101年大學部國際交流甄選專題成果展
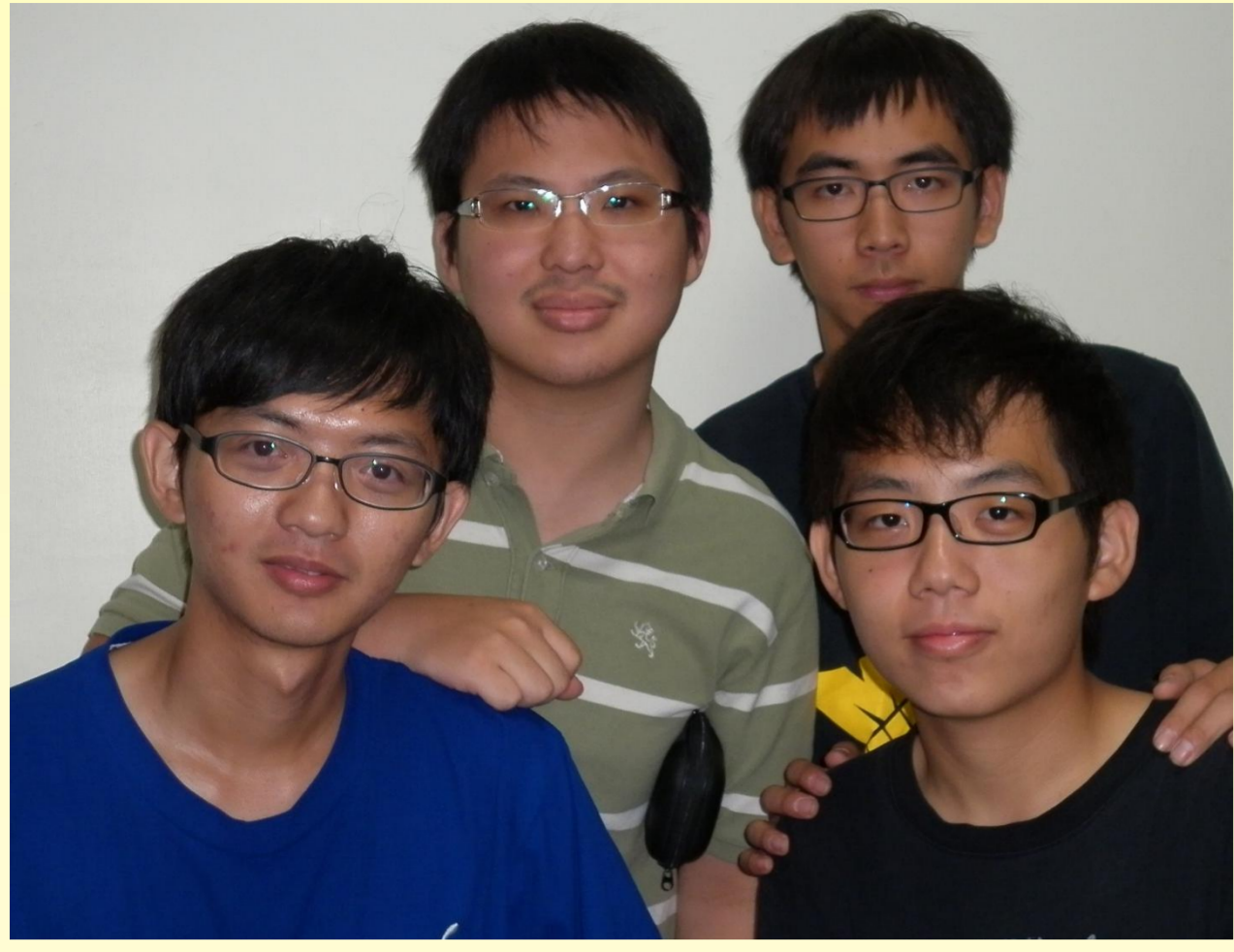