National Institute of Bustiness Management

School of Computing and Engineering

Diploma in Software Engineering – HND25.2F

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robotics

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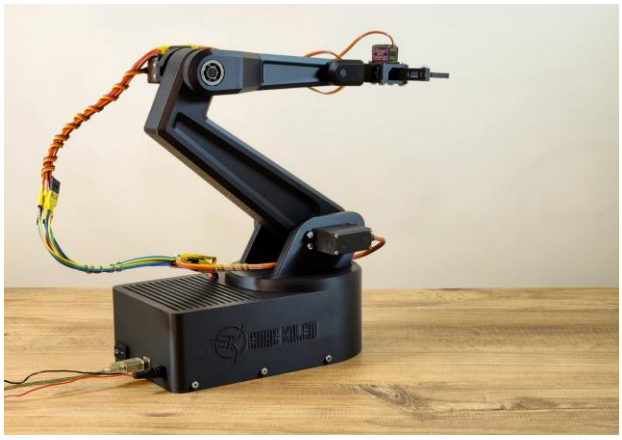
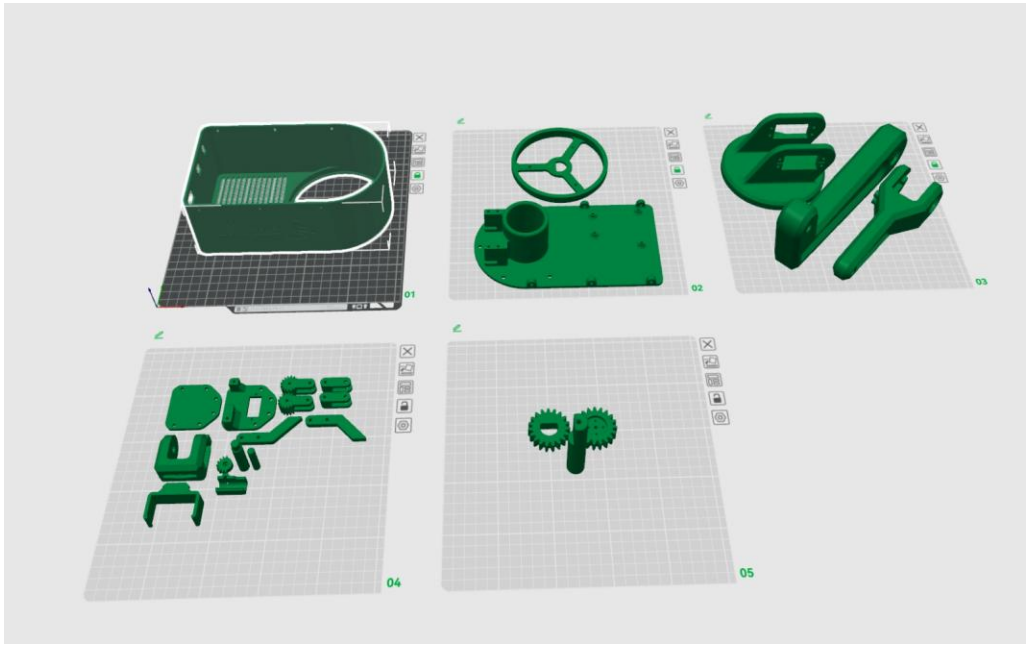
Automated Color Sorting Robotic Arm for Industrial Manufacturing

