Mobile Robots (**EECN30169/535307**)

Introduction to Autonomous Mobile Robots

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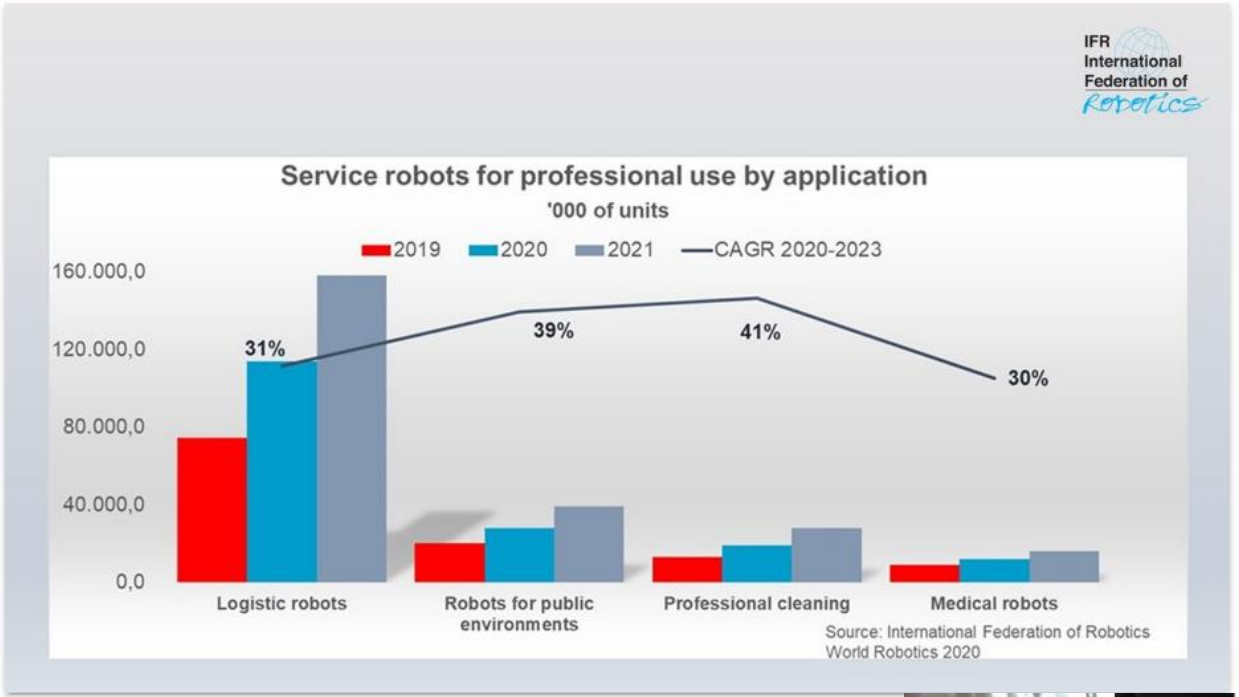
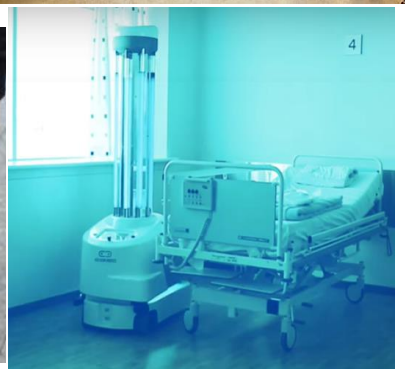
Professional Service Robots





From: IFR

Guidance Robots

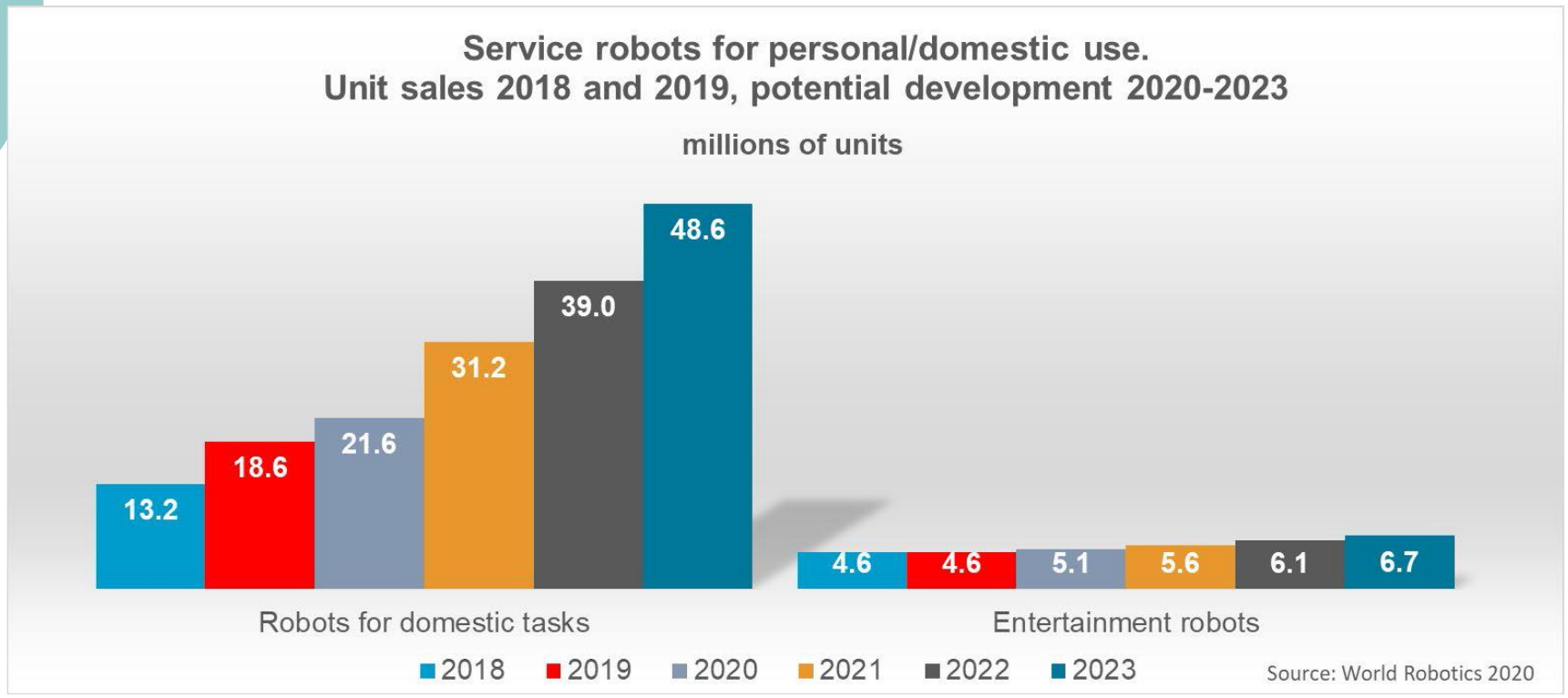

服務型機器人聯盟
Service Robot Alliance
聯盟成員
COMPAL
TECO 東元電機
SYSTEX
HIWIN 上銀科技
NUWA ROBOTICS
ASIX
SIN YU
msi
SCHUNK
LIPS
wifundity
新光保全
工業技術研究院
maxon
CENZ
凌群電腦
ADLINK
SOLOMON
Qisda
更多聯盟成員


