

Team 23

Home

Features

Design

Demo

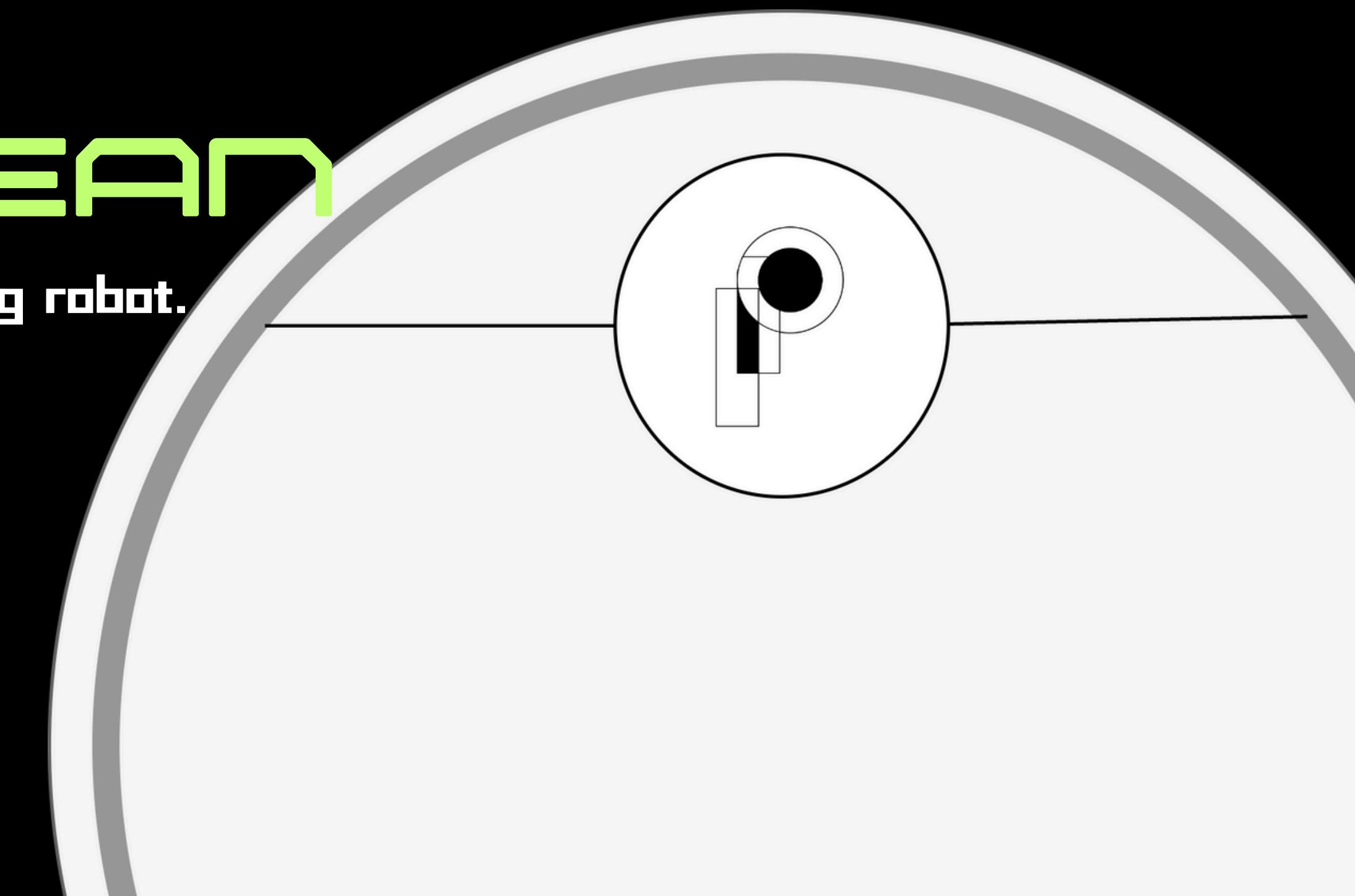
HDL final

# PILOTCLEAN

An ultimate FPGA dual mode cleaning robot.



