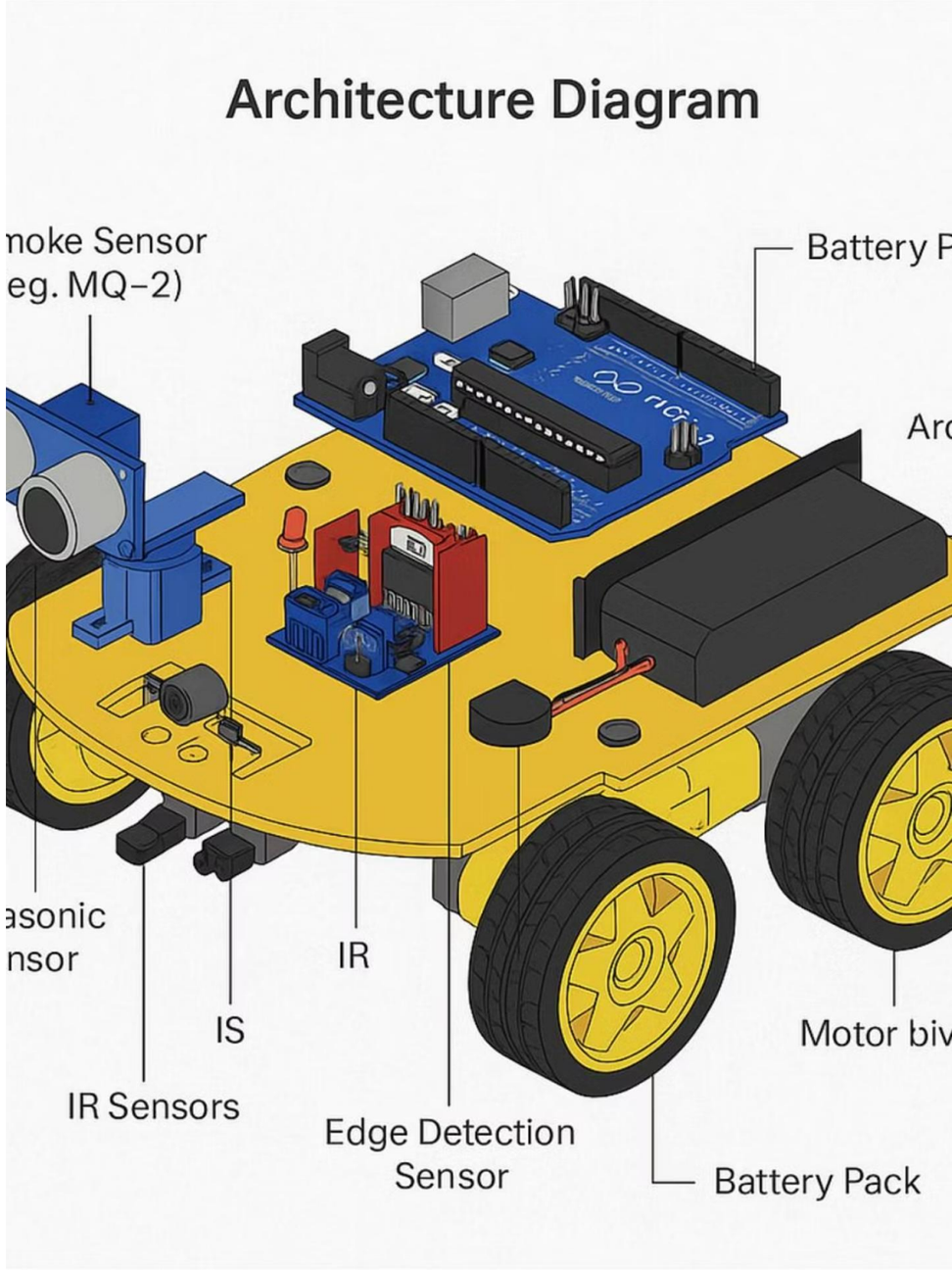
PathPal: A Human Following Robot Using Sensors

This Arduino-powered robot follows children or elderly people, detects smoke, gas, or edge hazards, and provides real-time alerts via buzzer and LED for enhanced safety.