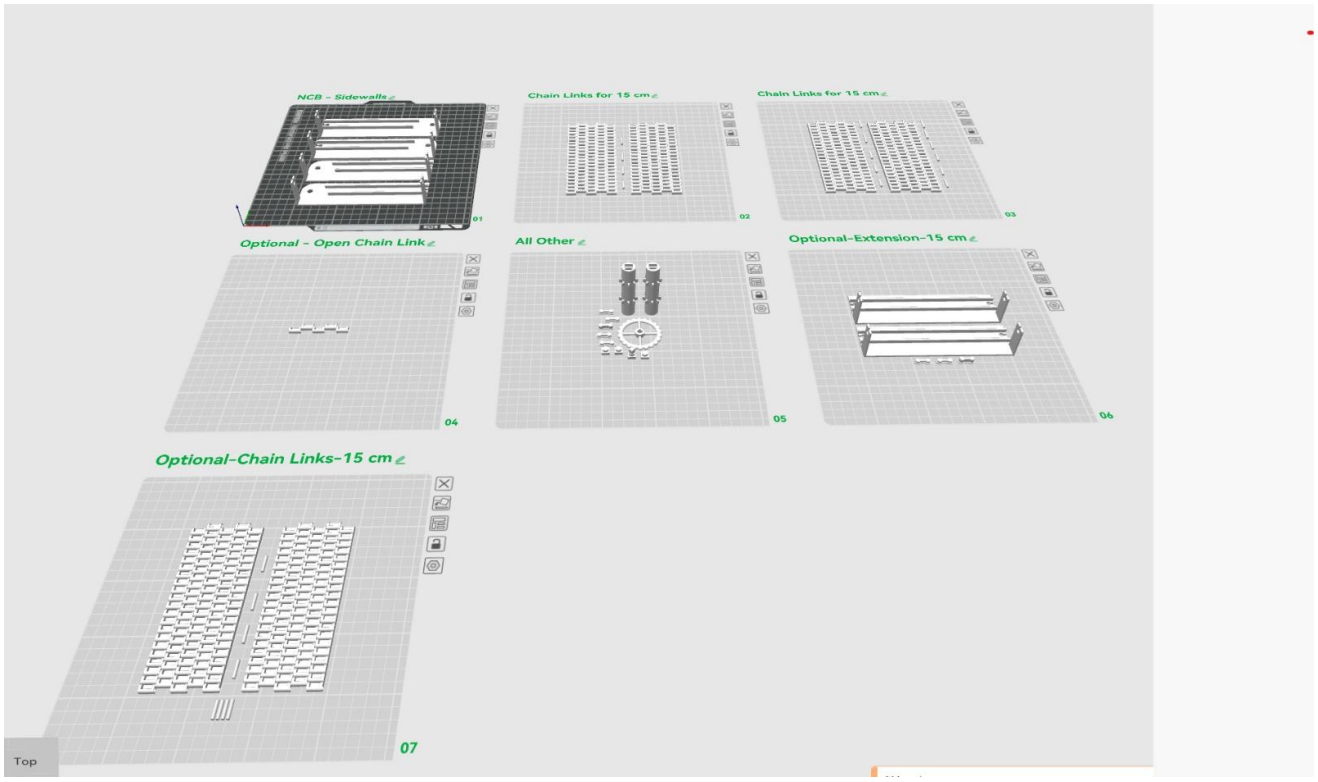
Problem Identification

The goal of this project is to develop a color sorting robot arm that can accurately sort objects based on their color using sensors. The system needs to identify the color of objects moving along a conveyor belt, and then direct them into the corresponding color-coded boxes. The challenges involved include accurately detecting the colors, controlling the robot arm, and ensuring the conveyor belt operates smoothly.

Detailed Design (Optional - Sketch or 3D Design)