第一航廈T1
報到櫃台
馬文
旅客排隊分流導引
台灣租車股份有限公司
智慧型機器人機場舉牌迎賓及機器人引導至乘車月台出口處
第二航廈T2
入境大廳
管制區行李運輸
免稅店區
愛波卡
手推車跟隨
四八零一
娛樂互動
租的不好租
大件行李搬運
Twenty
大件行李搬運
中原大學電機工程學系
搬運輔助


LEXUS | 中部汽車
商談沙發區
精品區
保養沙發區
雲豹小隊
迎賓導覽
博均科技股份有限公司
迎賓導覽+餐點運輸


CHIMEI
MUSEUM
優式機器人股份有限公司
草皮修剪
奧林匹亞草坪
C101
迎賓導覽
茂綸股份有限公司
清潔消毒
1樓大廳
南臺科大組
迎賓導覽

Personal/Domestic Service Robots



Pet robot from dASAROBOT

Intelligent Autonomous Robot

Machine Intelligence

- The goal of building an intelligent robot is to construct a intelligent machine that can demonstrate Human-level intelligence.
- It is required for an intelligent machine to possess the ability of planning its action and execution to complete these actions.

But the difficulties are:

- Intelligence is difficult to define. It is a concept. When we observe something is intelligent, we can easily know it, and we will know what is not intelligent.
- Human-level intelligence is very complex.

The present status

- Intelligent machines have been developed for decade (since the invention of computer), the research is distributed in many small areas, such as speech and image recognition, path planning and motion planning, etc.
- In these individual areas, there are many achievements. Can machine intelligence be built incrementally and grow gradually?

Making an intelligent behavior

- An intelligent behavior is a robot program that allows the robot to survive in an unstructured environment and complete a task.
- It is important for an intelligent robot to complete a task in such real world environments.
- One can not rely on a world model(map) for a robot to work in an unstructured and changing environment.

Our Understanding:

- We realize that an intelligent machine does need human-level intelligence. Machine intelligence can be built and added incrementally from lower level to higher level.
- An intelligent robot needs to work in an unstructured and quick changing environment.
- This means a robot executes task or tests in the real world, not in a model in a virtual computer simulator.

Autonomous Robots

- Autonomous robots are free-ranging robot. That can execute a task without human intervention of supervision.
- Behavior-based robotics is a method to construct autonomous robots ◦
- There are already many autonomous robots exist in the market, such as vacuum cleaning robots. More are under developing.

Guidance Robots I

Autonomous Mobile Robots(AMR)

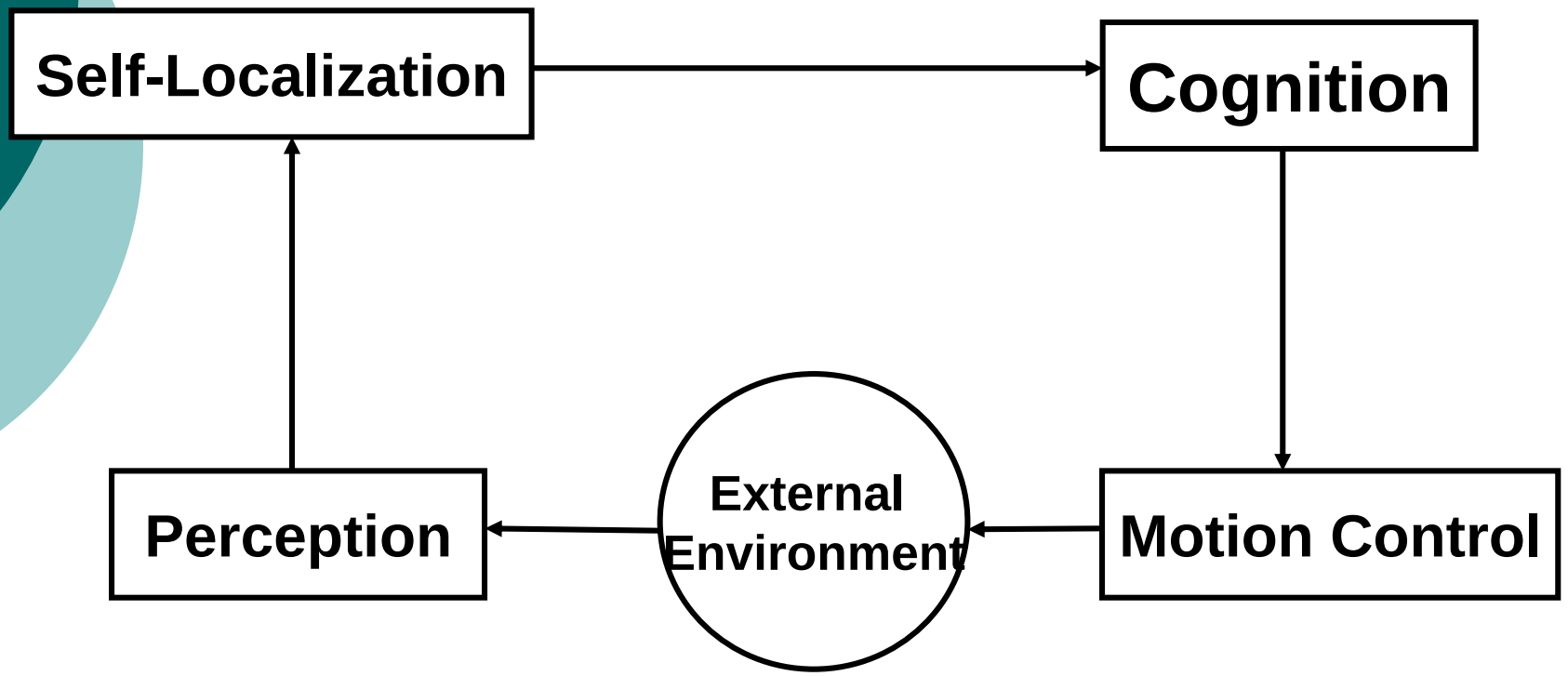
EECN30169/535307

Course Introduction

- This is a course about developing autonomous mobile robots.
- Through hands-on projects, students learn about real-life robotics.
- The idea of "learning by doing" is emphasized.