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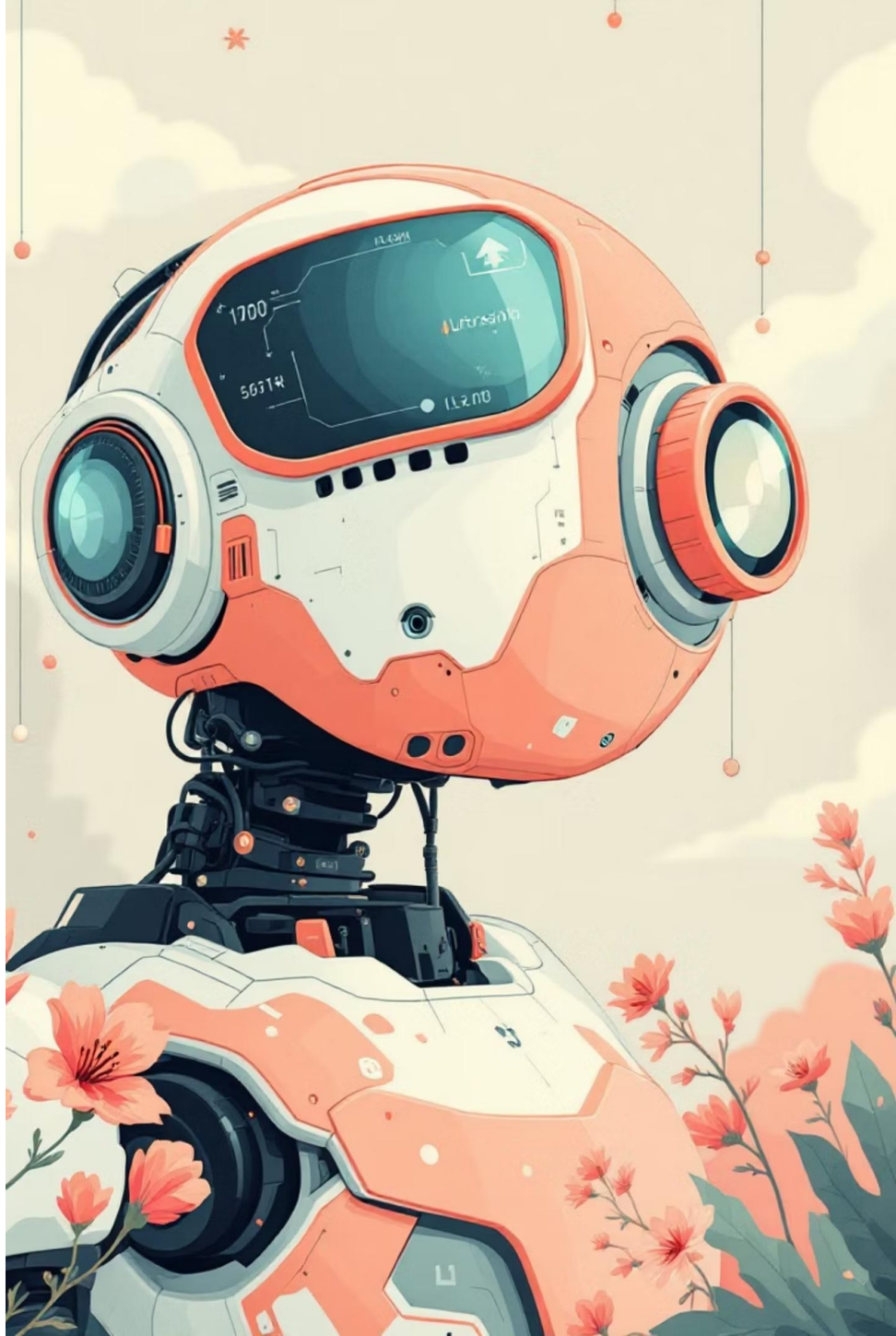
Project Overview

Core Functionality

Uses ultrasonic sensors to detect and follow a person at a safe distance. Equipped with MQ-2 smoke sensor for fire hazards, gas leaks, and smoky areas.

Safety Features

IR sensors detect edges like stairs or cliffs. Activates buzzer and LED for immediate alerts on dangers, blending robotics, sensors, and safety systems.



