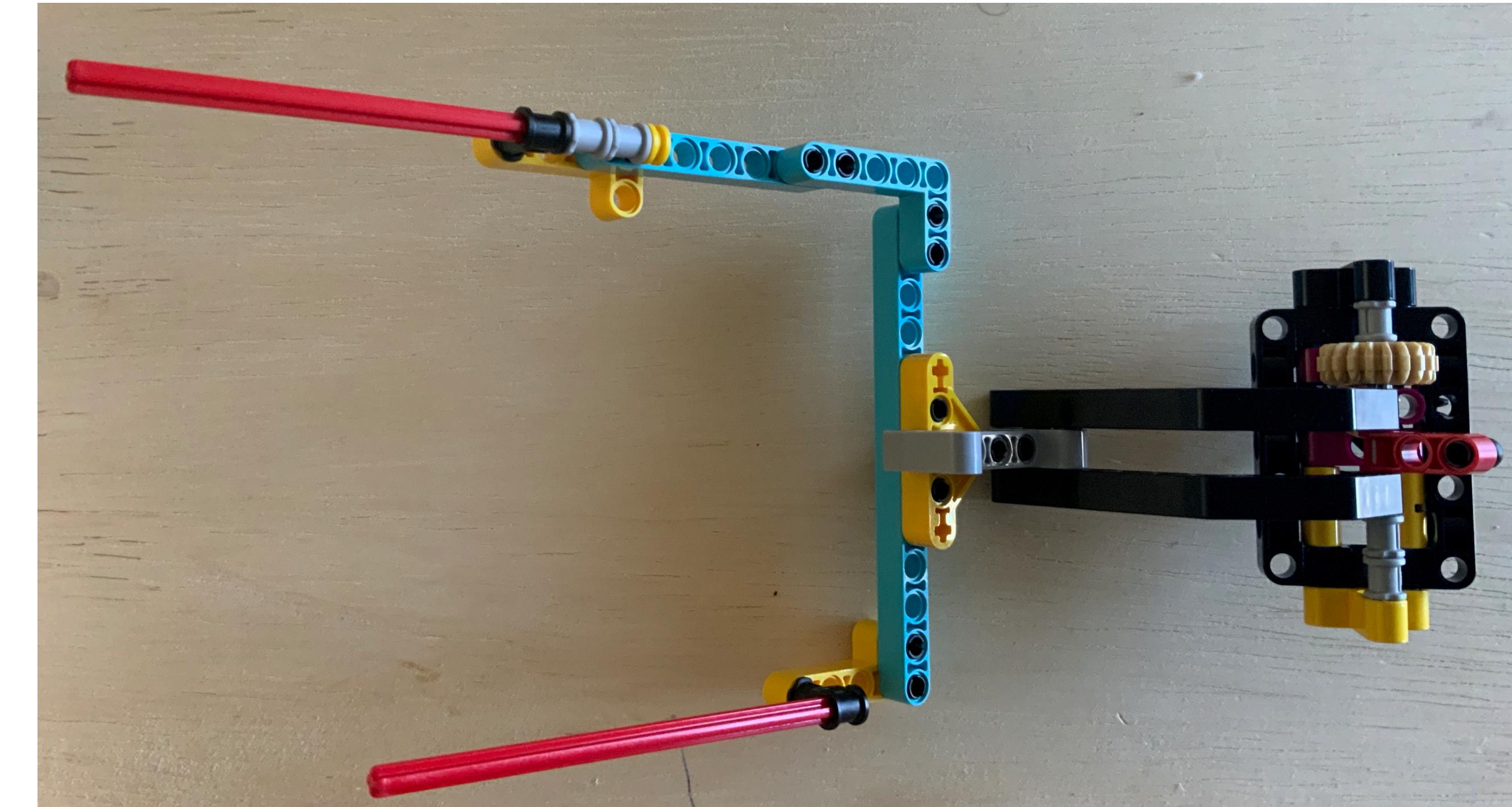
# Route 1 (M11, M10)

Delivery arm



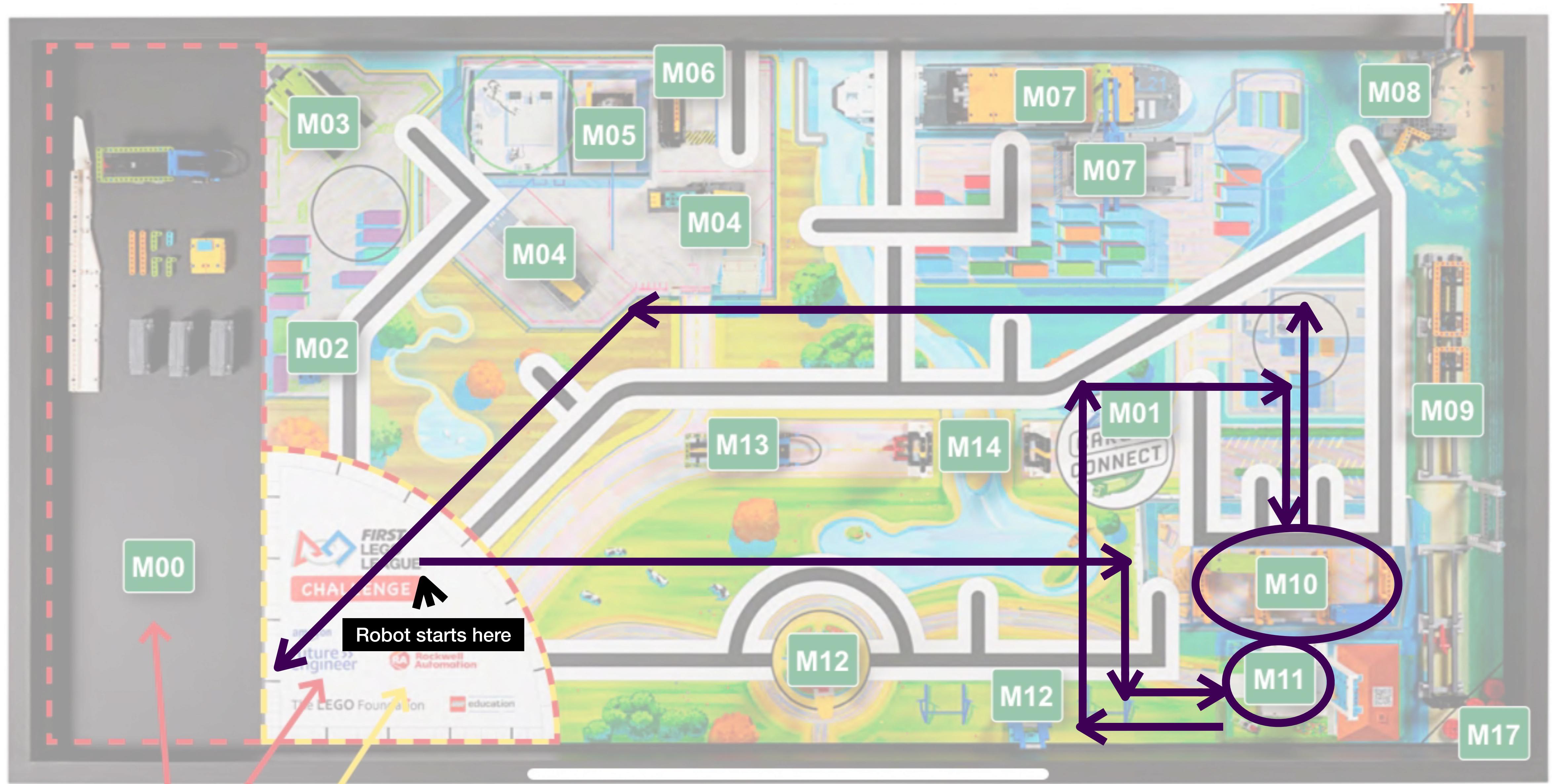
- It delivers the package.
- It lowers the ramp and the package slides down.