→To learn about design and programming of an autonomous mobile robot.

Navigation Control System of a Mobile Robot



Feedback control, Cybernetics and Robotics

- An intelligent robotic system is basically a machine that can understand its own states as well as external world such that it can take actions accordingly.
- It counts on sensors and actuators, and on-board embedded computer
- Feedback control is essential in robotics.

Course outline

- Intelligent autonomous robot introduction
- Embedded computing platform
- DC motor control
- Motion control
- Mobile robot structure
- Sensors and sensor interface
- Obstacle avoidance
- Behavior-based control system
- Localization
- Robot hockey contest(with 4 hands-on assignments)

Reference Books and Articles

- Mobile Robots Inspiration to Implementation by Joseph L. Jones, Anita M. Flynn and Bruce A. Seiger, A.K. Peters, Ltd., 1999
- Introduction to Autonomous Mobile Robots by Roland Siegwart, Illah Nourbakhsh and Davide Scaramuzza, 2nd Edition, The MIT Press, 2011
- Mastering ROS for Robotics Programming, Lentin Joseph, PACKT Publishing 2015, eBook

Robot Hockey Contest

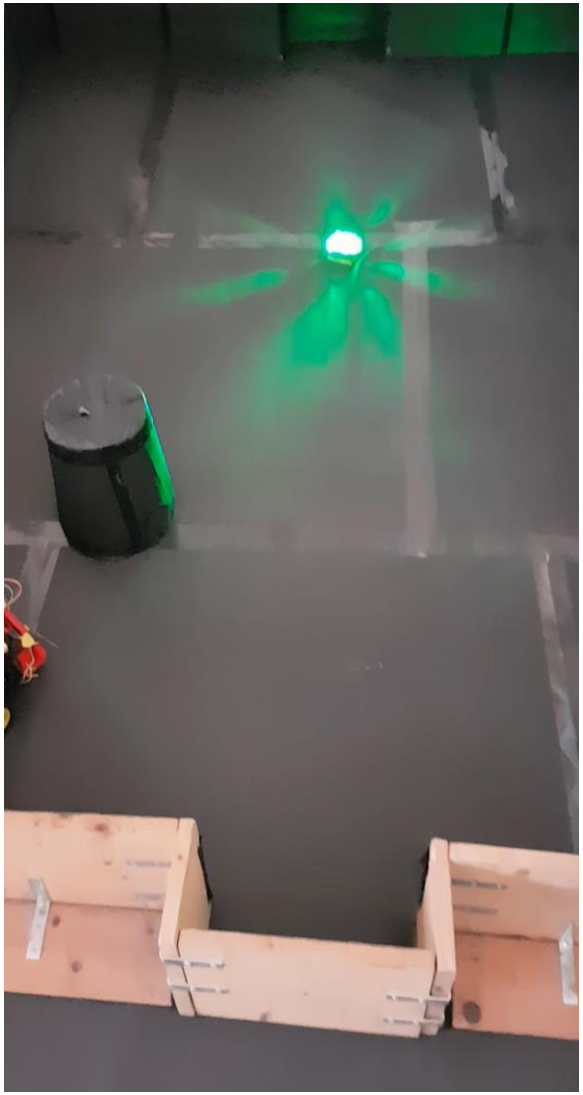
- Major Project
- Will be accomplished via 4 check points of the course
- All supplies for the robot and the contest are provided by the class