Hardware Requirements

Arduino Uno

Main microcontroller board.

Ultrasonic Sensor (HC-SR04)

For measuring distance from human and obstacle detection.

IR Sensors

For human direction tracking and basic obstacle detection.

Smoke Sensor (MQ-2)

For detecting smoke or harmful gases.

More Hardware Components

01

Motor Driver (L298N)

Controls direction and speed of DC motors.

02

DC Motors with Wheels

For robot movement.

03

Edge Detection Sensor

IR or light sensors facing downward to detect edges.

04

Buzzer & Red LED

For emergency alerts; servo motor optional for scanning.

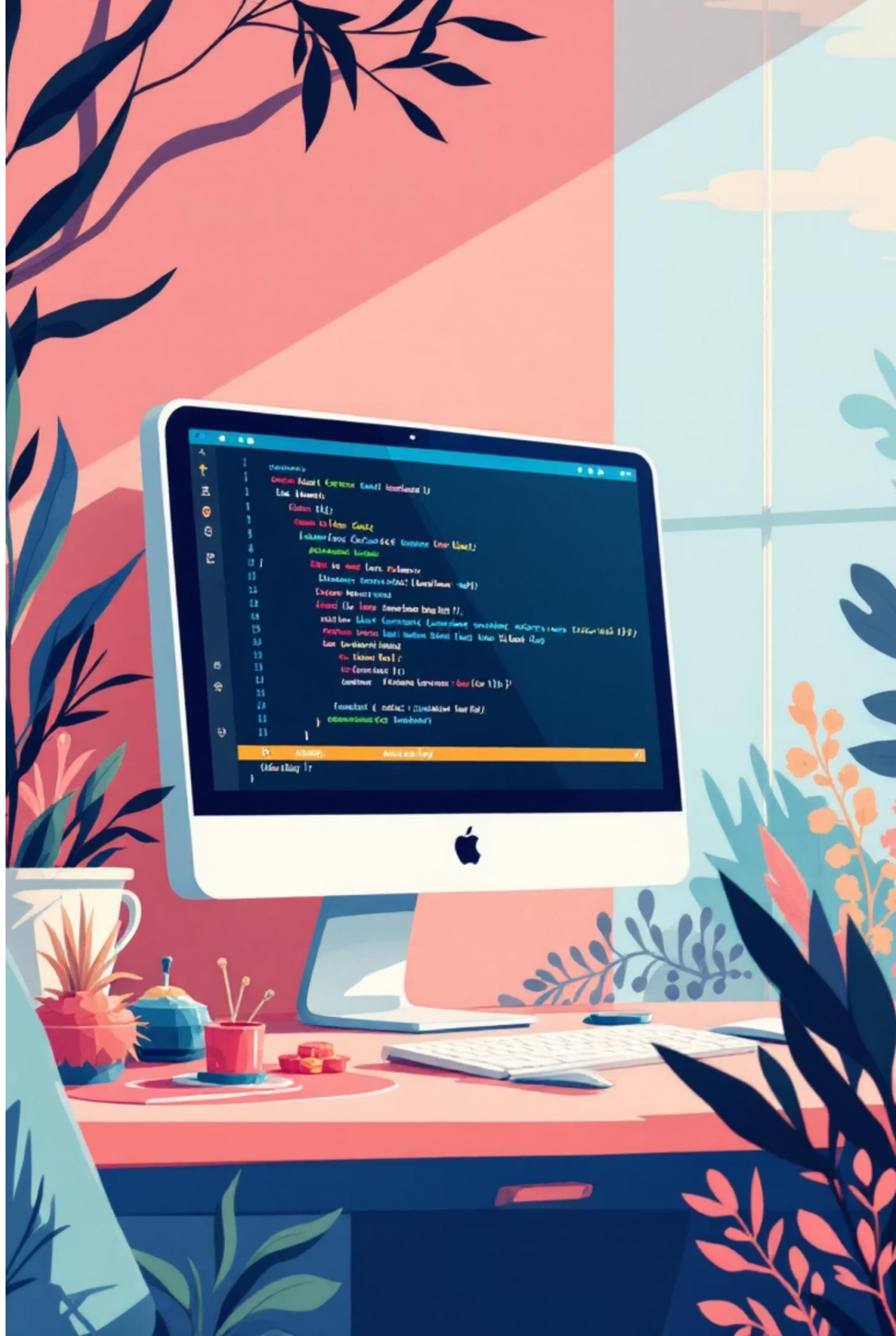
05

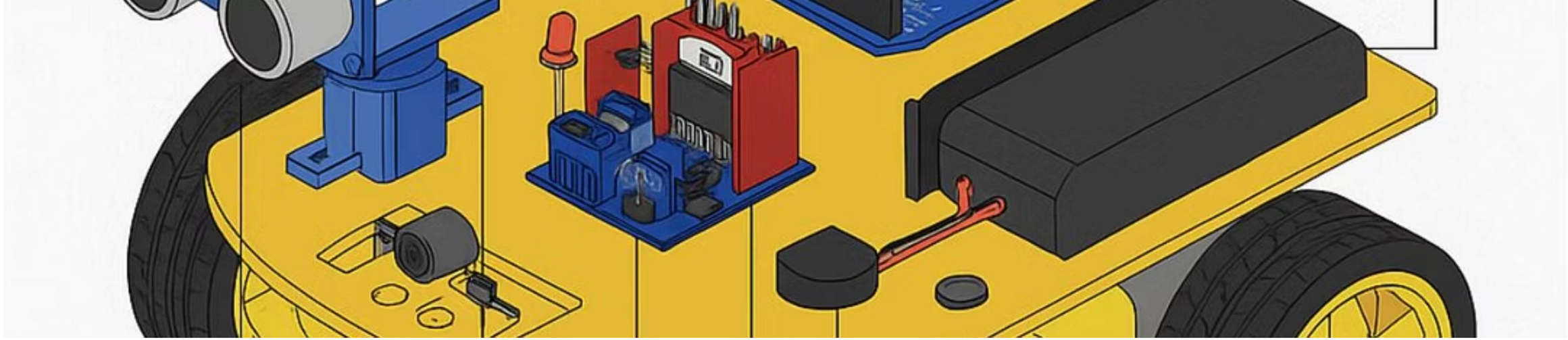
Battery Pack & Chassis

7.4V or 12V power supply; body for mounting components.

Software Requirements

- **Arduino IDE:** Write, compile, and upload code to Arduino Uno.
- **Tinkercad Circuits:** Simulate electronics, sensor inputs, and code.
- **CH340/CP210x Driver:** USB-to-serial for uploading to clones.
- **Libraries:** NewPing for ultrasonic; Servo.h for servo; MQ2.h for smoke; IRremote for IR/edge.
- **Design Tools:** TinkerCAD 3D/Fusion 360 for architecture; image tools for diagrams.





Architecture Overview

The robot integrates sensors for following, detection, and alerts in a cohesive system.

Expected Outcomes

For Children

Mobile guardian follows at safe distance, detects smoke/gas with MQ-2, alerts via buzzer/LED on edges like stairs to prevent falls.

For Elderly

Smart companion scans ahead for dangers, warns on smoke, gas, or edges; enhances independence and safety indoors.

Project Results

1

1. Following Mechanism

Ultrasonic sensors enable successful person following at secure distance.

2

2. Edge Detection

IR system prevents falls from ledges, table edges, stairs.

3

3. Smoke/Gas Detection

MQ-2 simulates emergencies by identifying gas or smoke.

4

4. Alerts

Buzzer and red LED activate on dangers for visual/auditory warnings.

5

5. Integration

All components function in unison as a safety assistant.

Applications & Conclusion

Key Applications

- Elderly Care: Follows and warns on gas leaks or falls.
- Child Safety: Monitors kids, detects smoke or fall risks in homes.
- Home Automation: Mobile patrols in smart systems.
- Future: Disaster response bots in smoke-filled areas.

Conclusion

PathPal combines ultrasonic following, MQ-2 detection, IR edges, and alerts into a low-cost safety assistant for homes, schools, elder care—proving basic tech protects vulnerable people.

Enhancing safety through innovative robotics.