Sorter arm (“Field Goal”)

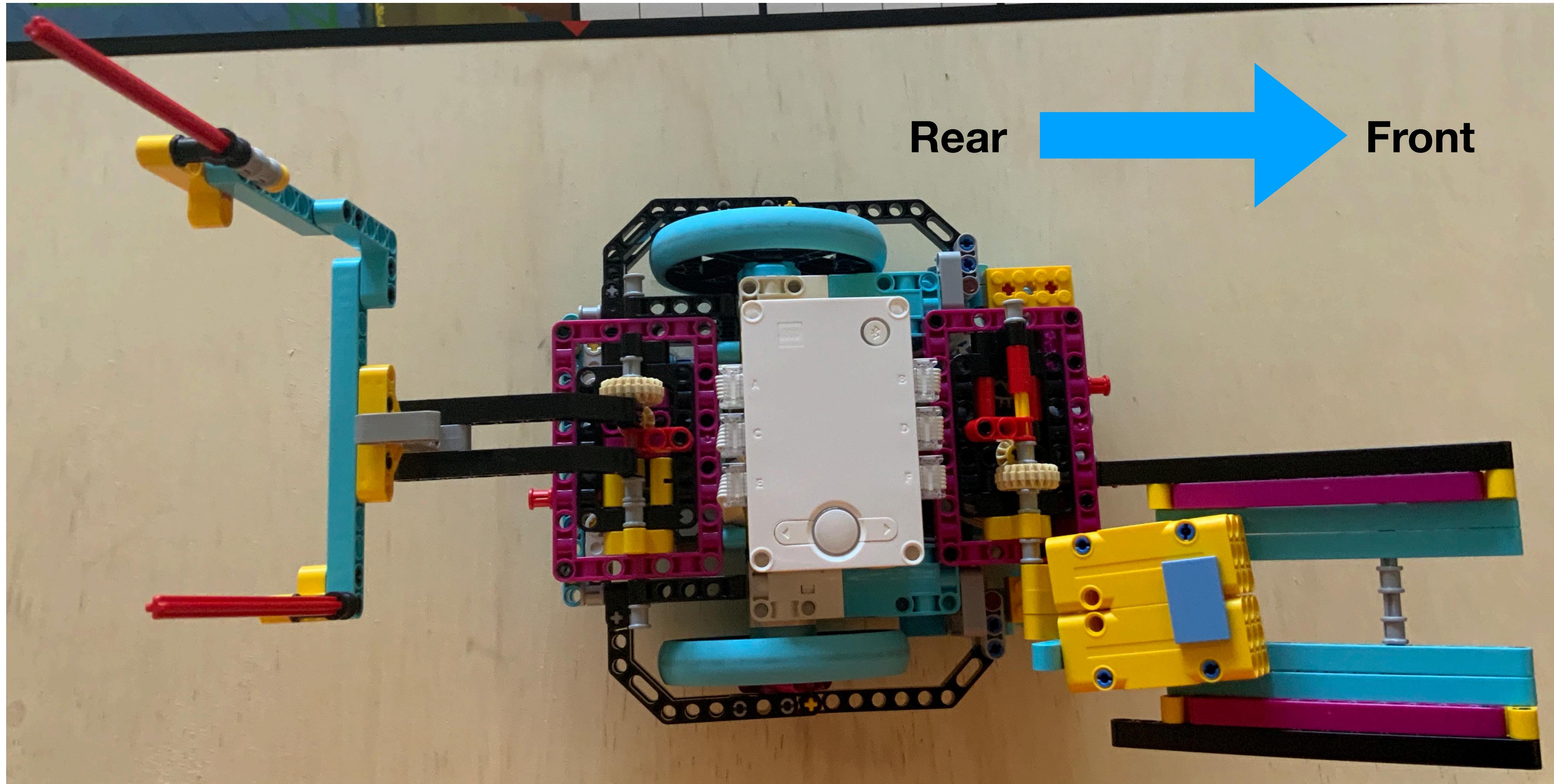


- It gets the green and blue containers after the Delivery Arm delivers the package.
- The west bay of M10 must have the blue container.
- The middle bay must have the green container.
- The east bay must have the orange container.