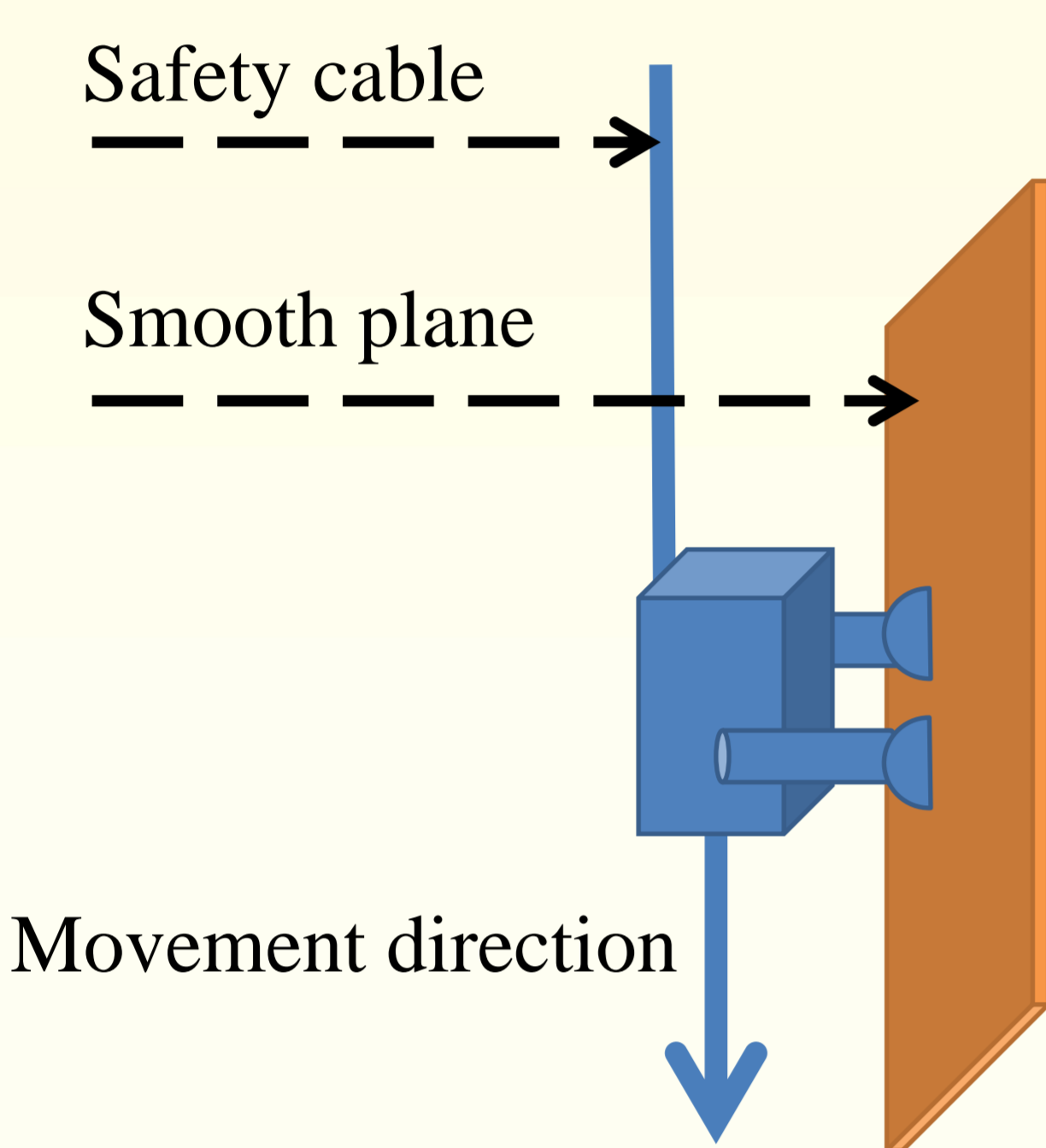
Skyscraper window cleaning robot