2018 Winter Olympics: Hockey game in Gangneung, South Korea

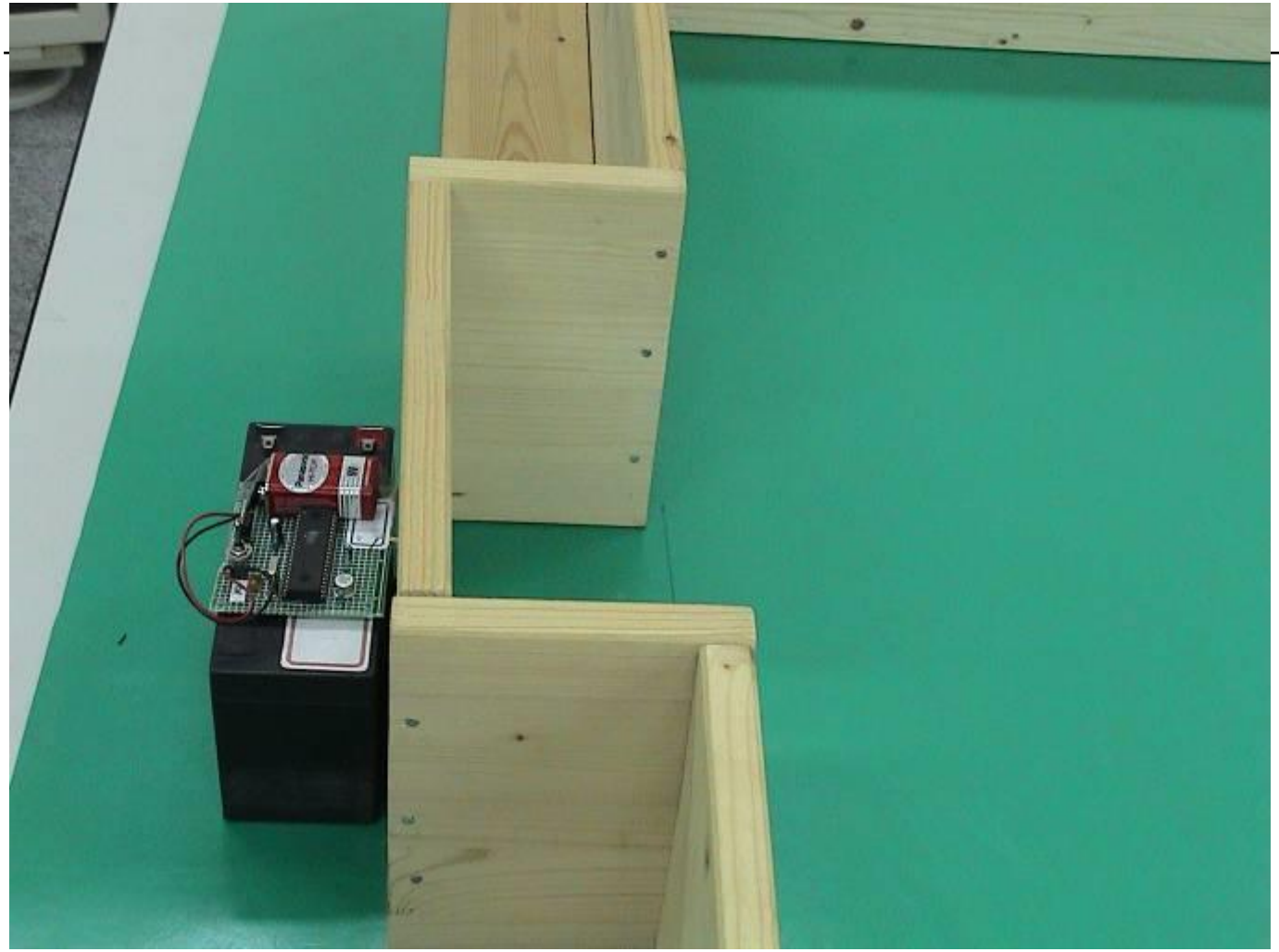
Making the ICN 5406 Robot

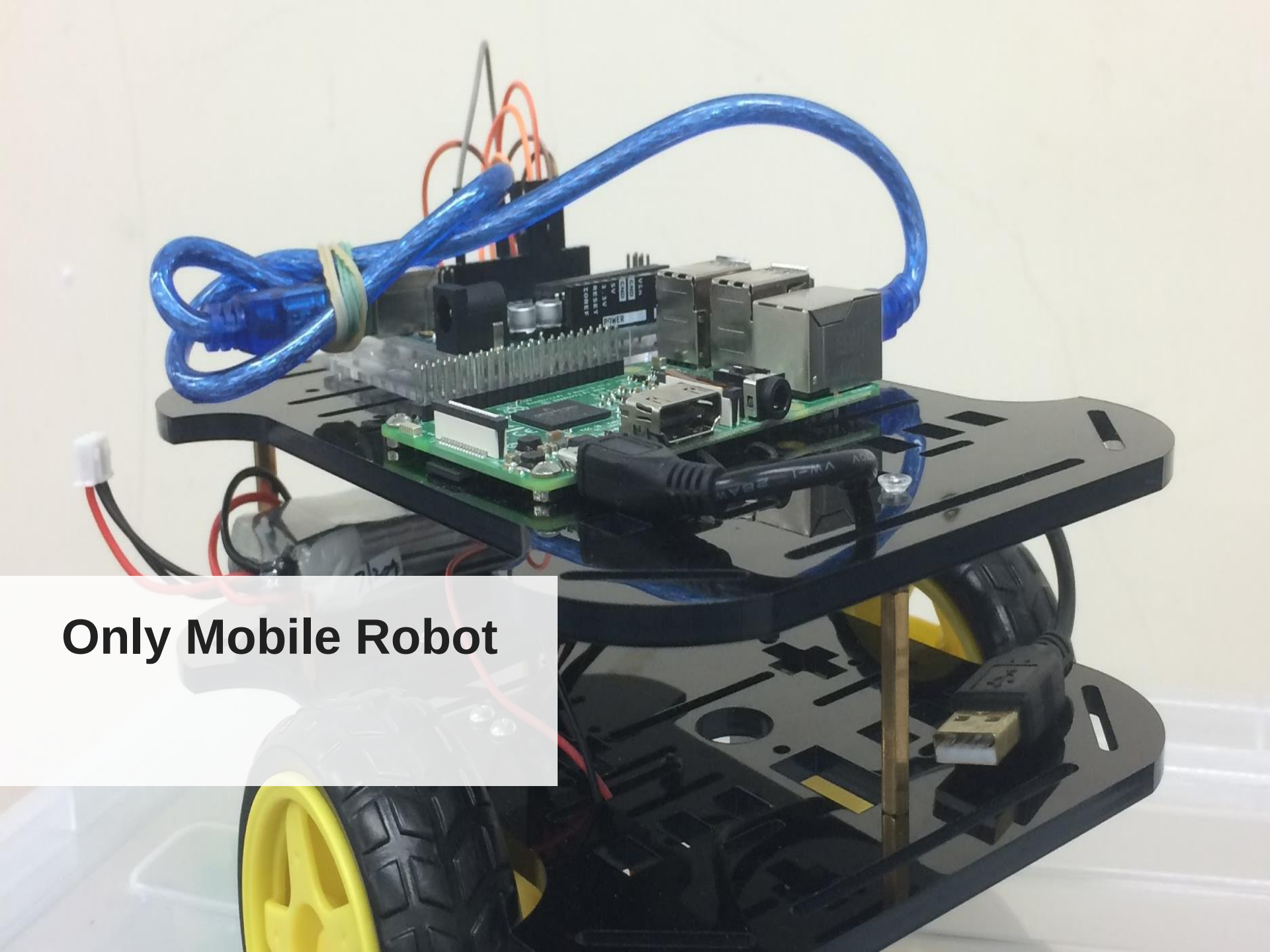
- Check point 1: Raspberry Pi and ROS
- Check point 2: Robot Motion Control
- Check point 3 Obstacle Avoidances
- Check point 4: Full Function Demonstration
- Robot Contest