SONG-ZE, YU YUN-ZHONG, LAI



# MOTIVATION



- Limitations of Current Robot Vacuums:
  - Lacking remote-control capabilities
  - Cannot handle sudden, localized messes even with advanced algorithm
- Our Vision:
  - A dual-mode robot vacuum combines
    - the flexibility of manual control
    - the efficiency of automatic cleaning

# FEATURES

## APP CONTROL

- All the settings includes:
  - mode selection
  - robots' direction
  - power on/off
  - suction control

## DUAL MODES

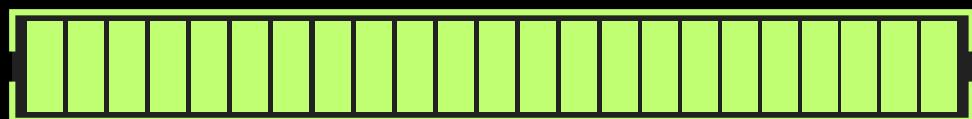
- Remote Control Mode
- Random Mode

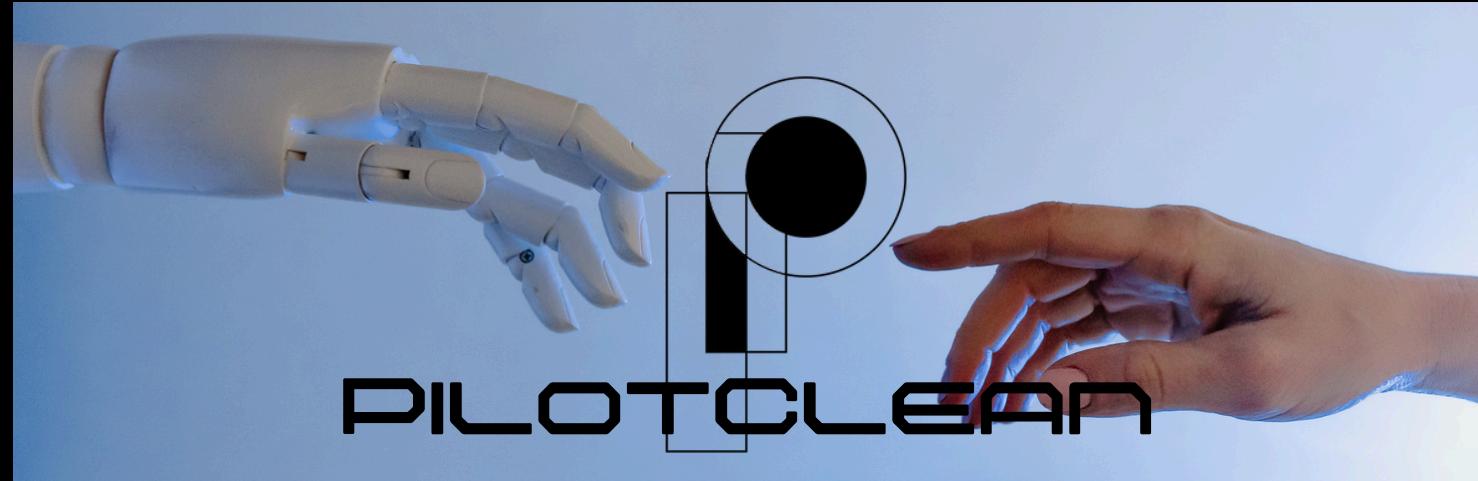
## SPEED SETTINGS

- Three levels of moving speed for different needs

