

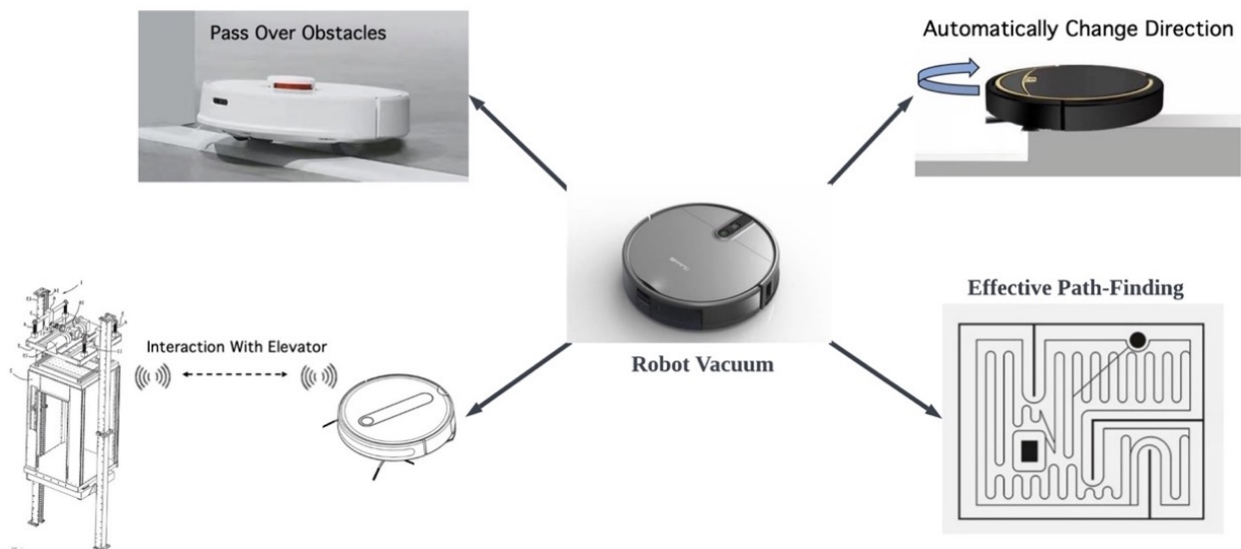
Robot Vacuum

Introduction

As technology advances, robot vacuums have become increasingly popular and intelligent in recent years. Despite lots of advancements, however, from our daily experience in the use of robot vacuums, many problems that need to be addressed still exist. One issue is that the robot vacuum may fall from a high plane and break. The other is potential to get stuck when passing through uneven surface. Additionally, it cannot finish the cleaning work on several different floors without manually moving it to the next floor over and over again. Finally, the path-finding algorithm can still be improved to optimize performance.

To tackle the problems mentioned above, we propose an advanced version of the robot vacuum. Specifically, we design four separate subsystems and then integrate them into the existing robot vacuum. Each subsystem is designed to handle one corresponding problem mentioned above. They are anti-fall steering subsystem, low obstacle passing subsystem, elevator interaction subsystem and effective path-finding subsystem respectively. The integration of these four subsystems will enhance the capabilities of the robot vacuum, making it more reliable and efficient, and reducing the workload required of workers. The figure below illustrates how our robot vacuum is expected to do.