Robot Hockey Contest



Infrared Beacon





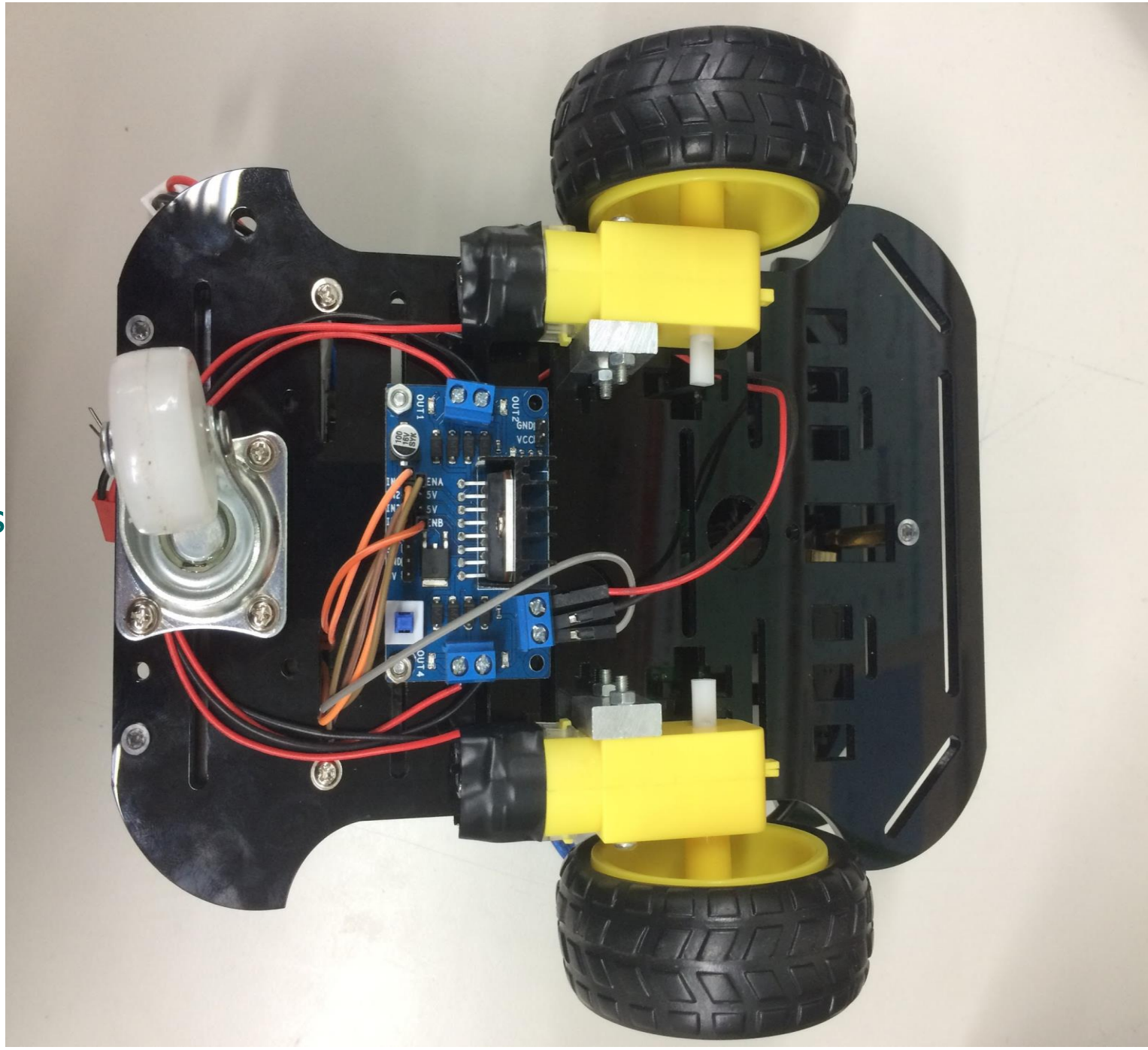
Only Mobile Robot

The First Layer (Checkpoint#1)