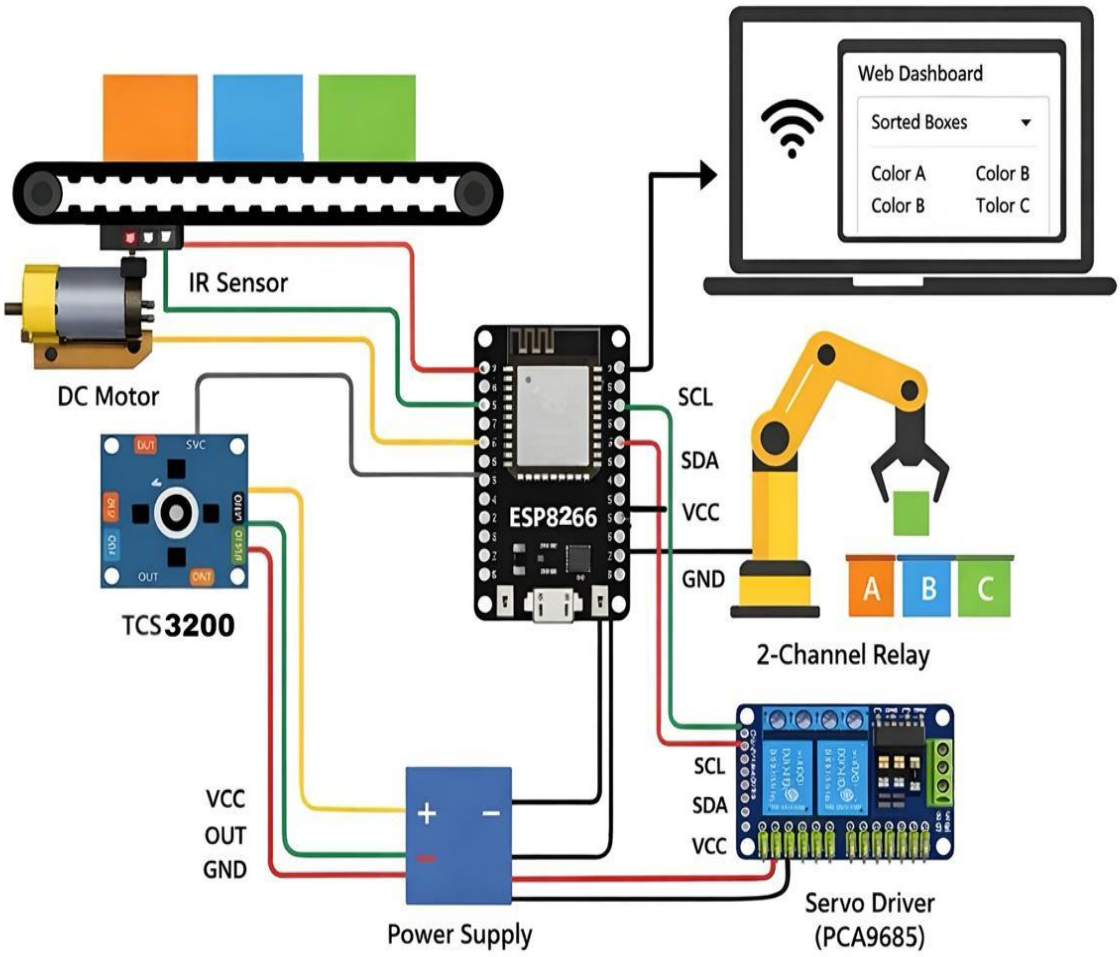



NCB - Sidewalls
01
Chain Links for 15 cm
02
Chain Links for 15 cm
03
Optional - Open Chain Link
04
All Other
05
Optional-Extension-15 cm
06
Optional-Chain Links-15 cm
07
Top

