

CSE461

Project Report

Lab Section: 08

Group: 02

Project Name
Industry Warehouse Management

Member Details:

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1. Project Title:

Industry Warehouse Management

2. Purpose

Objective:

A robot that follows a line, avoids obstacles and uses an arm to sort inventory in industrial capacity.

Scope:

Designed for warehouses, manufacturing plants, and logistics hubs, the robot streamlines navigation, ensures safety, and automates inventory management tasks like picking and sorting.

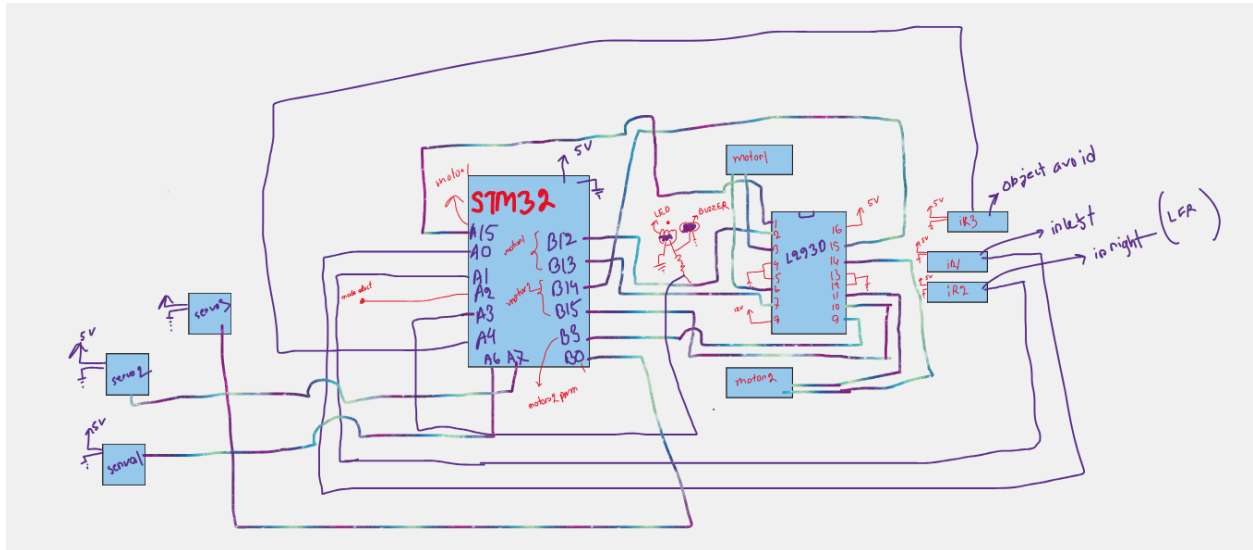
Significance:

This project enhances productivity, accuracy, and safety while reducing labor costs, supporting the growing demand for efficient industrial automation.

3. Components

- Microcontroller: STM32F103C8T6 Blue Pill Development Board
- Sensors:
 - IR sensor
- Actuators:
 - Servo Motor
 - DC motor
 - L293D motor driver
 - Mechanical Gripper
- Body/Chassis: Car Body
- Additional Components: Dc Buck LM2596 DC-DC Buck Converter Step Down Module

4. Diagram/Circuit Setup:



5. Cost Breakdown

No	Components	Quantity	Unit Cost (BDT)	Total Cost (BDT)
1	Robotics Claw Mechanical Gripper Clamp Kit	1	780	780
2	MG995 180 Degree Metal Gear TowerPro Servo Motor	3	370	1110
3	IR Sensor	3	70	200
4	Jumper MALE TO MALE AND FEMALE TO MALE(40 piece)	1	110	110
5	STM32F103C8T6 Blue Pill Development Board	1	490	490

6	ST-Link V2 Programmer For STM8 and STM32 Local Chip	1	585	585
7	18650 BATTERY HOLDER / CASE 3 CHAMBER	2	33	66
8	SONY ICR 18650 Rechargeable Lithium Ion Battery 4.2V 10000Mah (1 pcs) (B Grade)	4	186	744
9	Dc Buck LM2596 DC-DC Buck Converter Step Down Module	3	75	225
10	L293D Quadruple Half-H Driver IC Chip	2	55	110
11	Breadboard/Project Board - Half Size Self-Adhesive	2	75	150
Total Cost (BDT)				4500

6. Functionality Breakdown

Functionality 1: Line Following

- Overview: Car follows a black line and stops on a white line.
- Working Procedure: Uses an IR sensor array to detect line color, integrates with motor driver to control wheels, and manages power via the microcontroller.

Functionality 2: Inventory Handling

- Overview: Uses a 2-DOF robotic arm controlled by two servo motors to handle items, with LED and buzzer signaling actions.

- **Working Procedure:** Servo motors receive PWM signals from the microcontroller for precise movement, while the LED blinks and the buzzer beeps during picking and dropping to indicate operation status

Functionality 3: Obstacle Avoidance

- **Overview:** Detects obstacles using an IR sensor and stops or reroutes when a white box is detected within a small distance.
- **Working Procedure:** IR sensor detects proximity, processes signal through the microcontroller, and adjusts motor control to avoid obstacles.

7. Business Proposal

- **Target Audience:** Large-scale inventory management facilities looking for affordable automation solutions.
- **Market Analysis and Competitors:** Not that much use of industrial automation in Bangladesh
- **Revenue Model:** Revenue generation through direct sales of the system, service contracts, and customization for specific customer needs.

8. Potential Challenges

- **Technical Challenges:** Ensuring sensor accuracy and actuator precision for reliable performance.
- **Design Challenges:** Managing space constraints and maintaining proper weight distribution for stability.
- **Integration Challenges:** Addressing compatibility issues and simplifying wiring for seamless component integration.
- **Budget Constraints:** Staying within the budget while ensuring all necessary functionalities.
- **Risk Mitigation:** Conducting thorough testing, using modular designs for flexibility, and sourcing cost-effective components without compromising quality.