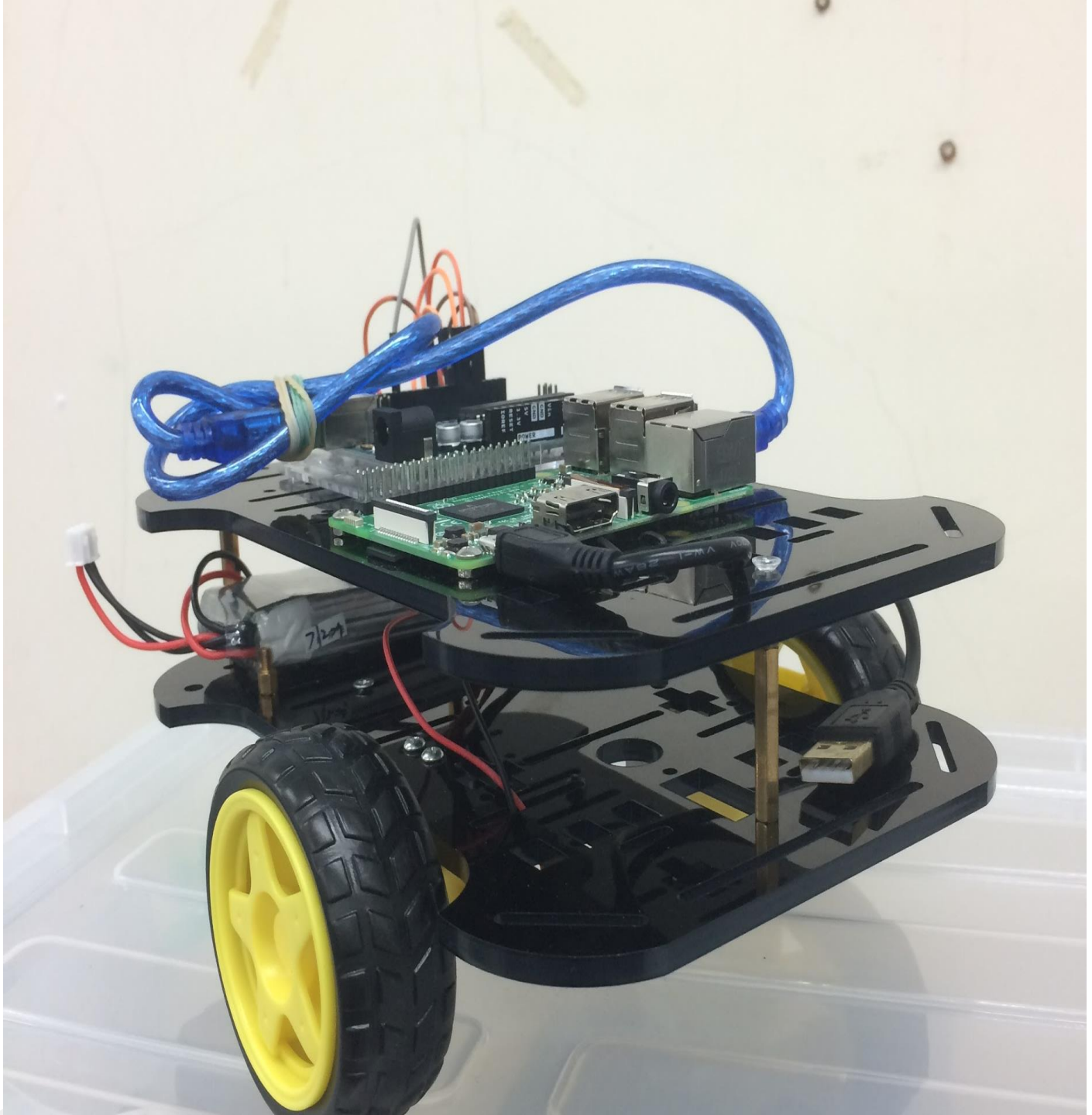
- Raspberry Pi
- Arduino UNO

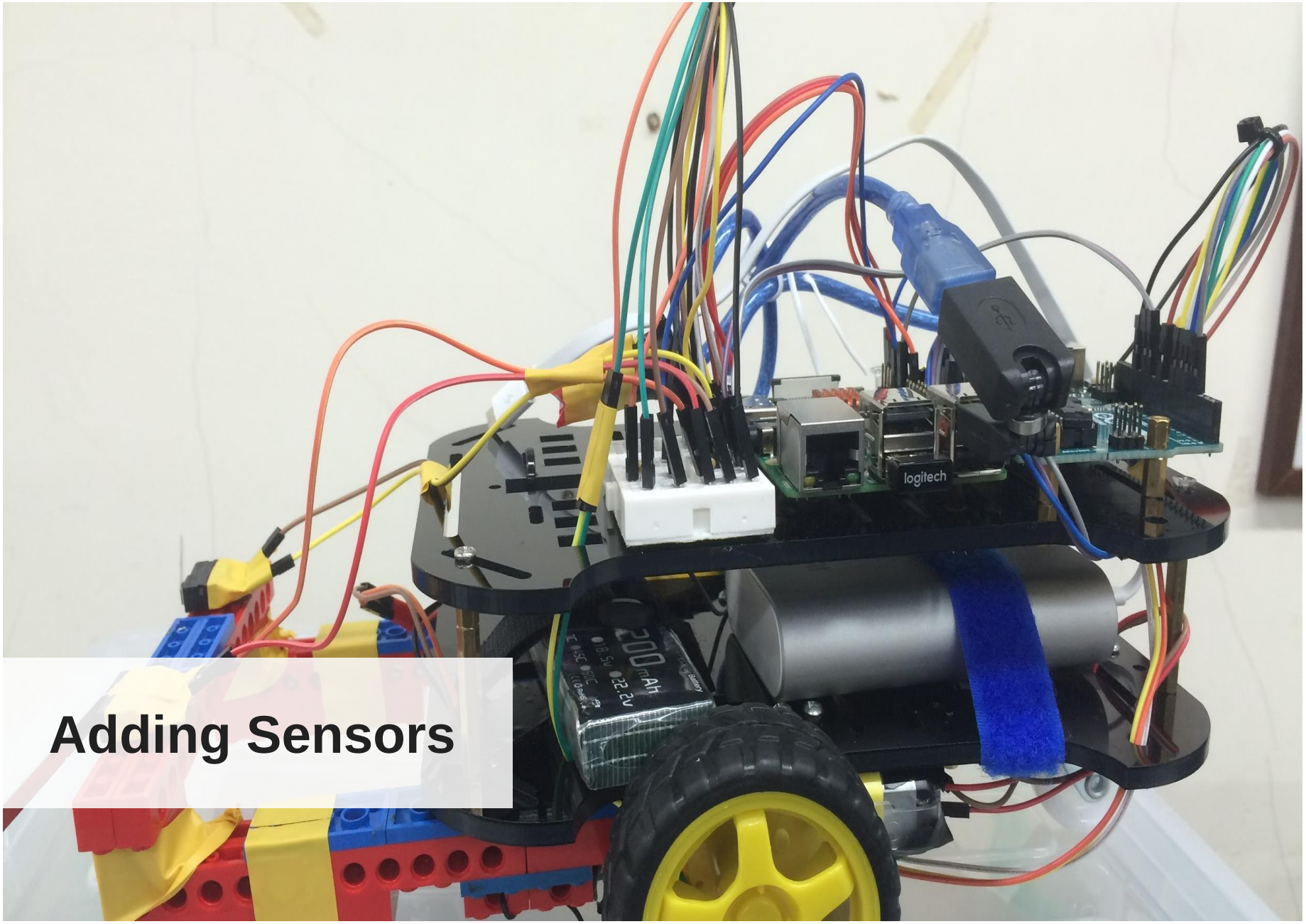
The First Layer (Checkpoint#2)

