

Narrow Explorer



Outline

- Introduction
- Hard Architecture
- Method
- Data Flow
- Demonstration
- Result
- Future Work

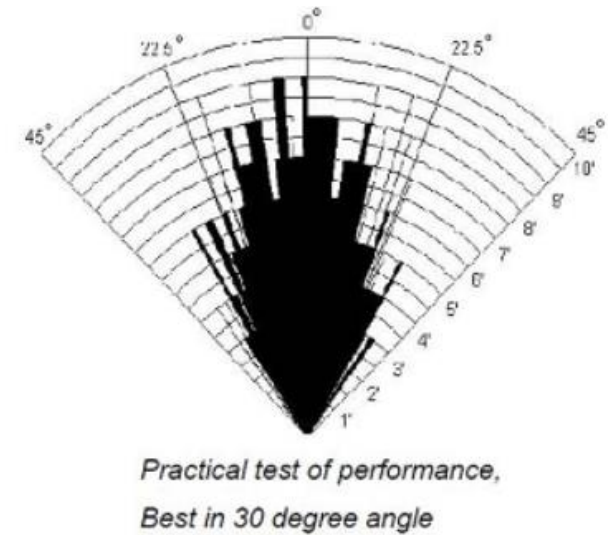
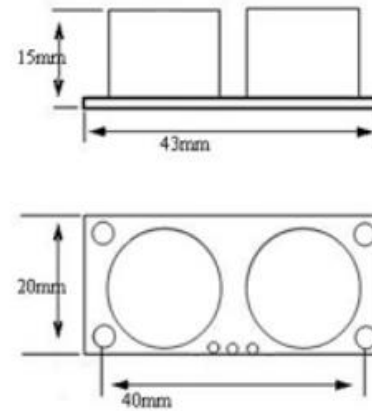
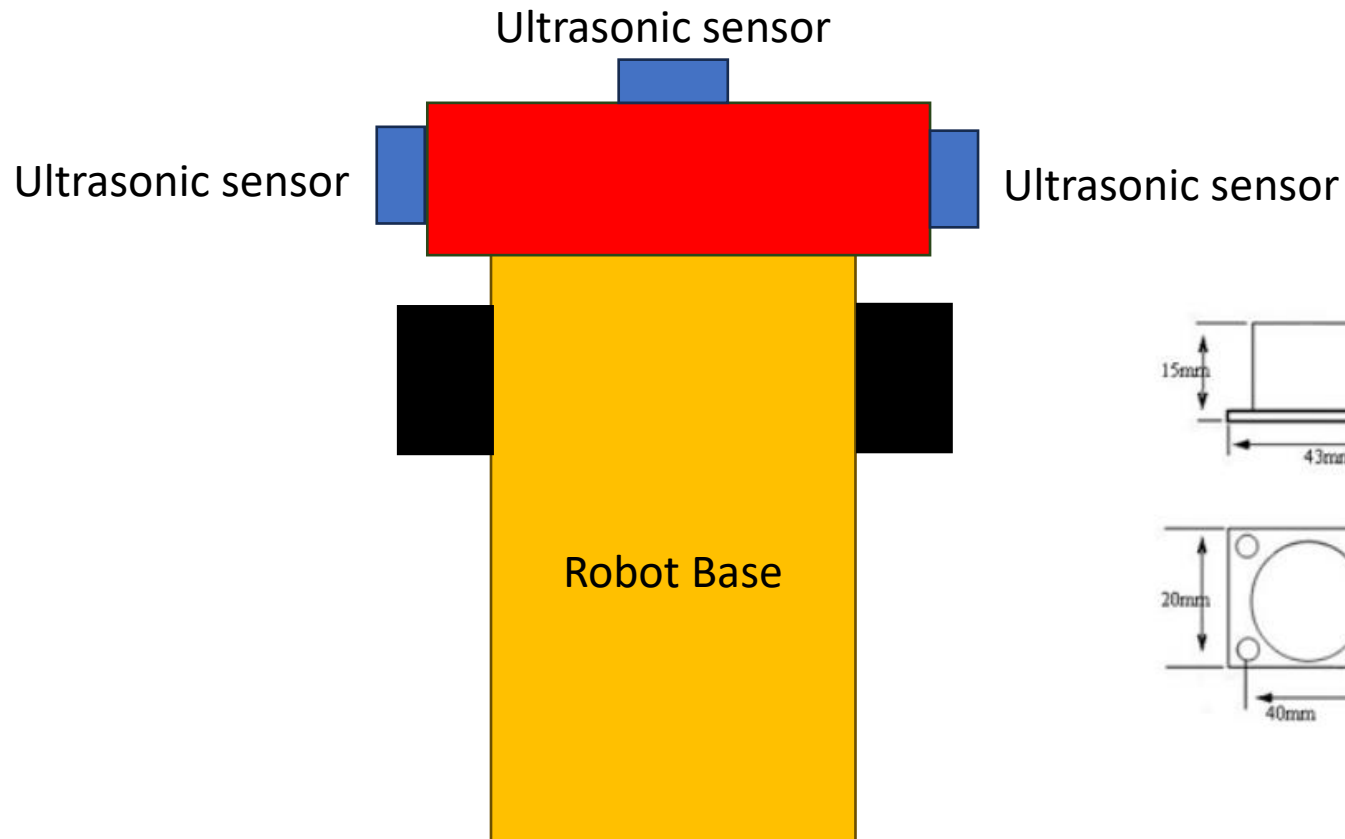