# Map of Route 1 (R1)

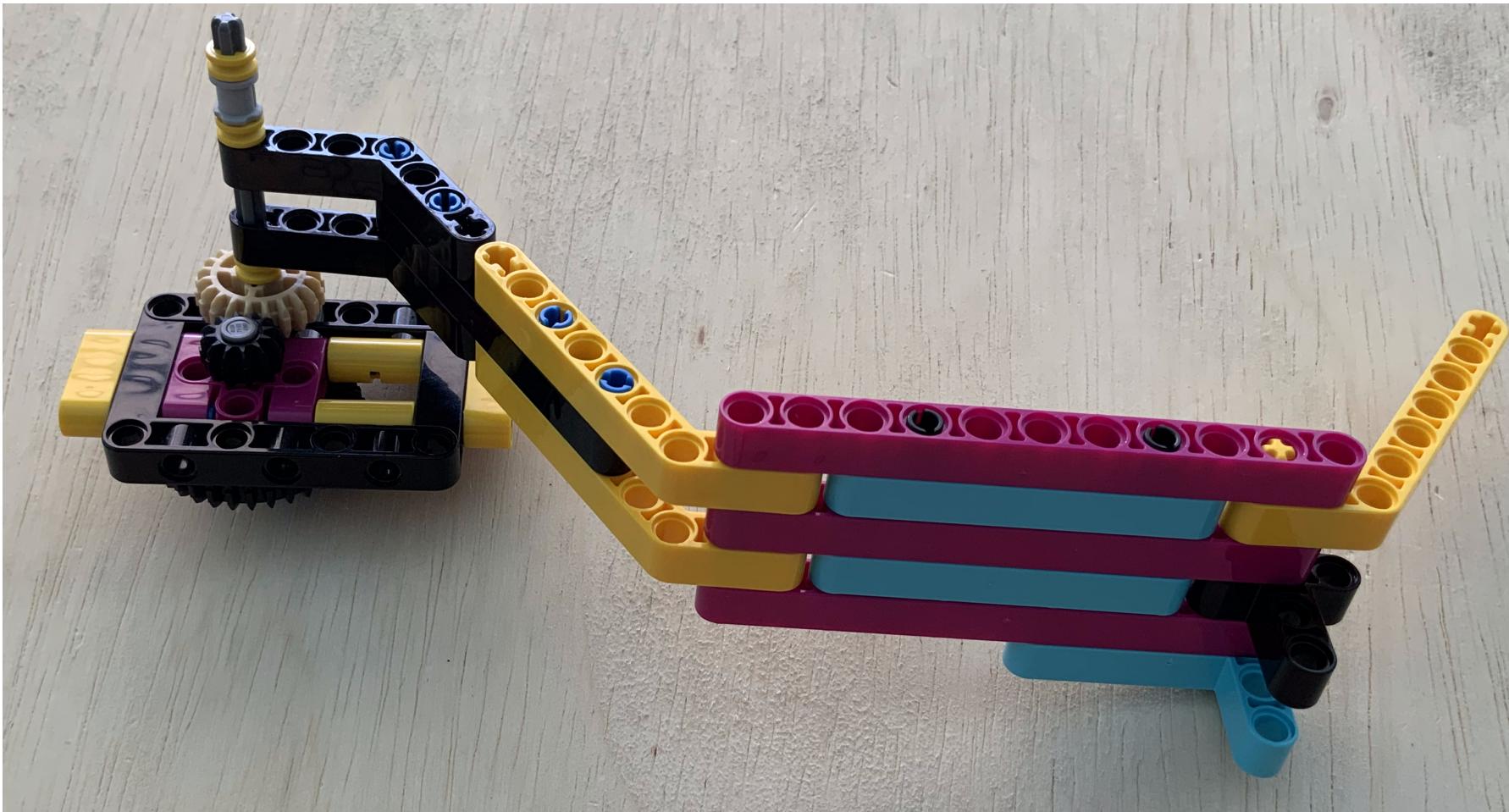


# Robot with delivery and sorter arms on



# Route 2 (M13, M14, M08, M09, M07)

Slapping arm



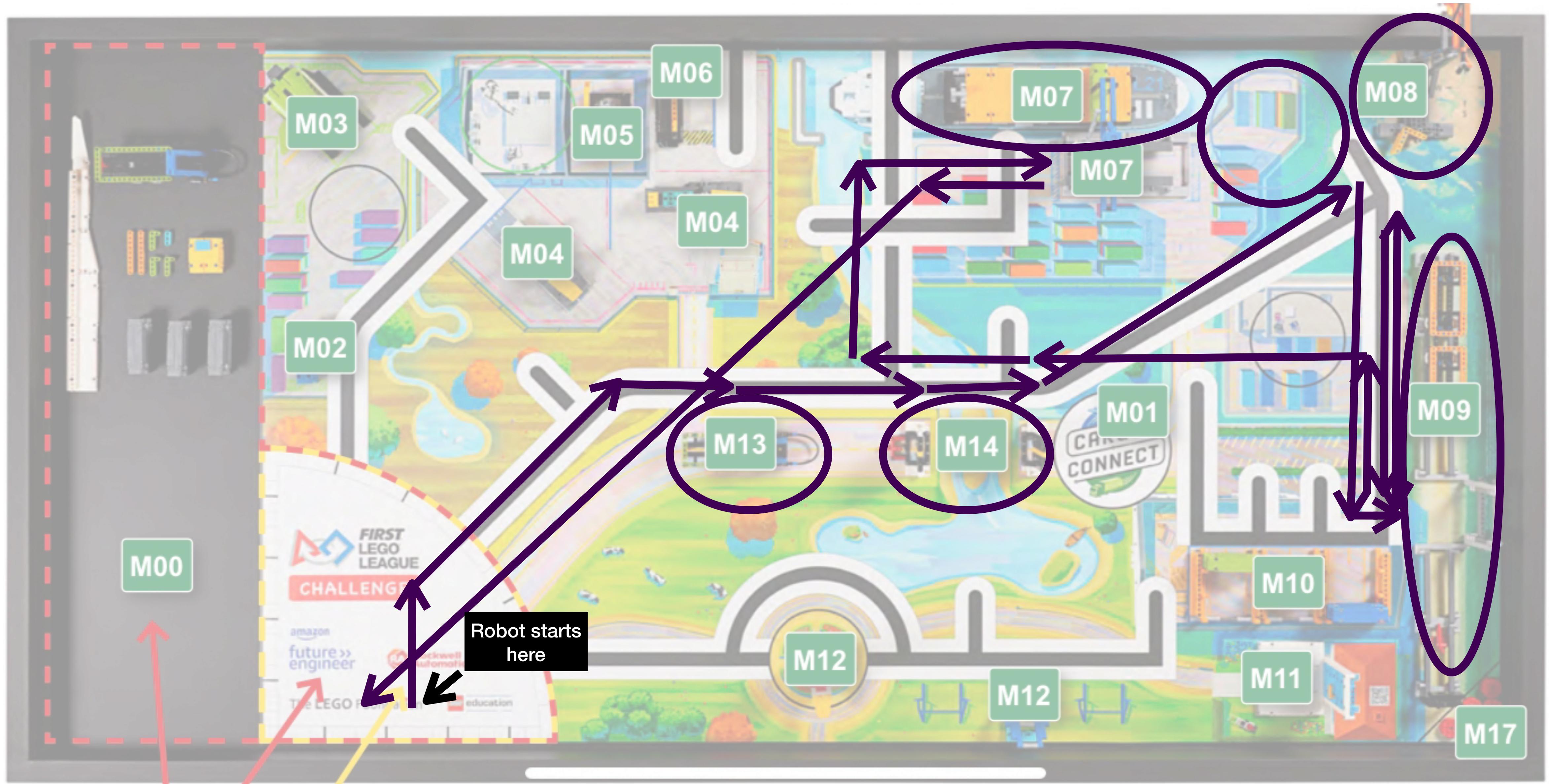
- The black hook on this arm repairs the train track.
- Knocks the east bridge deck down.
- The yellow extension pushes the cargo ship and unloads the container.