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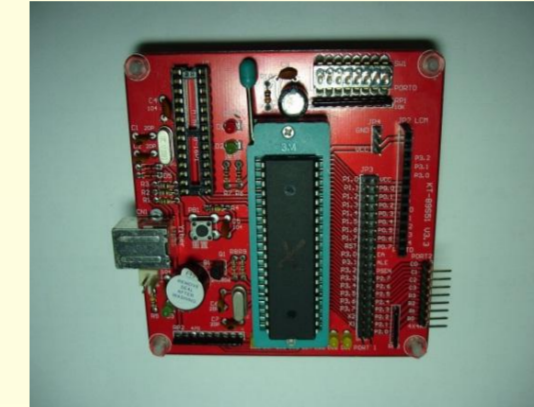Advisor: Hwang,Yean-Ren**

3

1.Motivation

We know that the window cleaner is a dangerous job. It should be working outside the skyscraper. Therefore, we want to design a robot to do this job.

Safety cable

Smooth plane

Movement direction

2.Assumption

- Moving on a smooth plane
- Washing window
- Safety cable
- Automatic control
- Downward

3.Robot's Structure and Component

3-1 Main structure

- To install components and safety cable .
- To fix the leg and washing arm.

Main Structure

Legs

Washing arm

3-2 Legs

Leg step forward

Push the robot forward

3-3 Washing arm

- Using a spring to make the linkage stay close to the window.
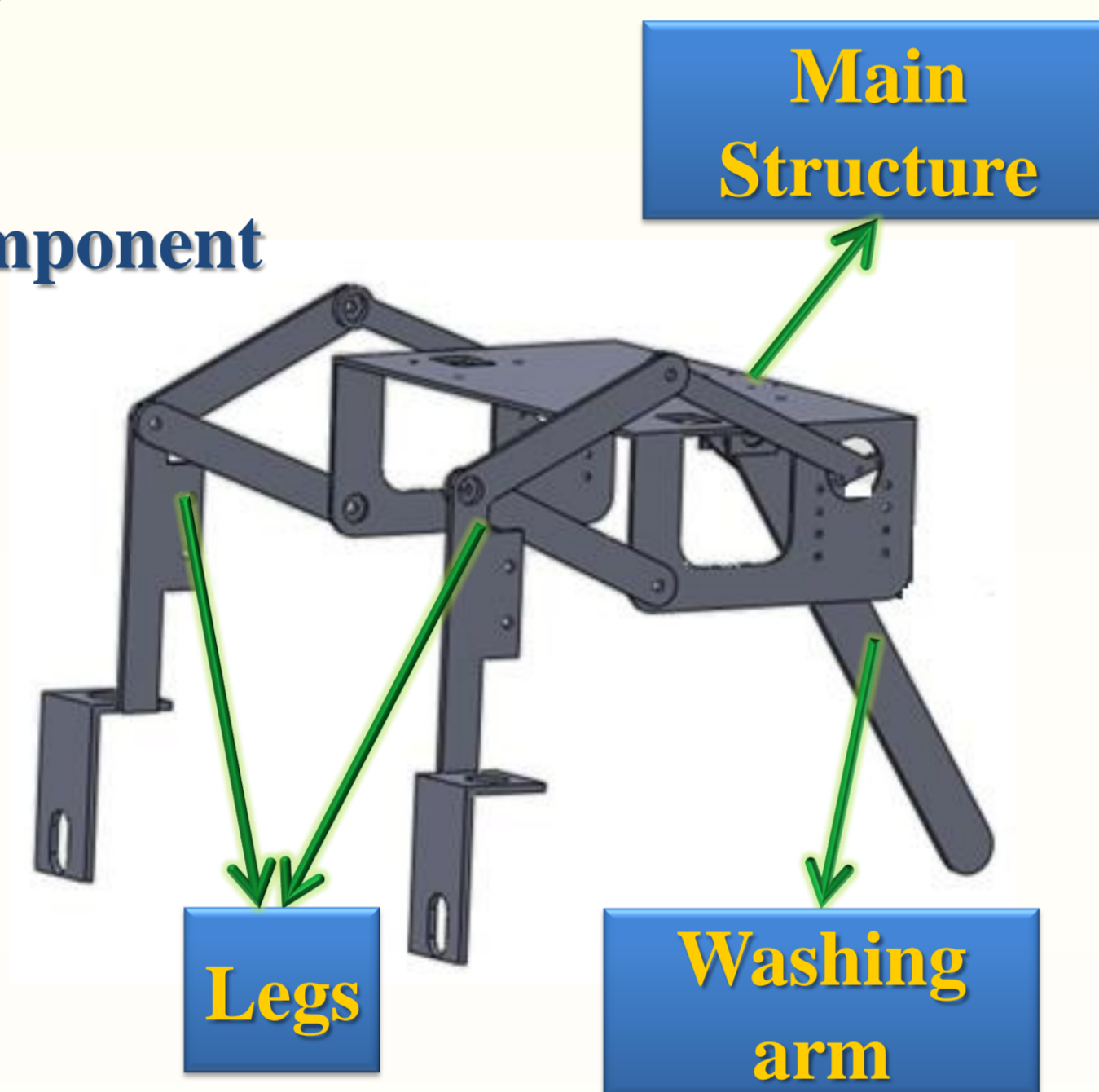
3-4 Component