Introduction

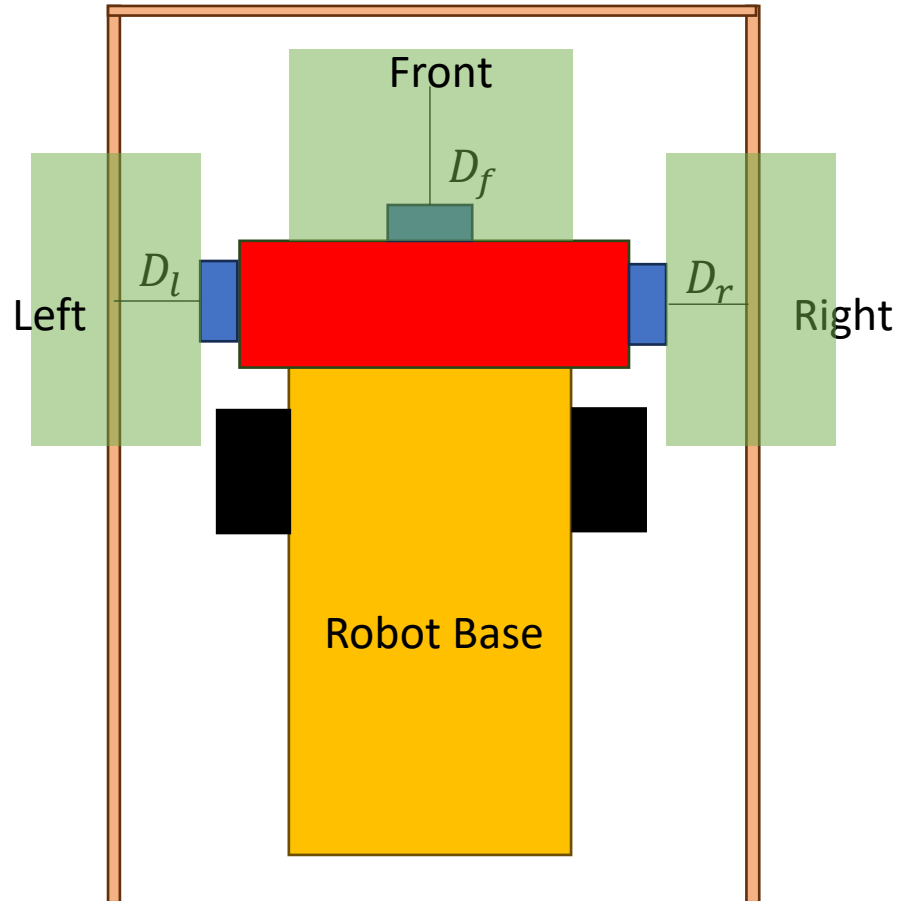
- Autonomous mobile robots have become integral in various missions and tasks, typically operating in spacious or well-lighted environments. However, there exists a significant challenge when these robots navigate through narrow spaces, such as pipelines or alleys, where traditional navigation methods face limitations, particularly in low-light conditions.
- The primary objective of this term project is to design and implement a small-scale autonomous mobile robot capable of effectively traversing in narrow and potentially low-light environments by integrating with ultrasonic sensors. The proposed project addresses a practical need in the field such as inspecting pipelines, exploring tight industrial spaces, or conducting search and rescue operations in areas inaccessible to humans.