Tail arm

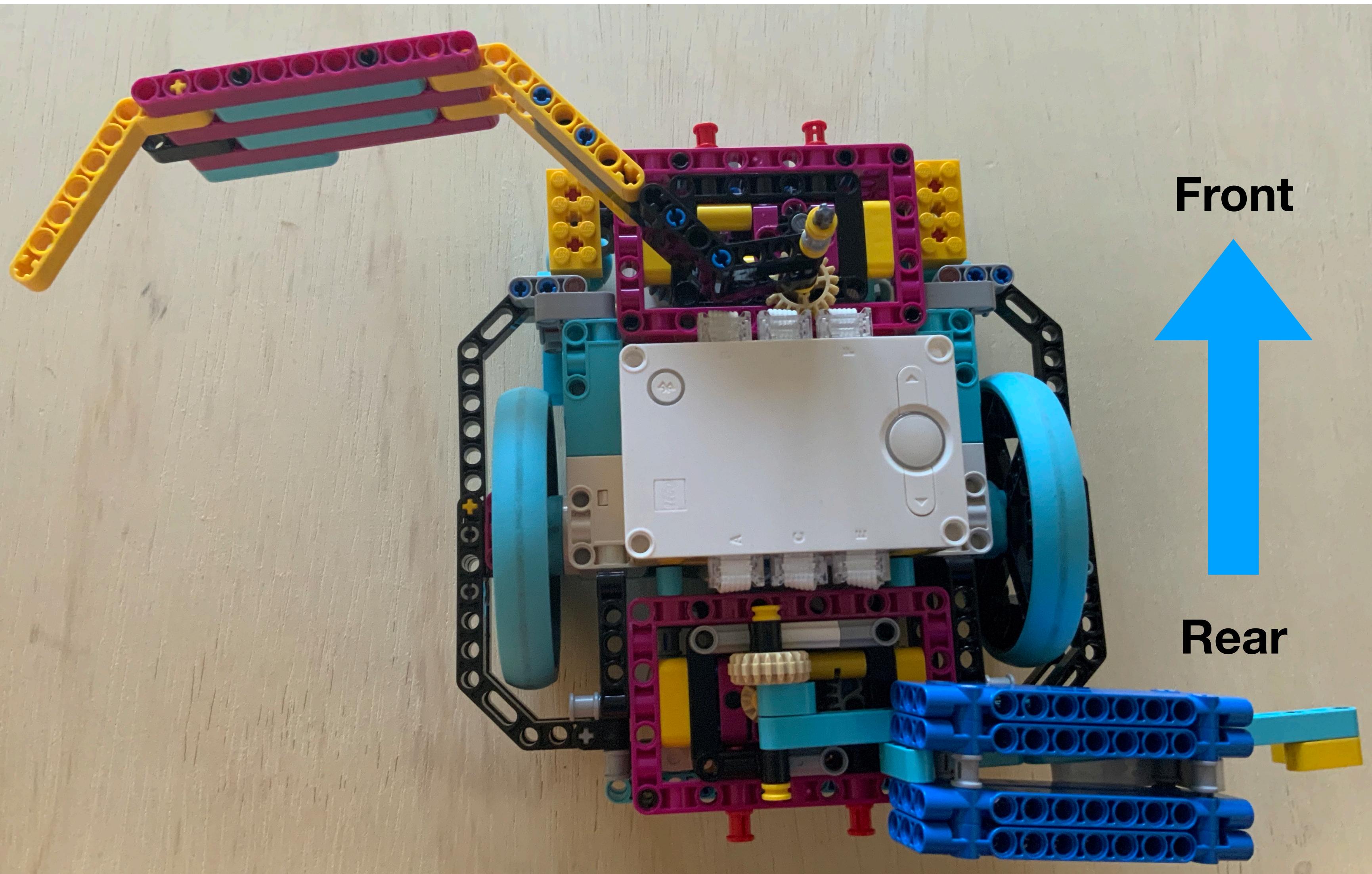


- The yellow hook is to hold the platooning truck until it is latched, and also to push the train.
- Knocks the west bridge deck down.
- The blue and white hooks hold the blue unhinged container until the robot reaches M08. The robot then rotates this arm so that the unhinged blue container drops down.

# Map of Route 2 (R2)



# Robot with slapping and tail arms on



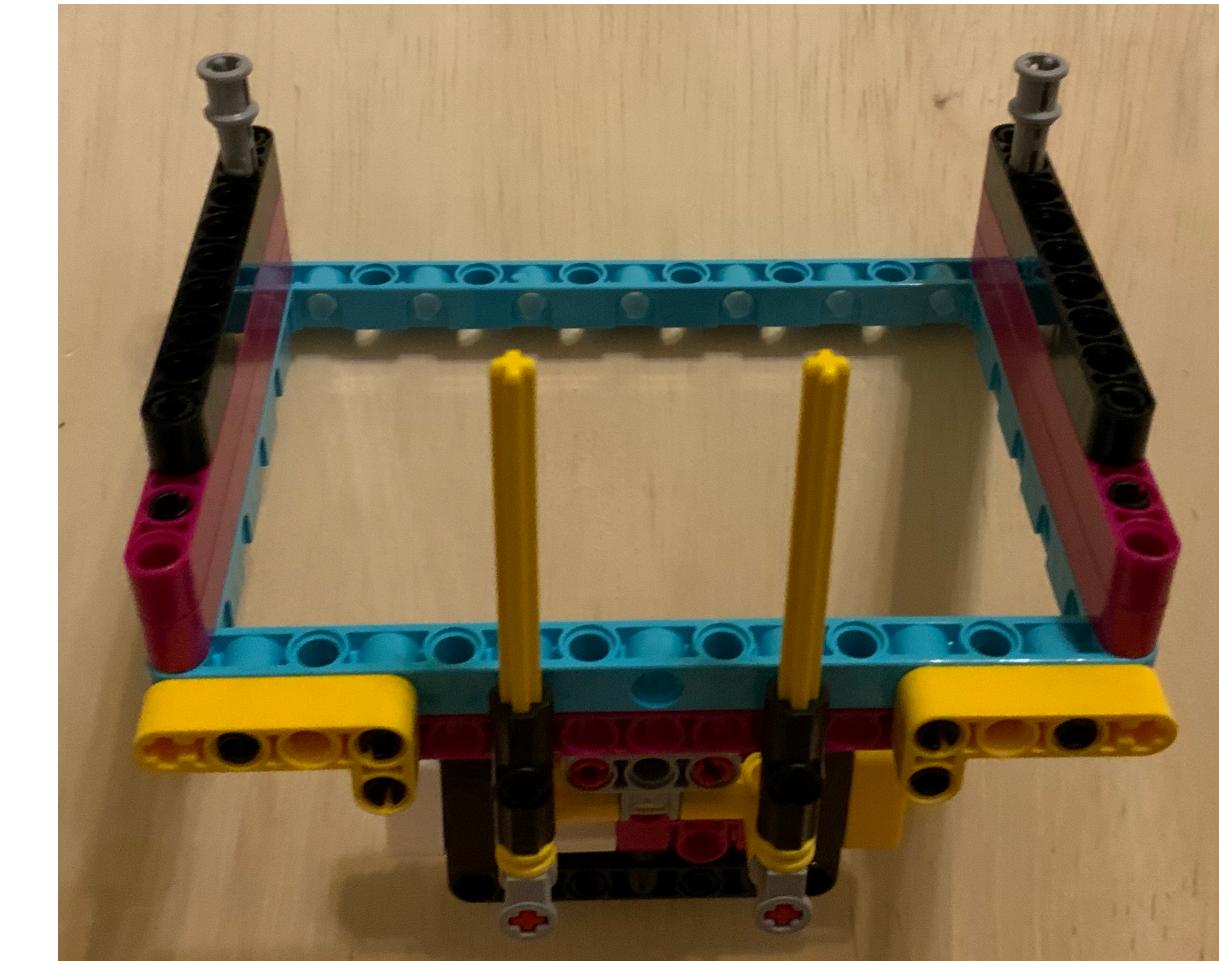
# Route 3 (M05, M03, M16) and Route 4 (M16, M01, M08, M06)

Lift Arm (Route 3)



- Switches the engine.
- The hook on this arm holds the green container from M10 until the robot switches the engine.
- Unloads the cargo plane.
- Moves cargo from M03 to a black circle right next to M03.
- Pushes the airplane past its blue line.

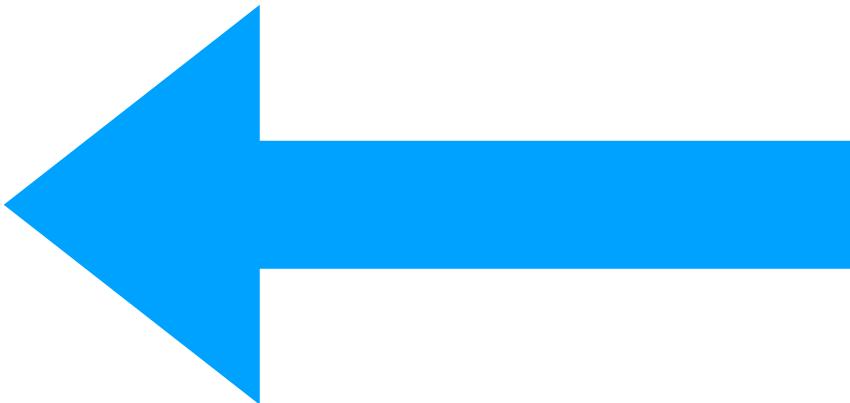
Poking Arm (Route 4)