- **Microcontroller:**
  Chip-8051 control the stepping motor and solenoid valve.
- **Stepping Motor:**
  The stepping motor control the mechanism's movement.
- **Solenoid Valve:**
  Solenoid valve can control vacuum generator induction or exhaust.
- **Vacuum Generator:**
  Vacuum generator is controlled by solenoid valve make the suction cup adsorbed on window or not.
- **Suction Cup:**
  With solenoid valve and vacuum generator , the robot will be adsorbed on window.
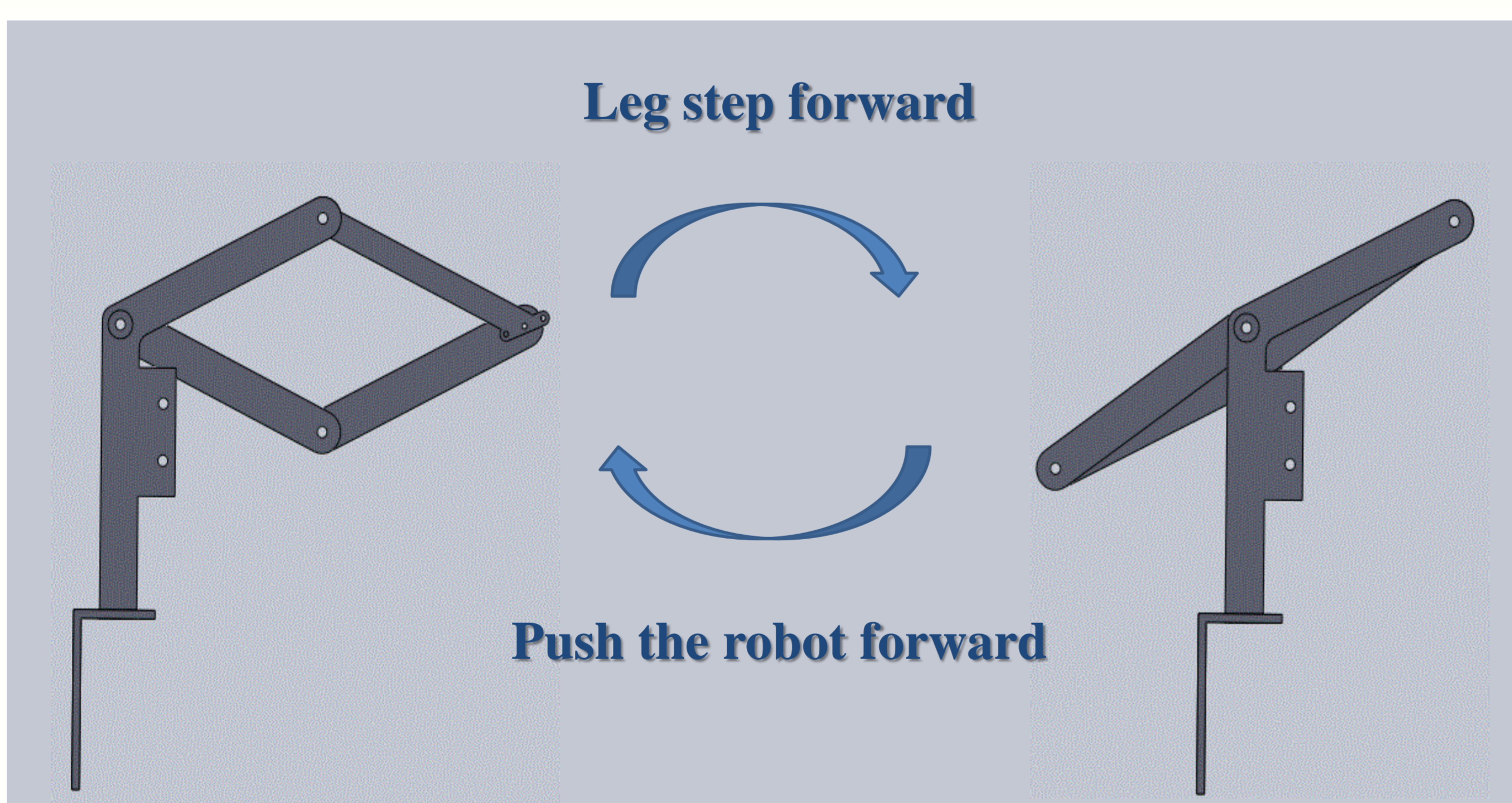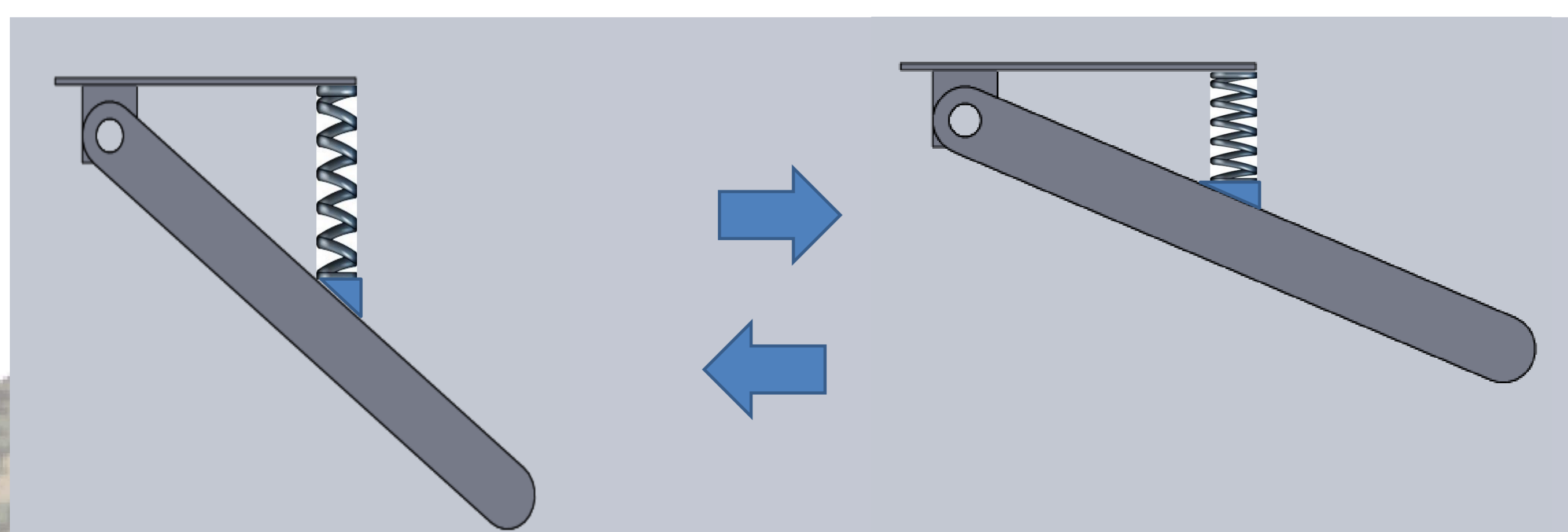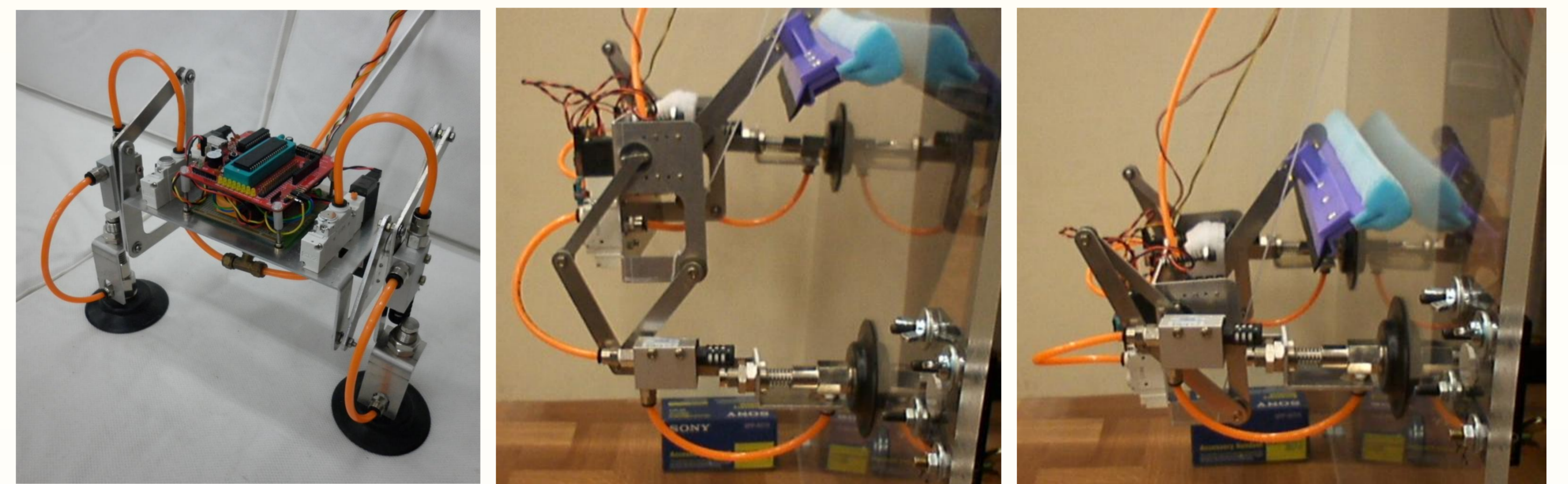
4.Result

5.Research conclusion

- The volume of the robot is $110*200*200(mm^3)$.
- The moving speed is about 1.2m/min.
- The weight of the robot is 1.5kg.
- The efficiency of clean is about $0.48m^2/min$.
- The robot can move downward at smooth plane automatically.

6.Future works

- **Washing:**
  There'll be a water nozzle spraying water and a wiper wiping windows to promote cleaning ability.
- **Water resistant:**
  We'll add a waterproof device so that electronic components will not hit the water.
- **Interface:**
  Building a control interface make the robot easier to use.