## INFRARED SENSORS

- Prevent collisions and stuck in random mode

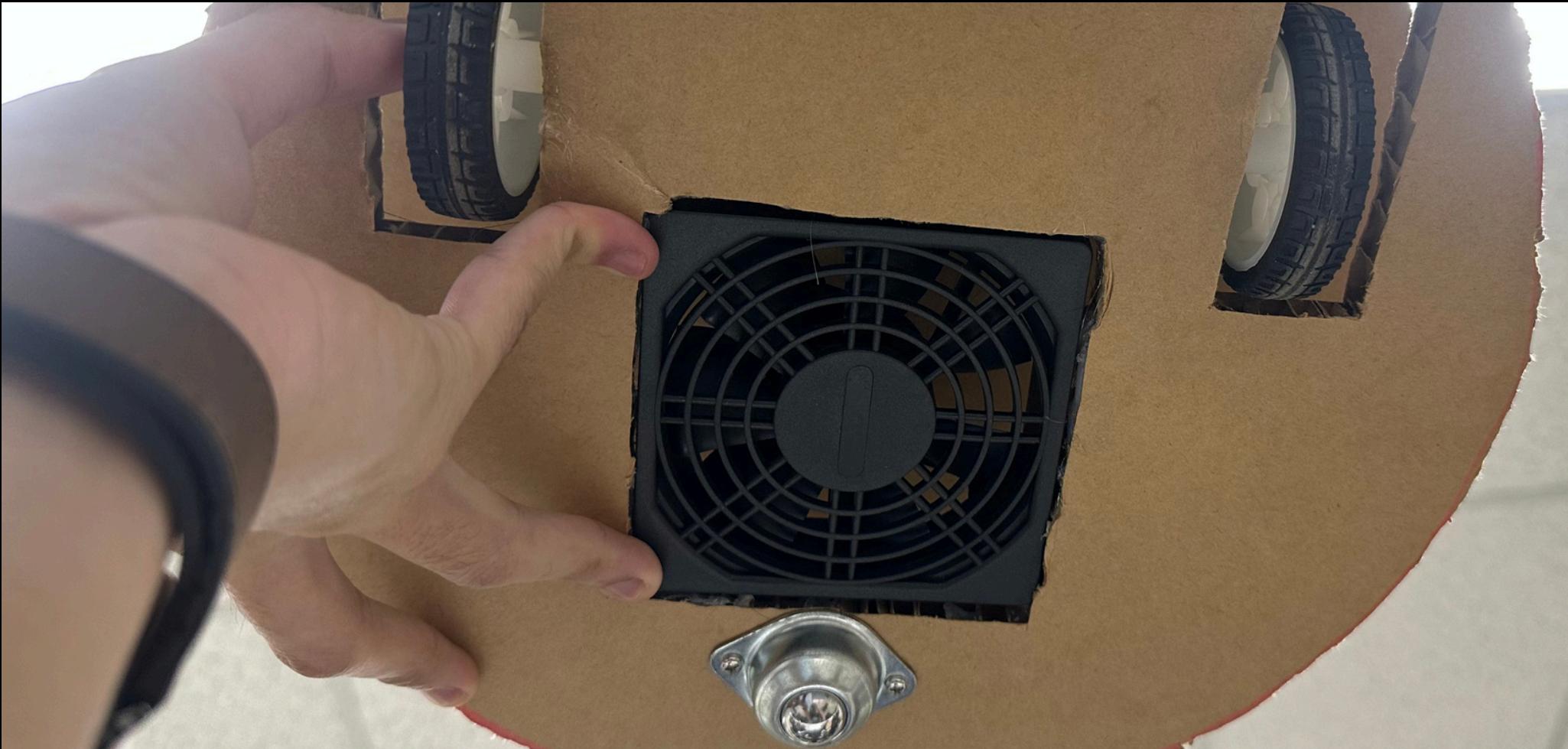




# DESIGN DETAILS

- 
- **1** **Dust collection System**
  - **2** **Trash Disposal Method**
  - **3** **Bluetooth and UART Protocol**
  - **4** **Random Walk Generation**

# 1 DUST COLLECTION SYSTEM



## 8x8 12V 0.6A square fan

experiments confirmed that an 8x8 12V square fan is the most effective for collecting dust.

## L298N module

utilizes three 18650 lithium-ion batteries connected in series to ensure maximum voltage output.

## Filter without paper layer

the middle filter paper layer was removed while keeping a outer masking cover to prevent cogging or trap large debris or dust particles.