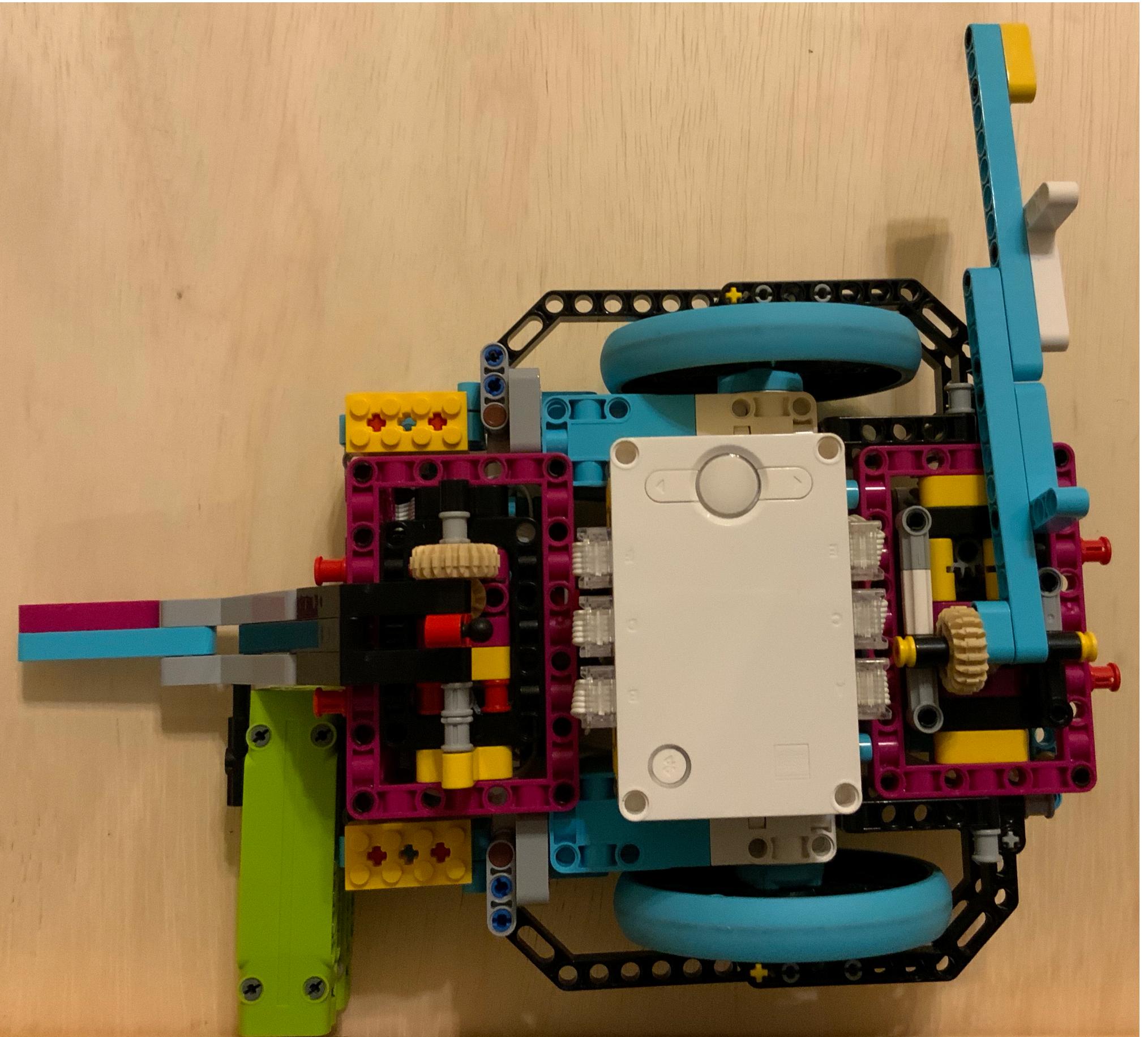
- Delivers the innovation project model, three grey containers, the hinged container from M02, and the food package from M08 to the Cargo Connect circle.
- The yellow extrusions are used to knock the yellow panel of M06.