Overview



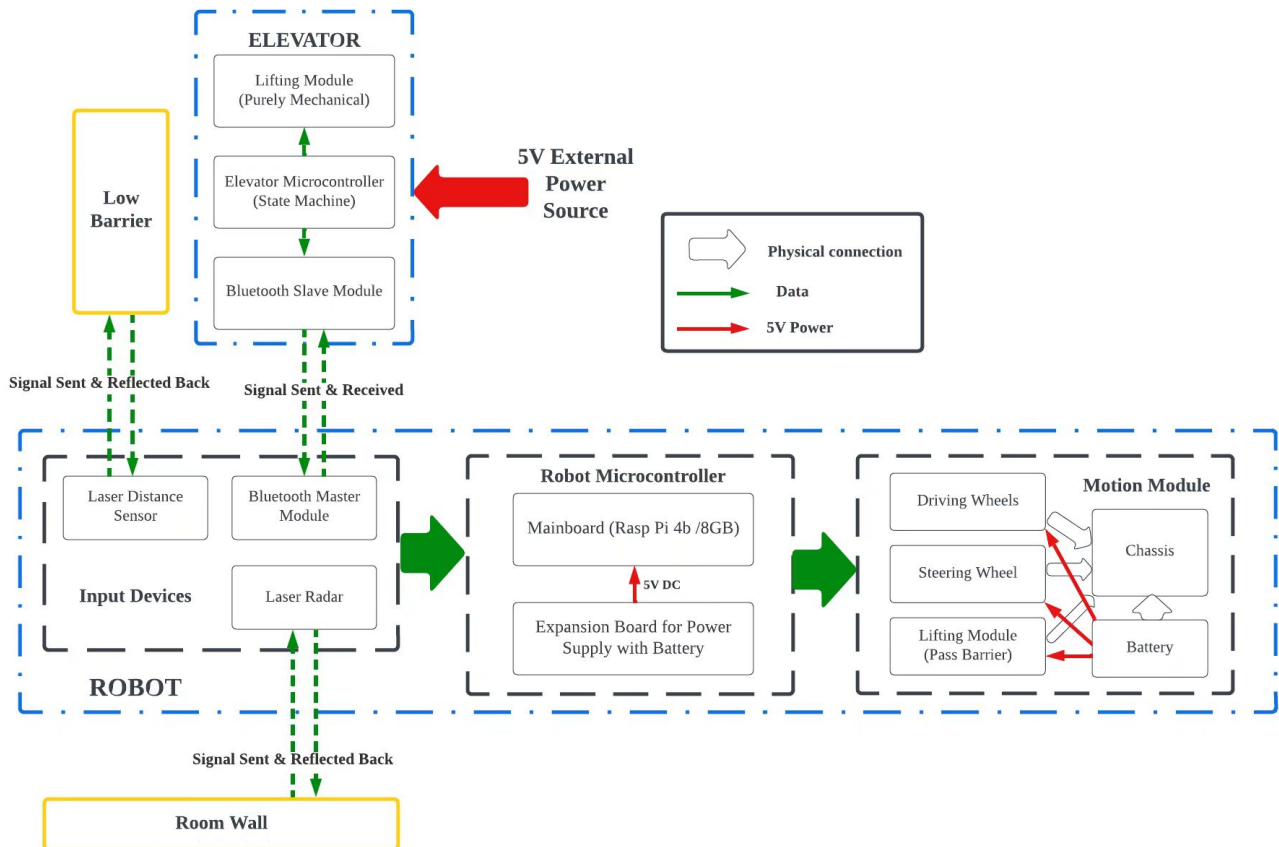
Block Diagram

The figure on the next page illustrates the overall block diagram of our robot vacuum. Our design has two devices, one robot vacuum and one elevator.

System verification

- **Anti-Falling Steering Subsystem**

- The anti-fall function based on infrared sensor and laser radar can be successfully operated, and the robot vacuum can successfully identify the position of the platform, retreat and turn.



○ When sensor-based anti-fall failure or misjudgment occurs, the steering wheel can intervene to drive the sweeping robot to avoid falling. The steering wheel can provide enough torque and friction for the robot vacuum with a maximum weight of 5kg. ____/ 3

- **Low Obstacle Passing Subsystem**

○ The robot vacuum should be able to climb over fixed thresholds with a height of at most 4cm and a width of at least longer than the width of the robot without getting stuck. ____/ 10

- **Elevator Interaction Subsystem**

○ The robot vacuum should reach the designated position in the elevator within 60 seconds from the time the vacuum arrives at the front of the elevator. ____/ 6

○ The robot vacuum should thoroughly leave the elevator within 10 seconds from the time the elevator reaches the desired floor. ____/ 5

- **Effective Path-Finding Subsystem**

○ In a completely unfamiliar environment, the robot vacuum could automatically patrol around and build the map. ____/ 7

○ Based on the map built in the previous procedure, the robot vacuum could perform cleaning work covering at least 90 percent of the ground area. ____/ 8

- **Cleaning Unit**

○ The robot vacuum should have certain cleaning ability, with the cooperation between the side brush and the fan, it can clean the foam ball on the ground. ____/ 4