## Initial Design?

A vertical airflow system directs trash into a replaceable bag.

## Challenges...

- complex arrangement of Dupont wires and an FPGA board -> dust intrusion
- impractical to disassemble the robot every time for cleaning
- solely on 12V power is slightly underpowered

## Final Design:

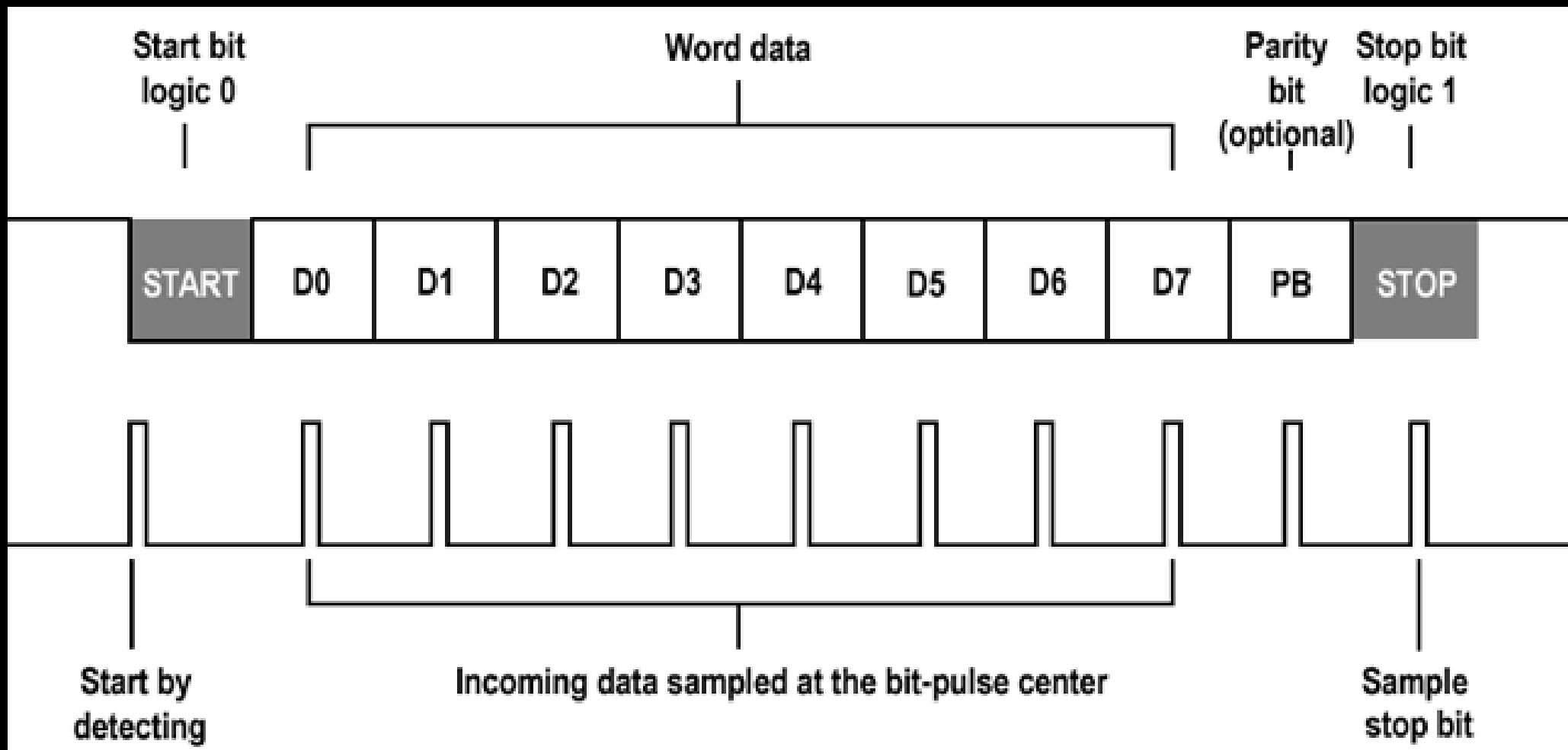
A return-to-home system where the robot deposits trash at its base station.