# Robot with lift arm and tail arm on

Front

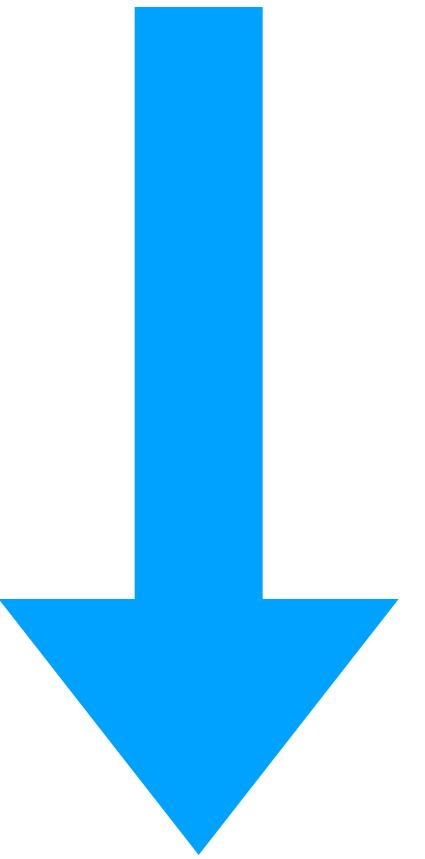


Rear

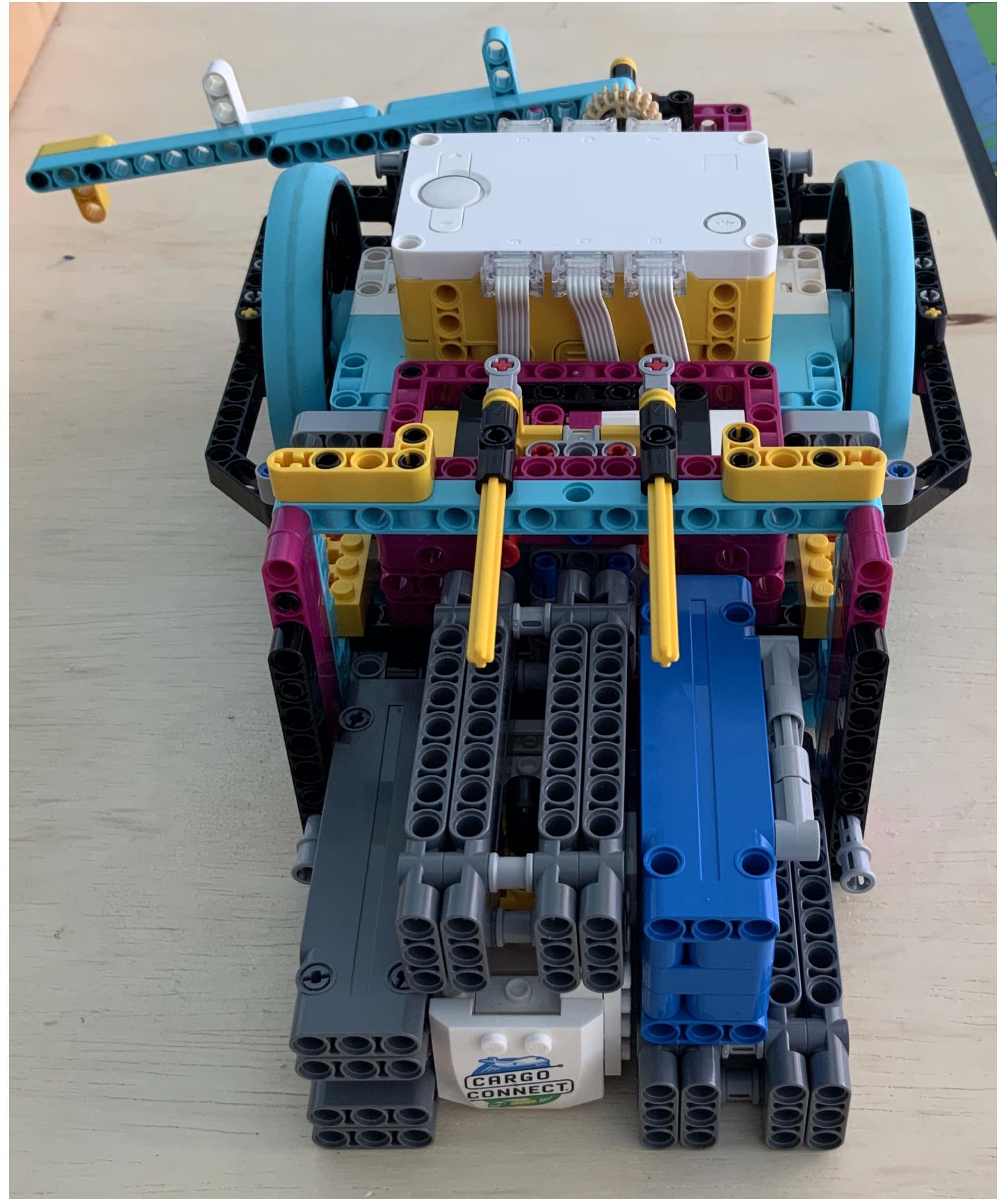


# Robot with poking arm on (front view)

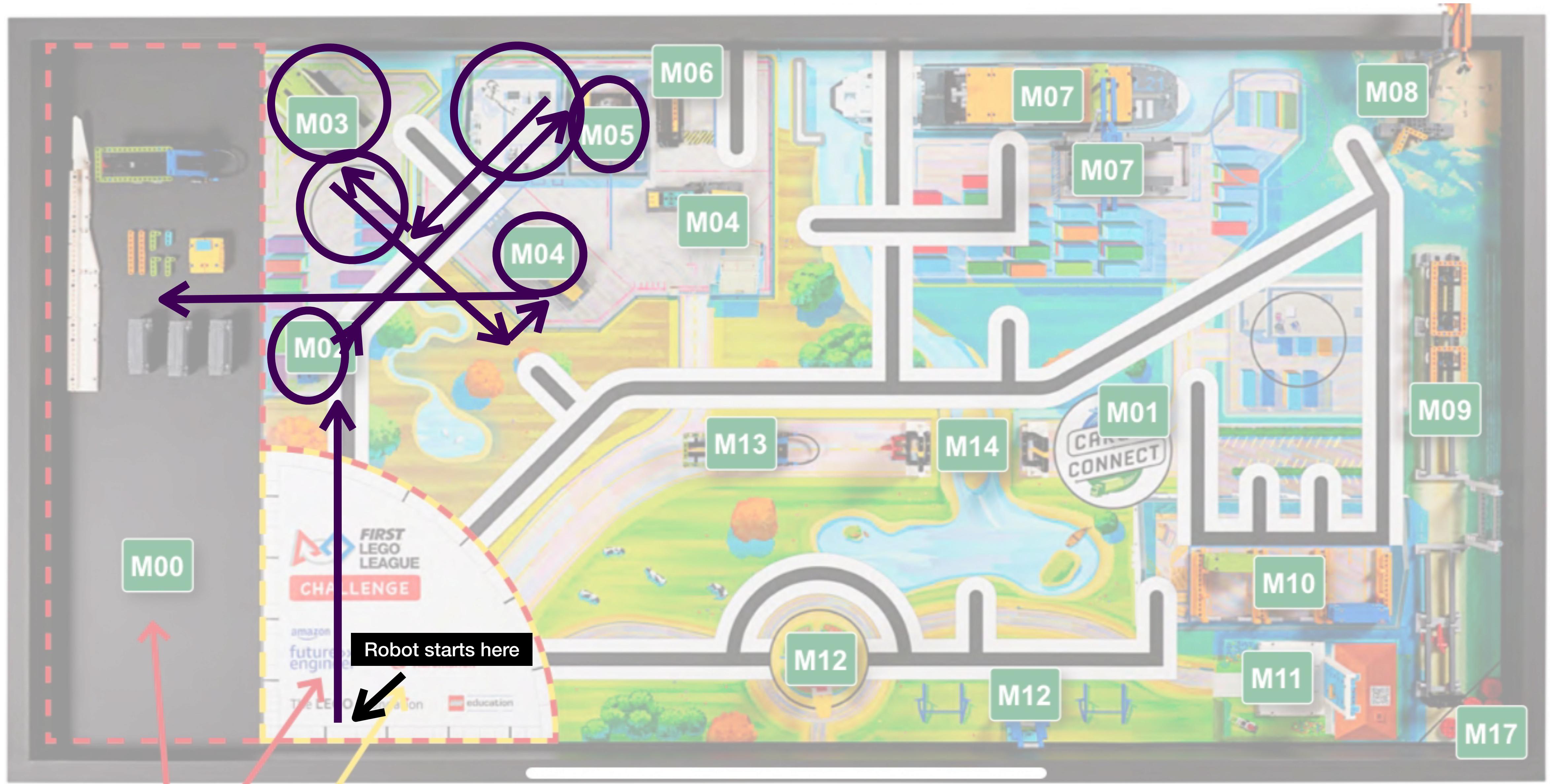
Rear



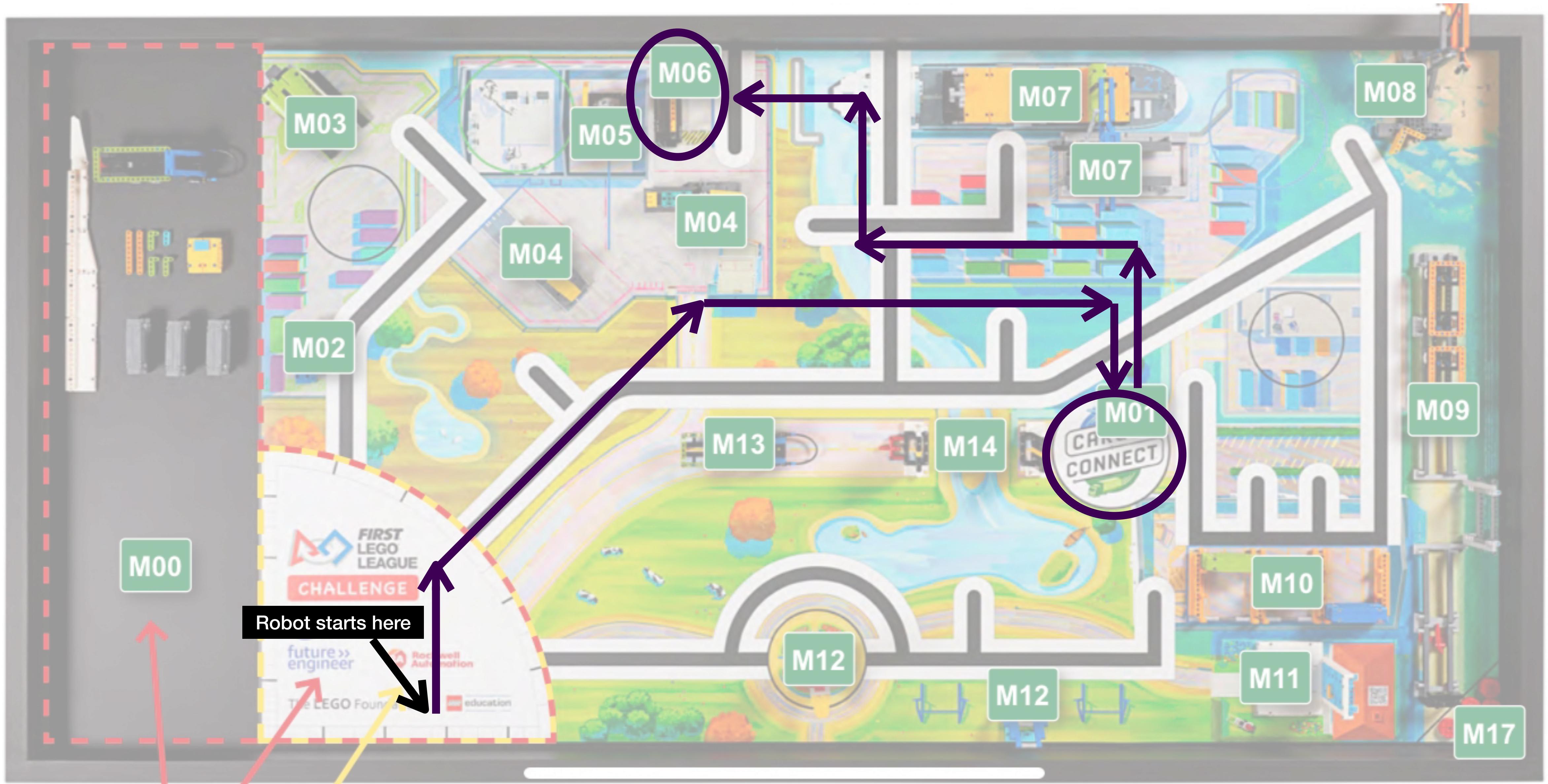
Front



# Map of Route 3 (R3)

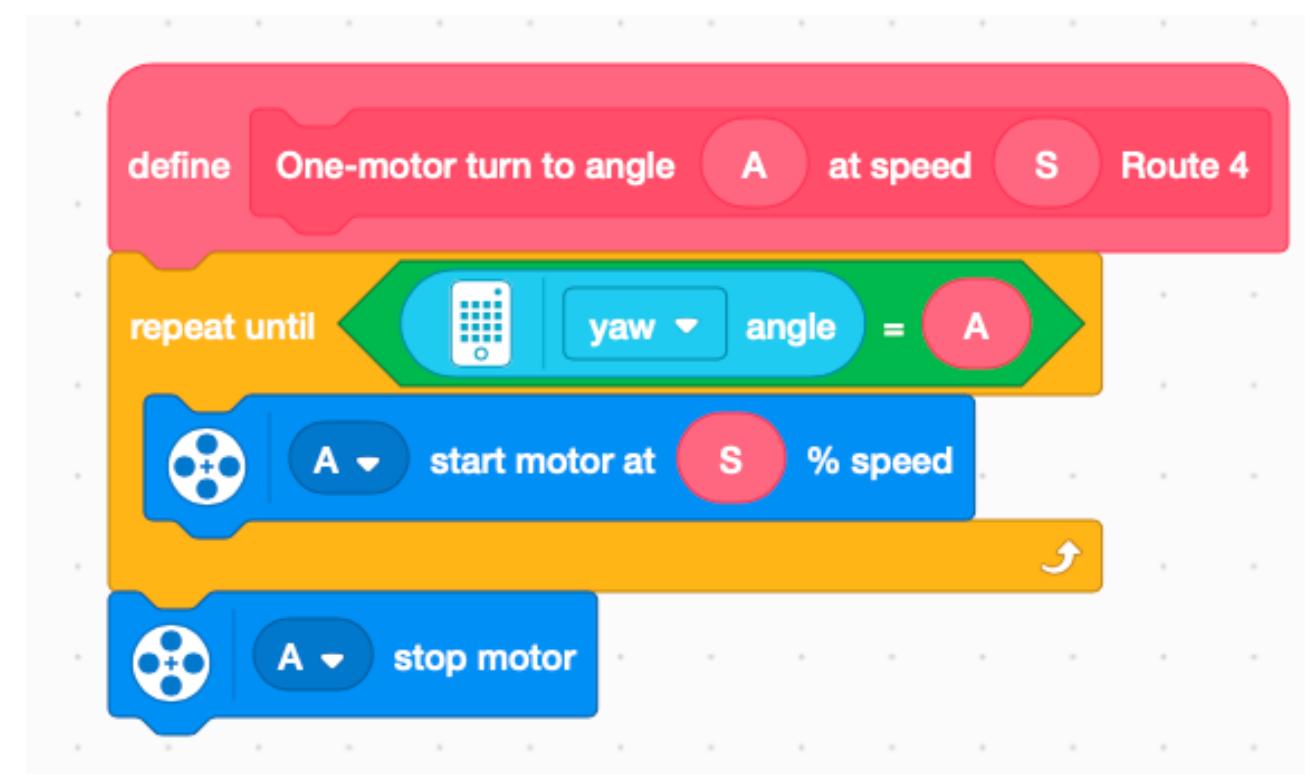


# Map of Route 4 (R4)

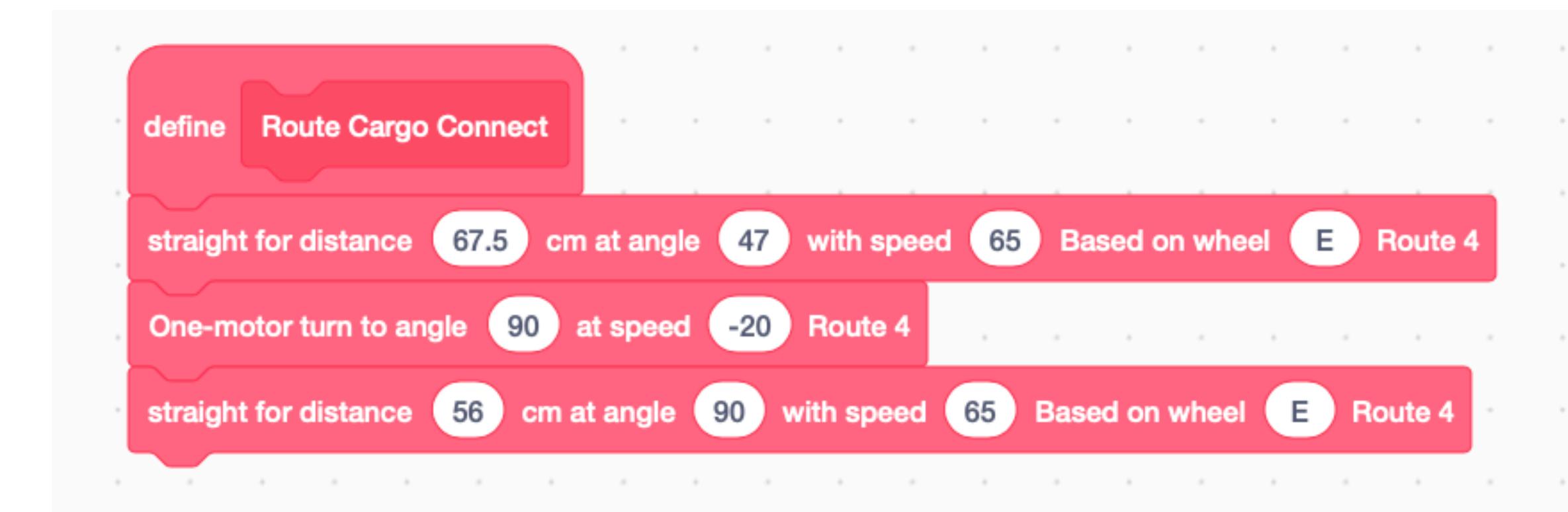


# Programming the Robot

- Each route has many mission functions, and the mission functions are made of "base" functions. The "base" functions do simple things like moving in a straight line at a certain angle.
- A "base" function is built using SPIKE PRIME built-in coding blocks.
- A mission function is a block which actually does a particular mission.