- L298N Motor Driver
- DC Motors
- Wheels



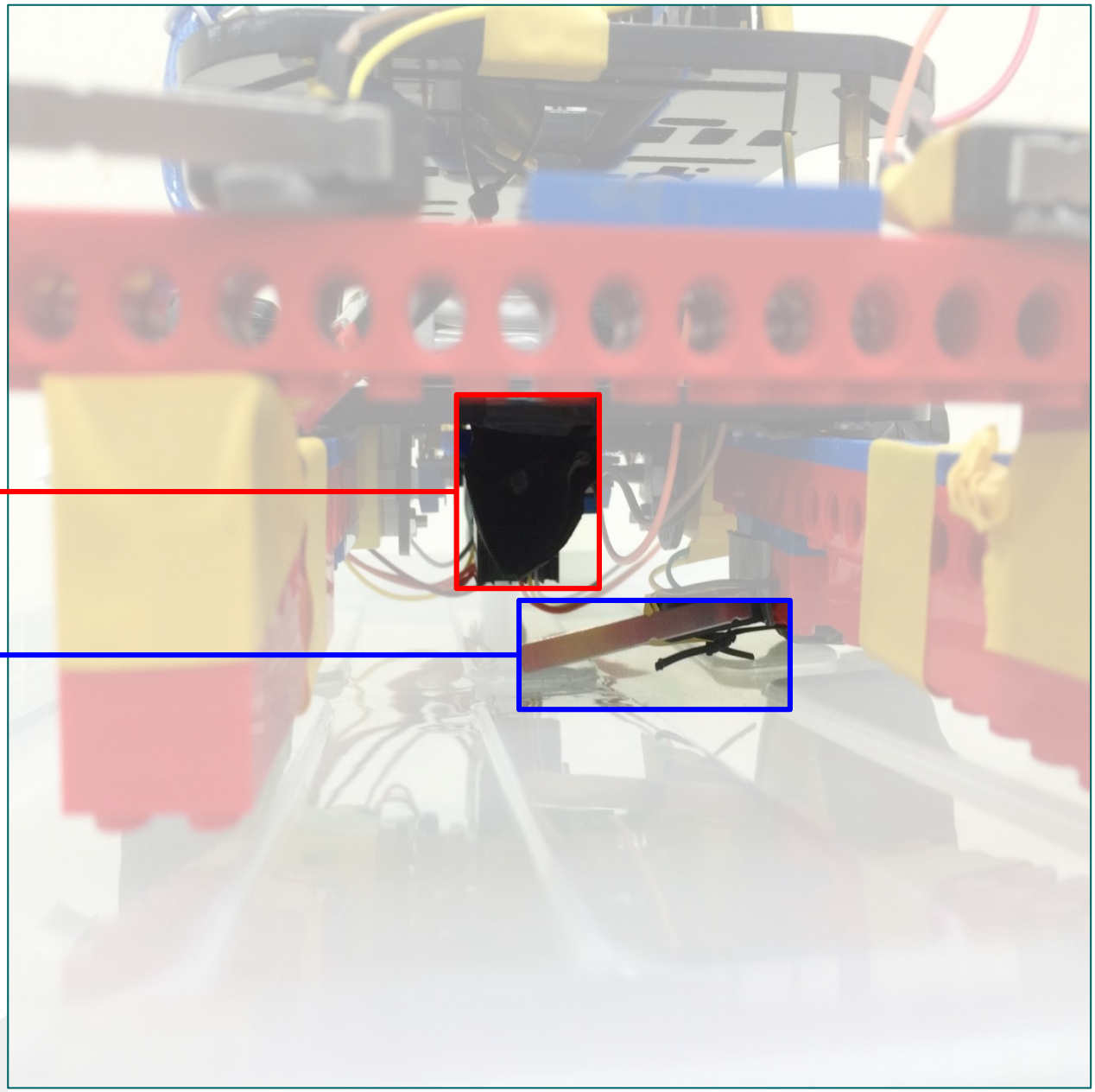
Two Layers Combined



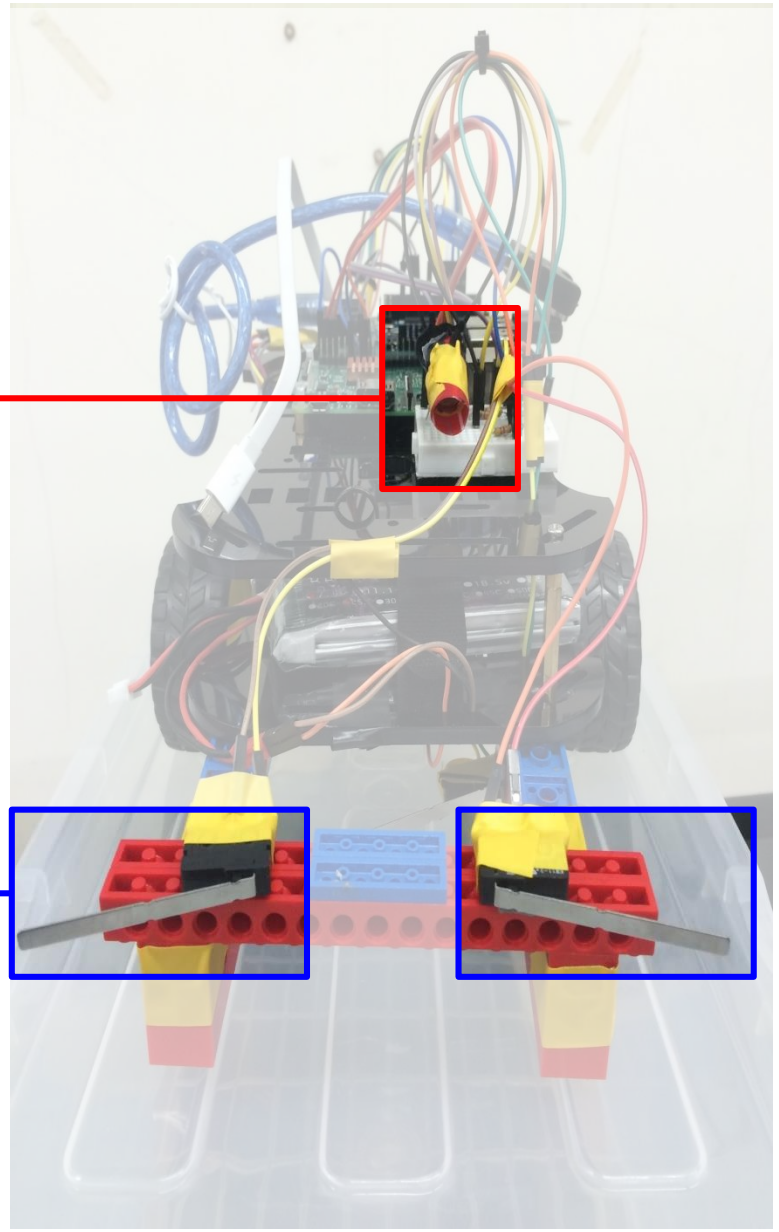


Adding Sensors

Sensors for obstacle avoidance (Checkpoint 3)