# 2 TRASH DISPOSAL METHOD



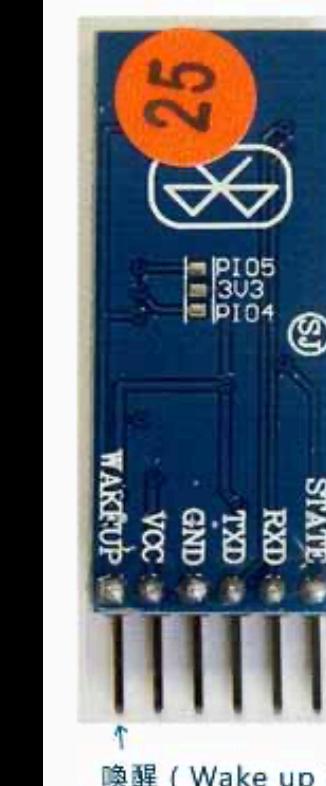
# 3 BLUETOOTH AND UART

## UART protocol

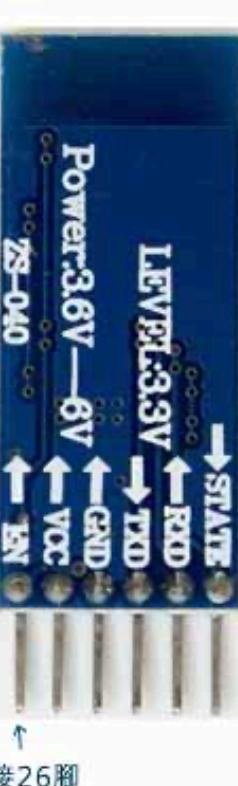


## HC-05 and HC-06 modules

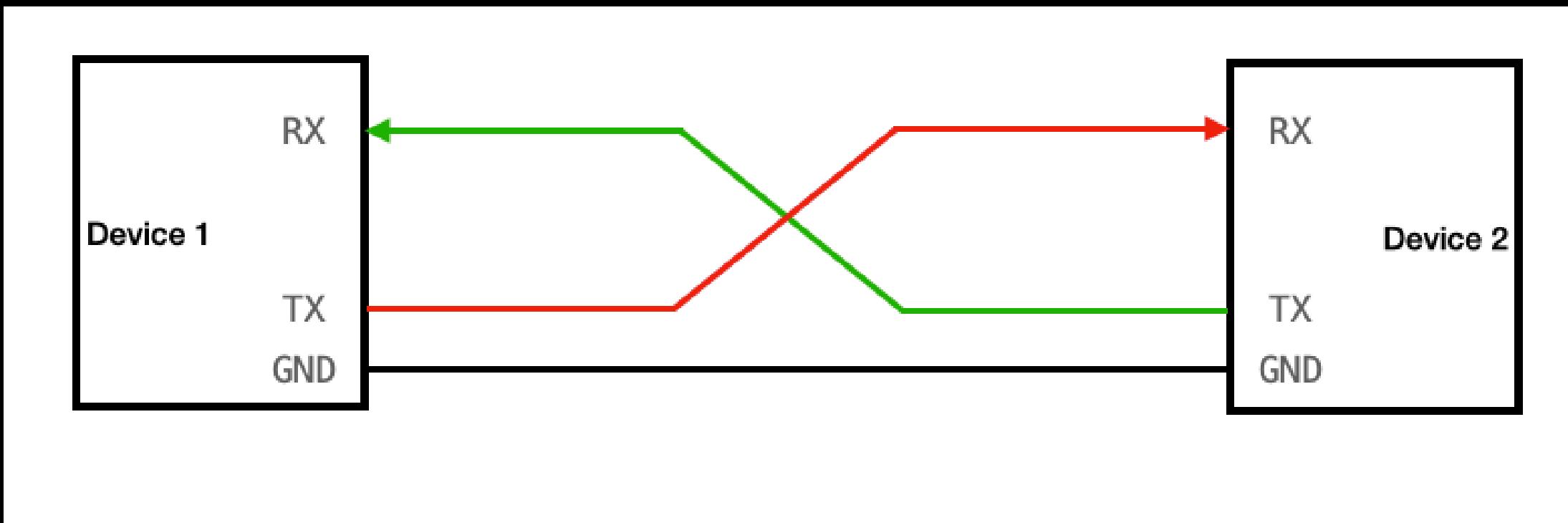
HC-05模組



HC-06模組