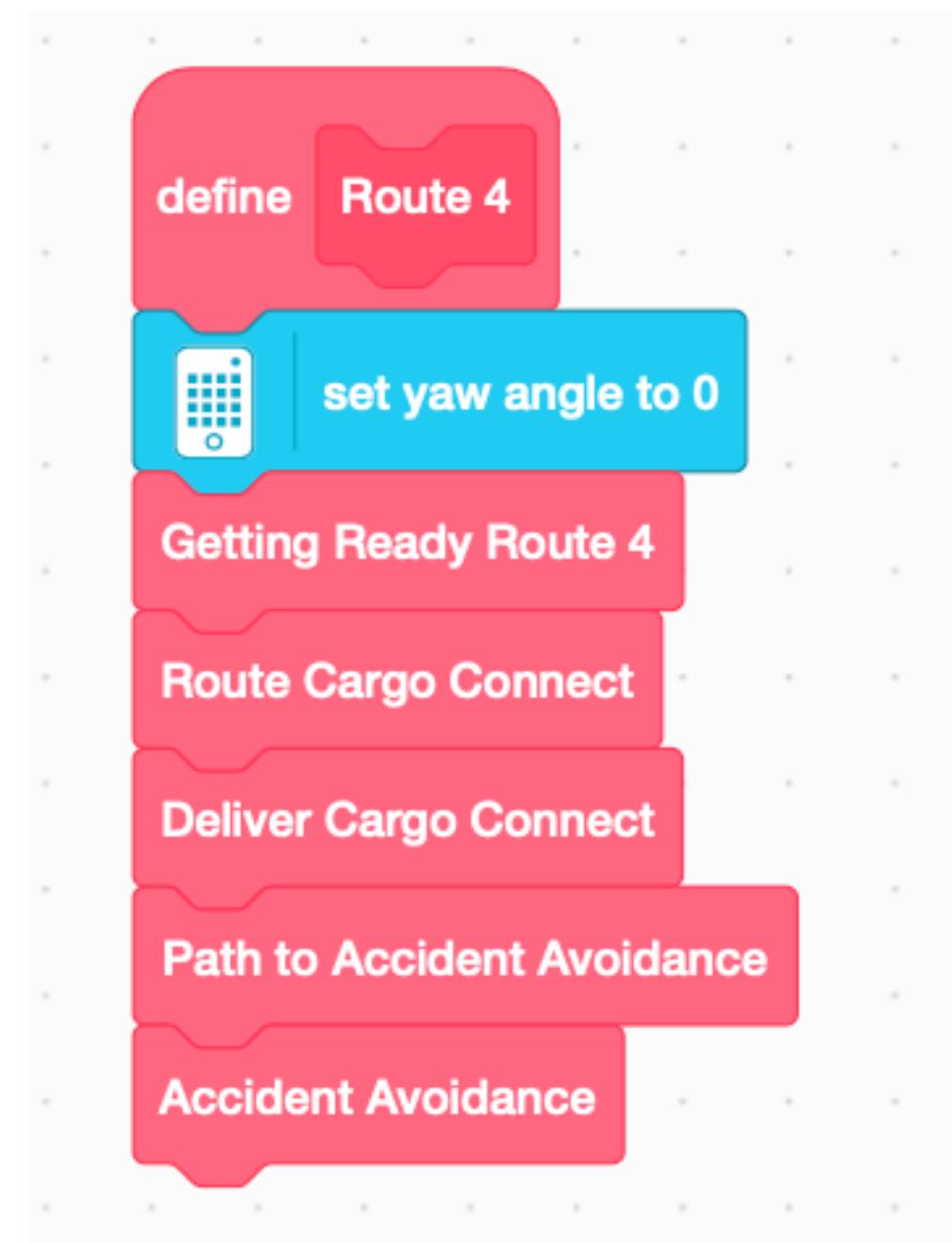


A "base" function



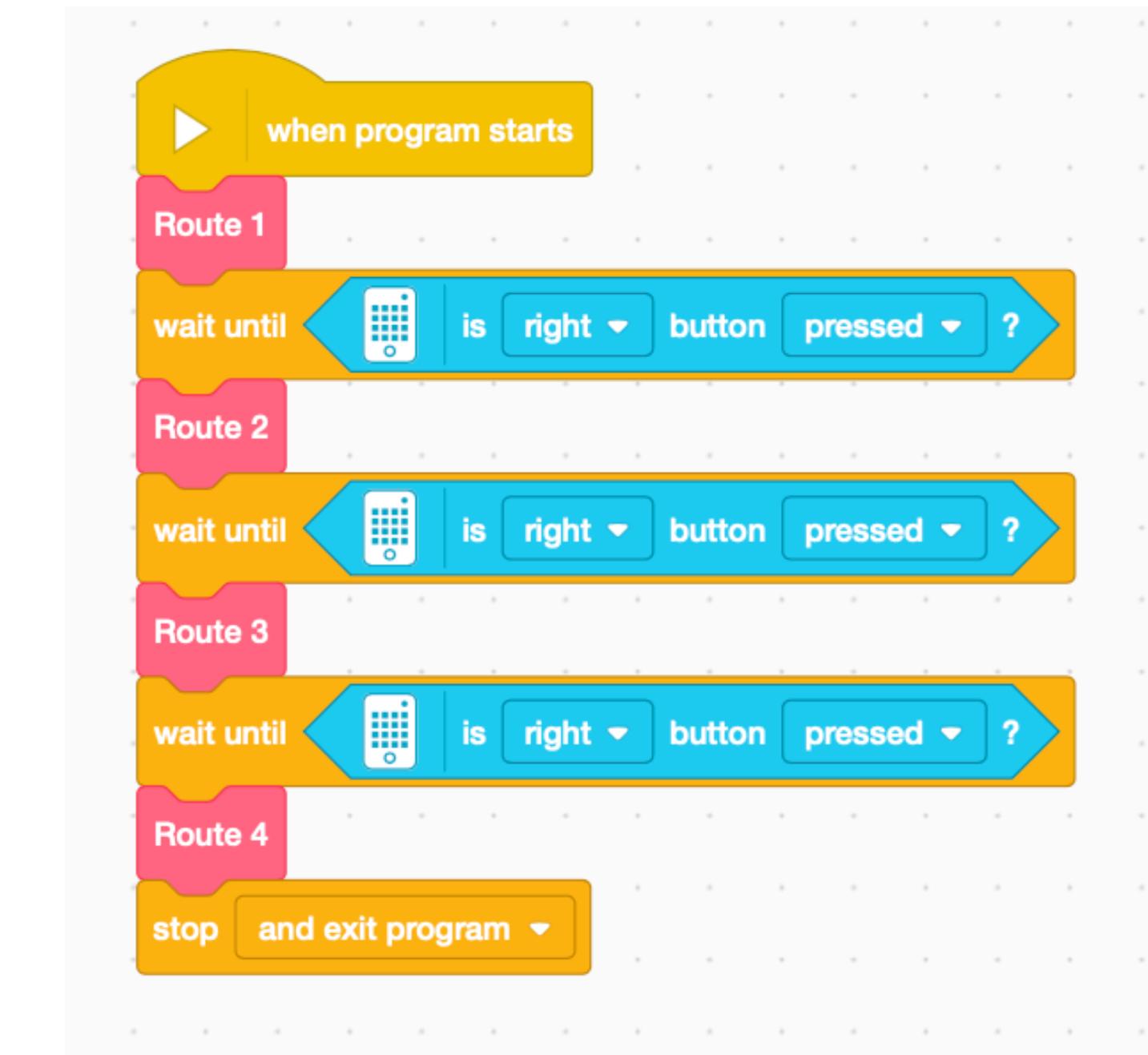
Mission function made of "base" functions

# Programming the Robot (contd.)



A route program

- We made our main program such that it is broken into multiple route subprograms (R1, R2, R3, and R4).
- In the main program, after completing each route, the program waits for manual input to start the next route when ready.
- The center button is pressed to launch the program which will do the missions for route 1. After completing each route, the right button is pressed to start the next route. This saves us time (about 3-4 seconds per route, or 12-16 seconds in total).



The Main Program

## Acknowledgements

Thanks to BAE Systems for providing grant money to buy SPIKE PRIME to build the robot.