TEAM M050

Intelligent Support System for Intra-Hospital Medicine & Sample Logistics

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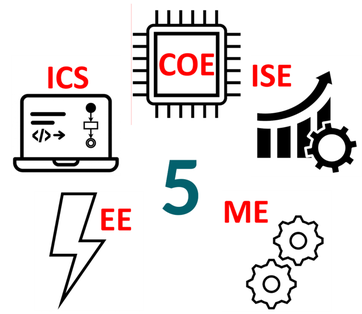


Problem Statement

In hospital environments, the delivery of medications and laboratory samples between departments is primarily performed manually by clinical staff, which creates delays due to dependence on nurse availability, task interruptions, and physical walking across corridors. This results in inconsistent delivery times, increased workload on healthcare personnel, and the presence of non-value-adding activities such as waiting and manual handoffs. Consequently, the current process is inefficient and difficult to control, highlighting the need for an automated solution that can perform delivery tasks reliably while reducing delays, minimizing human involvement, and improving overall operational efficiency.

Integrated Specifications

Motion Update Rate	≥ 1 Hz
Payload Integration	≤ 100 g, No loss
System Response Time	≤ 10 s
Wheel Activation Time	≤ 10 s
System Startup Time	≤ 10 min

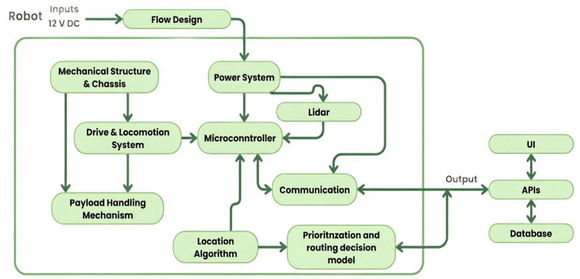
Specifications

Max Operation Time	≤ 120 min/run
Delivery Time Reduction	≥ 20%
Onboard Memory	≥ 2 GB RAM
Request Submission	Application
User Learning Time	≤ 20 min
Payload Capacity	≤ 100 g
Operating Surface	Flat floors
Startup Time	≤ 5 min
LiDAR Range	≥ 3 m (360°)
Obstacle Detection	≤ 1 m
System Architecture	3-tier
Command Transmission Rate	≥ 5 Hz

Constraints

Corridor Width	≥ 0.70 m
Total Traveling Distance	≤ D Max
Decision Delay	10 s
Operating Time	≥ 10 min
Operating Environment	Indoor only
Controller	Raspberry Pi
Data Privacy	No data stored
Surface Temperature	≤ 50 °C

Prototype Design

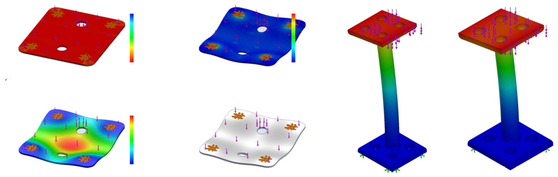


Testing

The system was tested in a controlled indoor environment to evaluate autonomous navigation, delivery timing, obstacle detection, payload stability, software response, and power performance. Repeated delivery trials confirmed consistent robot operation across the main mechanical, electrical, computing, software, and ISE functions.

Validation

The results confirmed that the robot satisfies the key project requirements, including route-distance limit, delivery-time limit, decision delay, obstacle detection, runtime, startup time, and safe operation. The robot-assisted process also achieved measurable delivery-time improvement over the manual process under identical operating conditions.



Conclusion

The autonomous delivery robot improves intra-hospital logistics by reducing delivery time, minimizing staff involvement, and ensuring reliable and consistent performance. The system successfully meets all design requirements and demonstrates a practical solution for efficient and automated hospital transport.