# 3<sup>rd</sup> BLUETOOTH AND UART



## Challenges....

We struggled at here since the RX means the HC-05 received the data from this pin from FPGA.....

## LFSR (Linear Feedback Shift Register)

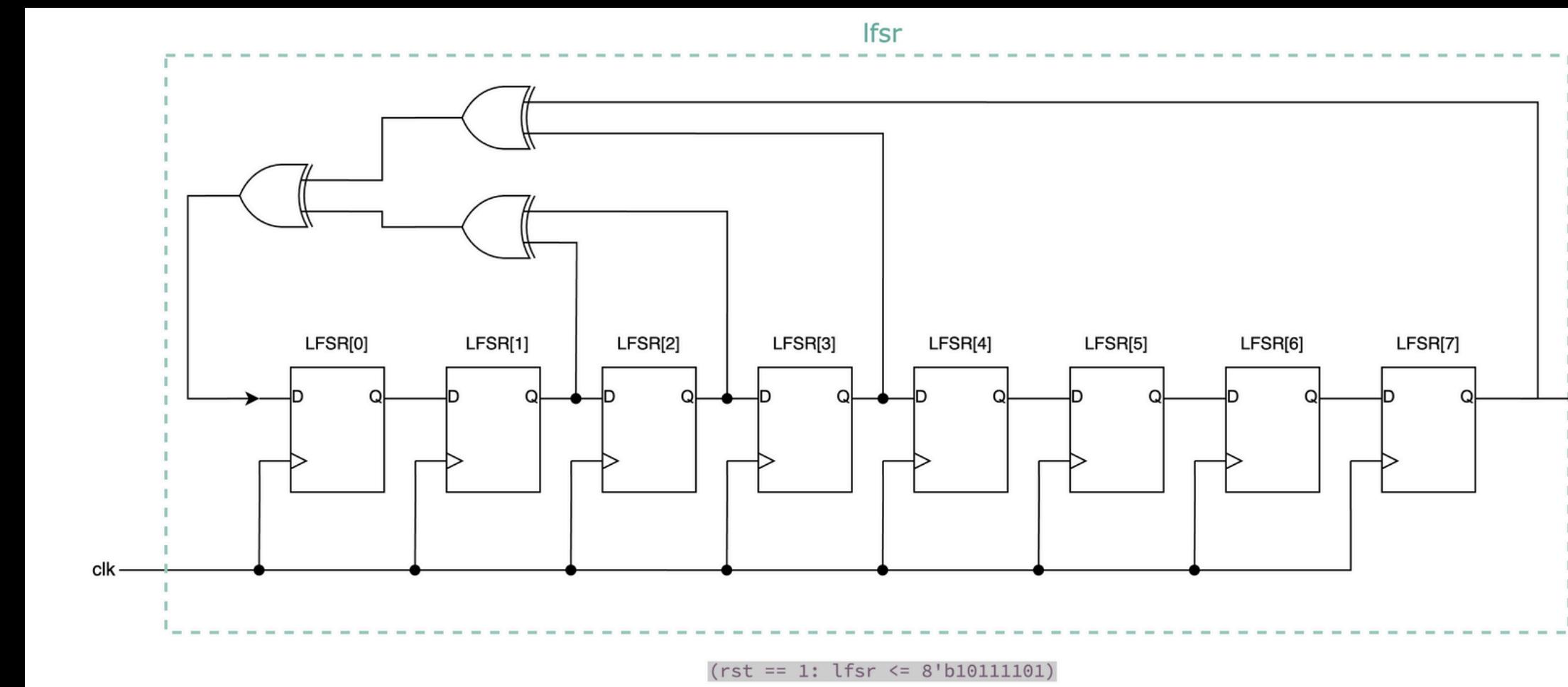
utilized LFSR to generate different directions for robot to move.

