
SWARM ROBOTICS FOR LOGISTICS IN CONSTRAINED WAREHOUSE

Hardware Description

The hardware setup for this project includes two Tortoise Mini Bots, specifically designed to execute logistical tasks in constrained warehouse environments. Each bot is equipped with components optimized for reliable communication, mobility, and power efficiency.

Key Hardware Components

1. ESP32 WROOM Chip:

- Serves as the primary communication module.
- Facilitates seamless interaction between the bots and the server, enabling real-time coordination and task assignment.

2. Motor Driver (L239D Chip):

- Handles the operation of two DC motors on each side of the bot.
- Provides precise control over motor speed and direction, essential for efficient navigation in tight spaces.

3. Mobility Design:

- The bot features a caster wheel at the front, allowing smooth and efficient turning without the need for a motorized chassis bed. This design also resolves issues related to improper turning observed in fixed 4-wheeled robots.

4. Power Supply:

- Each bot is powered by a 12V Li-ion battery, ensuring sufficient power for operating all components, including the two DC motors. The battery is chosen for its compact design and ability to sustain prolonged operational periods.

Observations During Real-Environment Testing

While the hardware performed reliably in most scenarios, the following issue was observed during real-environment testing:

- **Power Stability:**
 - Without a voltage regulator or controller, the motors exhibited reduced performance over extended use. This instability led to inconsistent power delivery, which in turn made it challenging to achieve precise motor tuning and control.
 - The lack of stable power affected the ability to maintain smooth and accurate navigation, particularly during tasks requiring fine adjustments.

Conclusion

To address the power stability issue, integrating a voltage regulator or controller is recommended. This addition would ensure consistent power delivery to the motors, improving reliability and control precision. Despite this limitation, the hardware setup demonstrates a robust foundation for implementing swarm robotics in logistical applications within constrained warehouse environments.