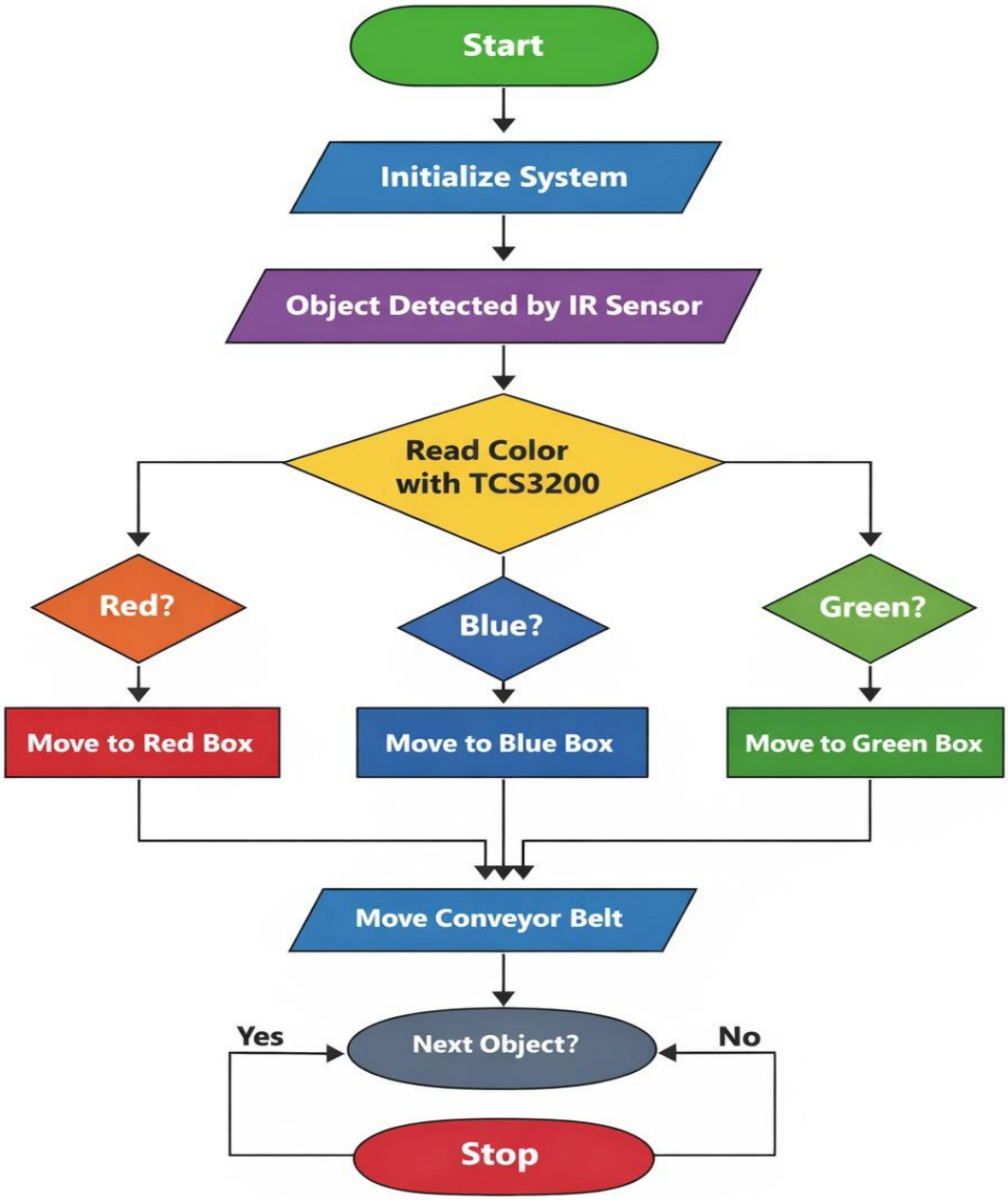
Bill of Materials (BOM)

Item	Description	Quantity	Cost
TCS3200 Color Sensor	Used for detecting colors	1	1000
IR Sensor	Used for detecting objects on the conveyor	1	100
Servo Motor	Controls the sorting mechanism	5	5500
Gear Motor	Drives the conveyor belt	1	300
Relay	Controls the motor circuit	1	300
Servo Driver (PCA9685)	control multiple servo motors by generating precise PWM signals via I2C communication	1	1200
Microcontroller (ESP8266)	Controls all components	1	1800
40-pin Single row female headers 2.54mm	Used to provide detachable electrical connections between the microcontroller	4	120
Dot Board(Vero Board)	Used as a base board to mount and interconnect electronic components during circuit assembly	2	120

Circuit Diagram (Simulation)



