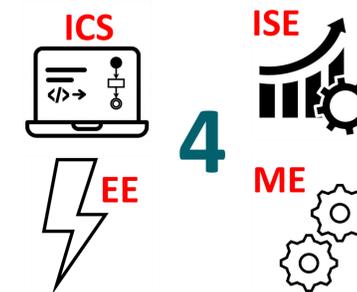


Automated Forklift for Optimizing Warehouse Inventory Management

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Introduction

❖ Problem Statement:

Manual forklift operations cause errors, safety risks, and inefficiencies in warehouses. Existing automation solutions are costly and hard to implement. A low-cost, retrofittable smart forklift system is needed to improve accuracy, safety, and efficiency without major infrastructure changes.

❖ Constraints:

- 2.5m² in Size
- 220V AC Charger
- 1MBps Wi-Fi Connection
- Min Lifting Capacity 20Kg

❖ Final Target Specification:

- 0.5 m/s movement speed
- 0.2 m/s Lift speed
- 1.5 m Lift height
- 100k mAh Battery
- 2 GHz Processing Power
- 4 GB Memory
- Displacement Error ±5cm
- 8Hr Operation time

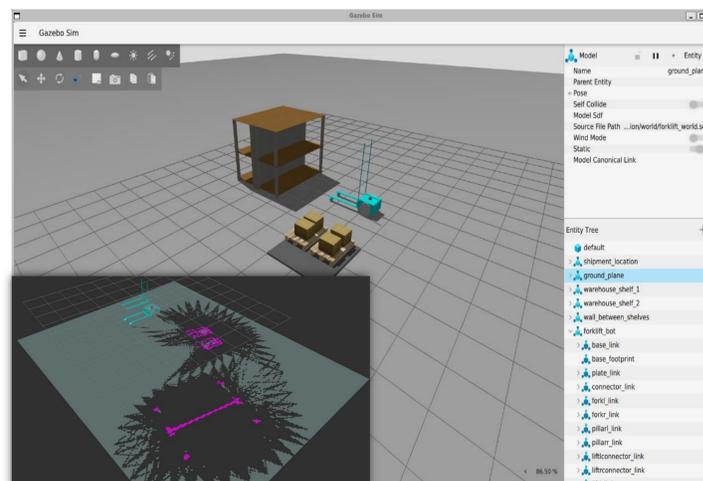
Prototype Design



CAD model of the forklift

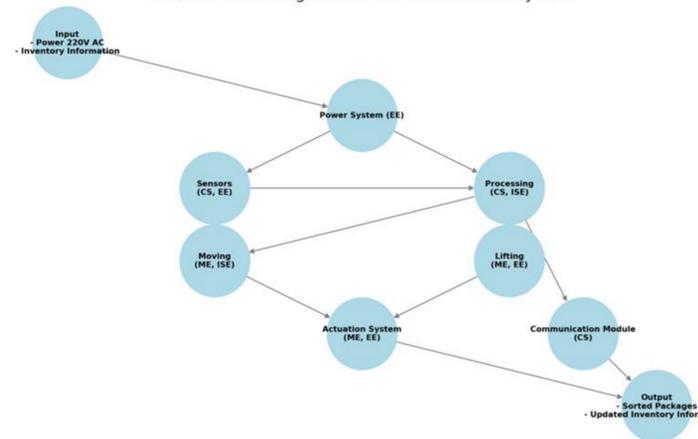


First physical Prototype of the forklift and its electrical components under development after the first integration



Using simulation software (Gazebo and Rviz) to test the robot in a safe way

Detailed Block Diagram of Automated Forklift System



This Figure shows how power, sensors, processing, and movement interact in the Automated Forklift System

Project Impact

❖ Economic:

- Lower Labor Costs: Reduces manual labor, cutting payroll expenses.
- Higher Productivity: Speeds up operations through automation.

❖ Social:

- Safer Work Environment: Reduces human interaction with heavy loads.
- Better Work-Life Balance: Less need for overtime.

❖ Environmental:

- Reduced Waste: Fewer damaged products means less material waste.
- Energy Efficient: Takes optimized paths to save energy.

Validation and Verification

- ✓ 0.5 m/s movement speed
- ✓ 0.2 m/s Lift speed
- ✓ 1.51 m Lift height
- ✓ 100k mAh Battery
- ✓ 2 GHz Processing Power
- ✓ 8Hr Operation time

Conclusion

The smart automated forklift system offers a practical solution to modern warehouse challenges by enhancing efficiency, reducing costs, improving worker safety, and minimizing environmental impact. Its ability to integrate into existing setups makes it a scalable, future-ready choice for businesses aiming to optimize their operations.