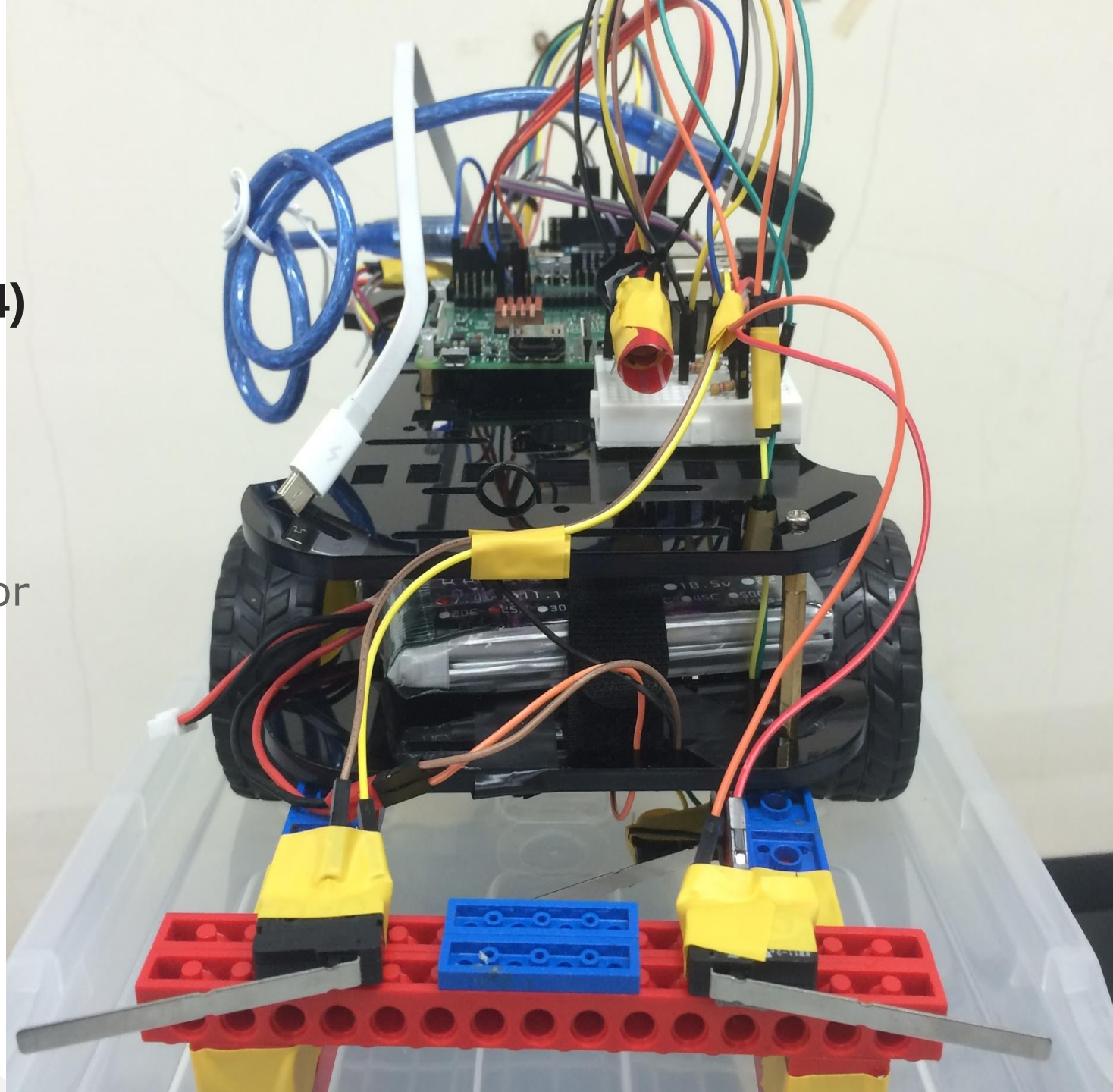


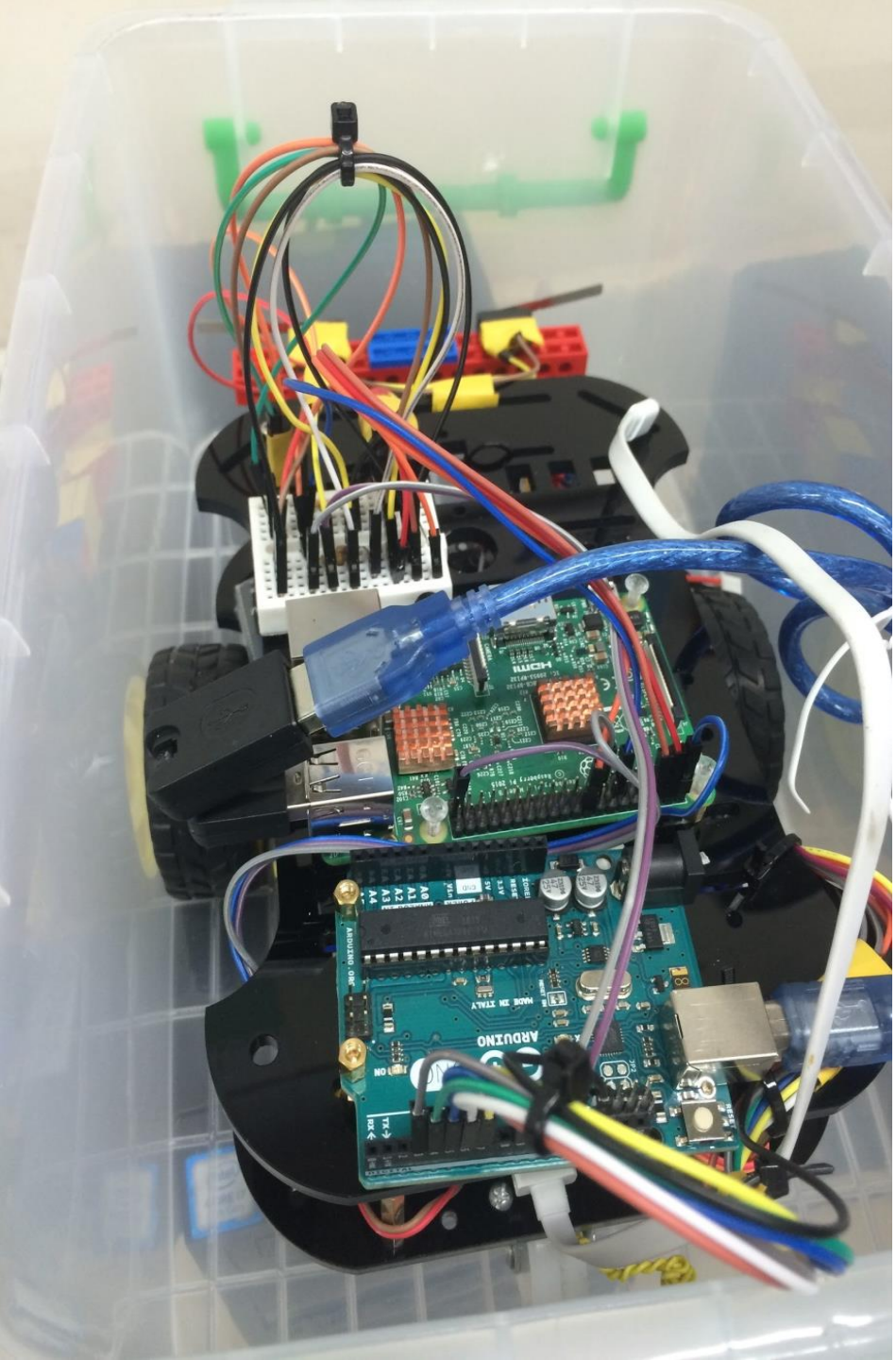
Sensors Configuration



Full Sensors (Checkpoint 4)

- IR Sensor
- Touch Sensor
- Light Sensor





Robot sits in a storage box

Cool Robot Show Term Project