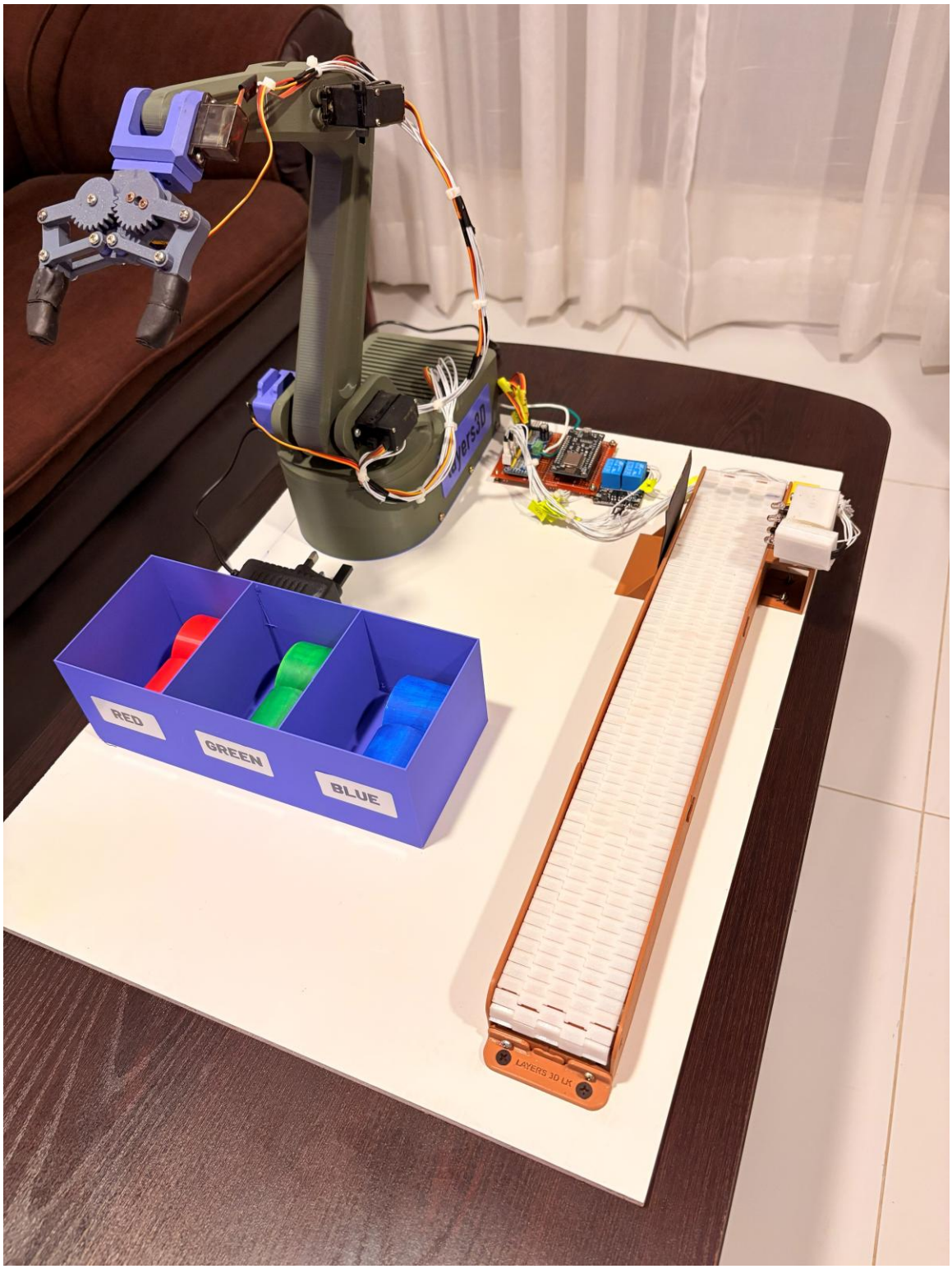
Flowchart


Start
Initialize System
Object Detected by IR Sensor
Read Color with TCS3200
Red?
Blue?
Green?
Move to Red Box
Move to Blue Box
Move to Green Box
Move Conveyor Belt
Yes
Next Object?
No
Stop

Timeline (Gantt Chart)

Task	Start Date	End Date	Duration
Research & Concept Design	12/11/2025	13/11/2025	[1 day]
BOM and Material Procurement	10/12/2025	12/11/2025	[2 days]
Circuit Design & Simulation	15/12/2025	16/11/2025	[1 day]
Hardware Assembly	02/01/2026	12/01/2026	[10 days]
Software Development & Testing	14/01/2026	17/01/2026	[3 days]
Final Testing & Debugging	20/01/2026	06/02/2026	[16 days]
Report Writing & Submission	[Start Date]	[End Date]	[X days]

Mechanical system and structure


RED
GREEN
BLUE