Hardware Architecture



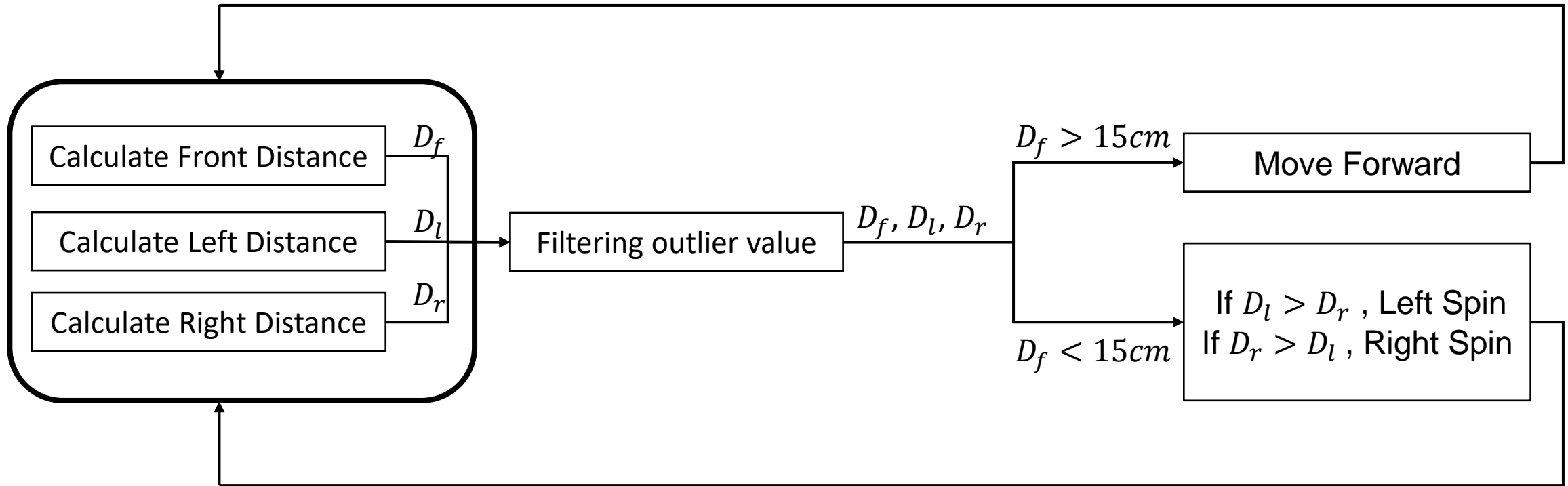
Method



- Dividing the surrounding into front, left and right, and estimate the distance to the wall by utilizing ultrasonic sensors.
- If $D_f < 15(cm)$, which means the robot is about to hit the wall, pause the robot and rotate the robot until D_f is larger than 90cm (best angle for robot to forward again)
- To ensure the robot stays as close to the center of the road as possible, adjust the motor speeds based on the speed difference between the two wheels.

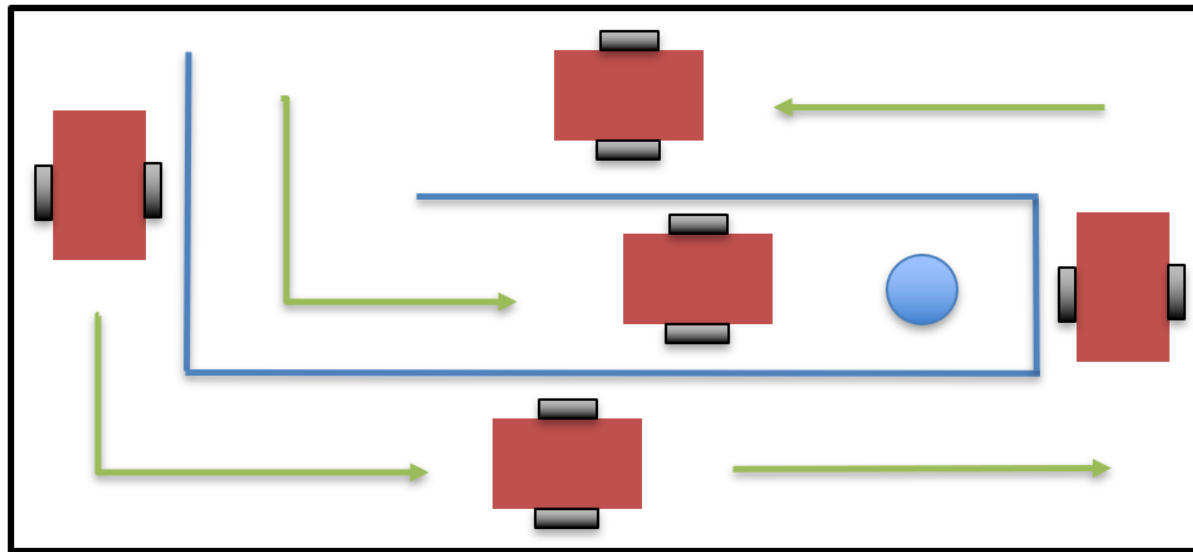


Data Flow



Demonstration

- In the demo, we plan to use huge cardboards to mimic the narrow space or the narrow environment that our robot needs to pass. Starting with placing on the one end, the robot will automatically move toward the other end the robot will autonomously navigate towards the other end using the ultrasonic sensor to guide its path to get the target.



Future Work

- The integration of more wheels and sensors not only provides increased adaptability but also opens up opportunities for the development of more nuanced and versatile strategies.
- The expanded hardware configuration lays the foundation for designing superior control policies, thereby elevating the robot's overall efficiency in maintaining its position at the center of the road.