### Challenges...

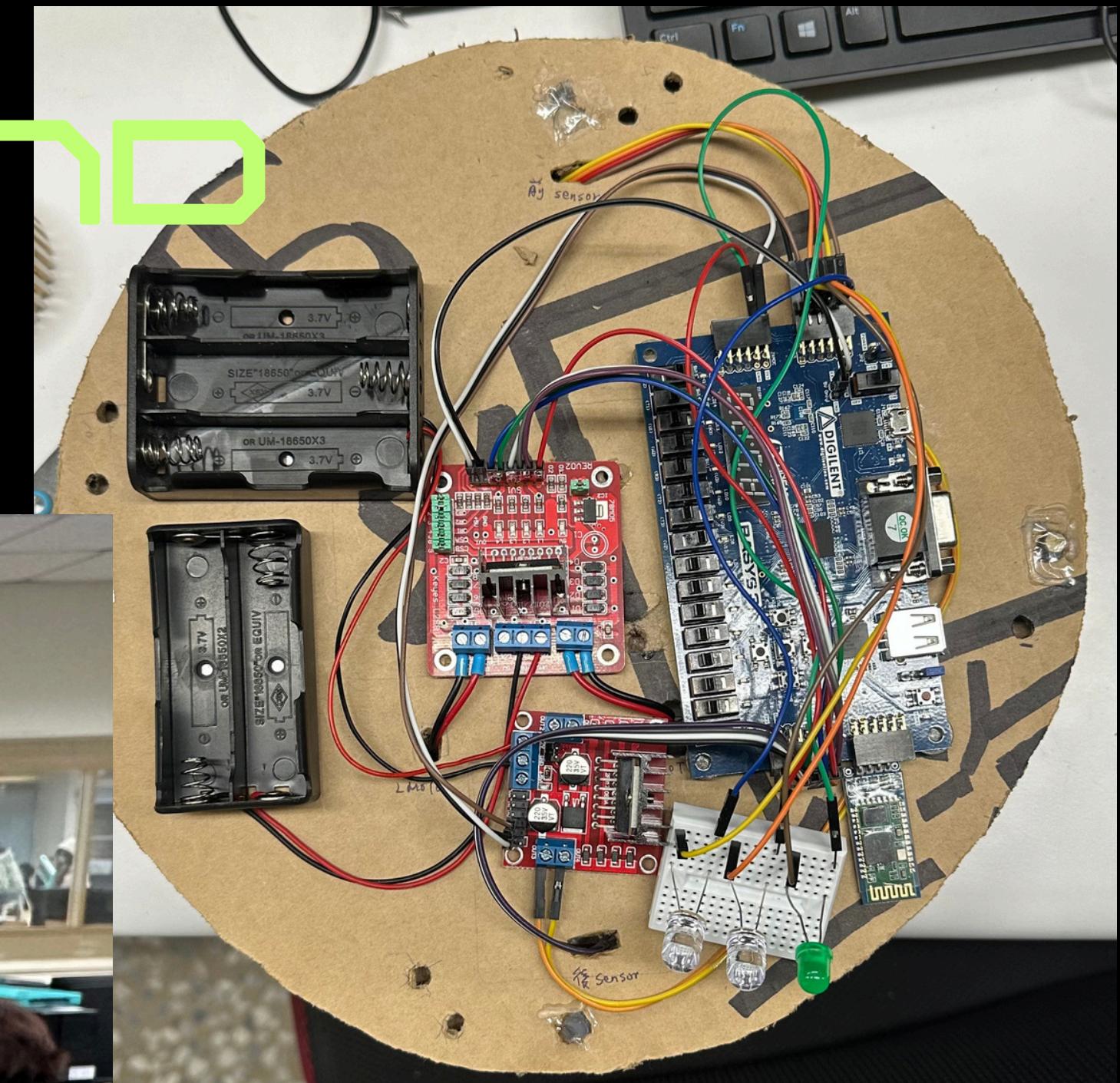
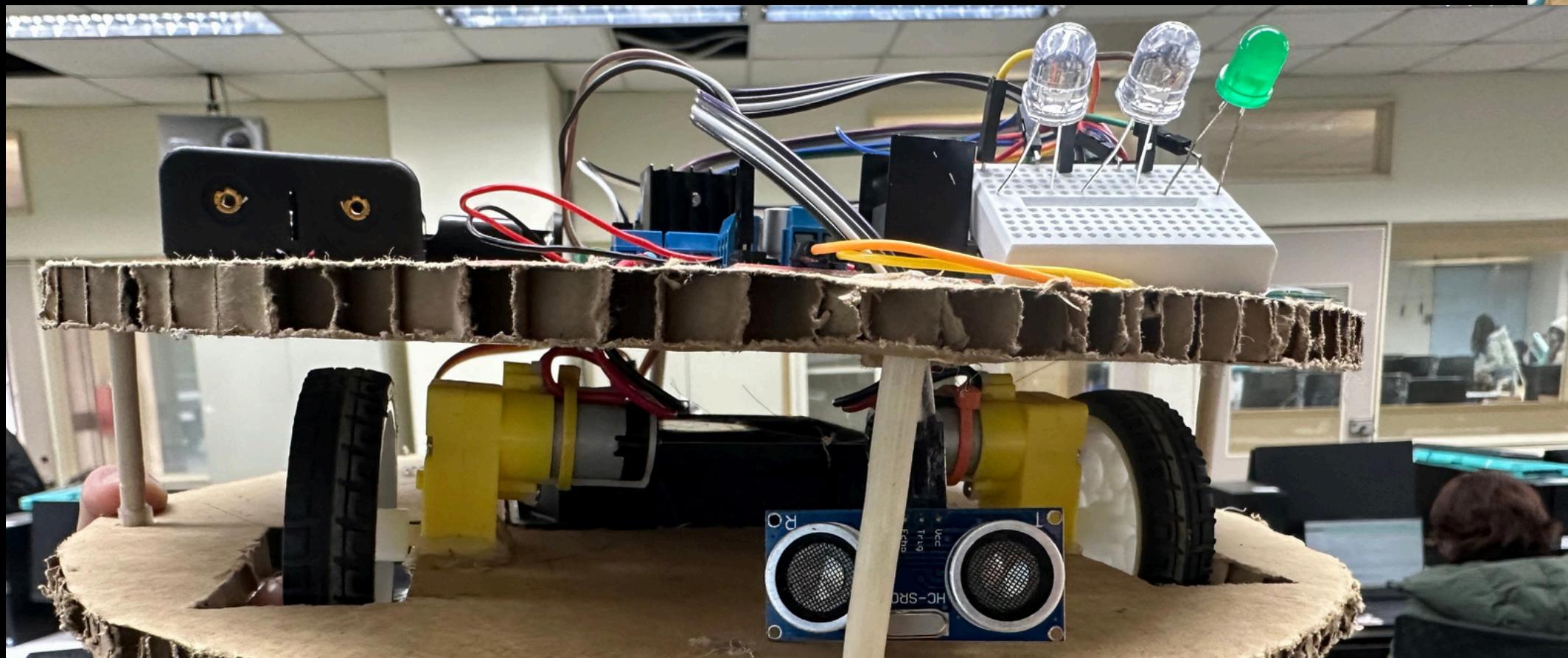
- LFSR with poorly designed initial seed.
- doesn't account for every bit.

<b>0</b>	2	14	11	10	15
<b>0</b>	3	14	11	9	16
<b>0</b>	4	11	14	12	13
<b>0</b>	5	10	15	12	13

# 4 RANDOM WALK GENERATION



# 5 INFRARED SENSORS AND MOTOR



# DEMO TIME

