# AUTONOMOUS GROUND VEHICLE FOR RECONNAISSANCE


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# INTRODUCTION

- A GROUND VEHICLE THAT MOVES AUTONOMOUSLY USING SENSORS.
- HELPS IN RECONNAISSANCE (SPYING / SURVEILLANCE) IN DANGEROUS AREAS.
- AVOIDS OBSTACLES AND SENDS LIVE VIDEO FEED TO THE OPERATOR.

# PROBLEM STATEMENT

- India and many developing countries face serious challenges in road condition monitoring and terrain inspection. Currently, these tasks are done manually, which makes the process slow, costly, and prone to human error. As a result:
- Potholes and road damages remain undetected for long periods, causing accidents and traffic delays.
- Municipalities lack real-time data to take timely action.
- Delivery and logistics companies face inefficiencies due to poor route conditions.
- In hazardous or remote areas, human inspection can be unsafe or impossible.

# PROPOSED SOLUTION

- TO ADDRESS THESE ISSUES, WE PROPOSE AN AUTONOMOUS GROUND VEHICLE (AGV) — A SELF-DRIVING ROBOTIC CAR CAPABLE OF NAVIGATING THROUGH ROUGH TERRAIN AND COLLECTING REAL-TIME ENVIRONMENTAL AND OBSTACLE DATA. THE AGV IS EQUIPPED WITH SENSORS THAT DETECT POTHOLES, ROCKS, TREES, AND OTHER OBSTACLES. IT CAN AUTOMATICALLY AVOID THEM WHILE SIMULTANEOUSLY RECORDING THEIR LOCATIONS AND TYPES FOR ANALYSIS. THIS TECHNOLOGY CAN BE APPLIED IN MULTIPLE SECTORS:
- CIVIL SECTOR: ROAD QUALITY MONITORING, SMART CITY INFRASTRUCTURE, AND DELIVERY ROUTE OPTIMIZATION.
- DEFENSE SECTOR (FUTURE SCOPE): RECONNAISSANCE, TERRAIN MAPPING, AND SAFE NAVIGATION IN HAZARDOUS ZONES. BY INTEGRATING AUTONOMOUS NAVIGATION AND DATA COLLECTION IN A SINGLE SYSTEM, THIS PROJECT PROVIDES A LOW-COST, SCALABLE, AND INTELLIGENT SOLUTION FOR SMART INFRASTRUCTURE AND FUTURE SELF-DRIVING SYSTEMS.

# OVERVIEW

- THIS PROJECT FOCUSES ON BUILDING AN AUTONOMOUS GROUND VEHICLE, OR AGV, WHICH CAN MOVE ON ITS OWN WITHOUT HUMAN CONTROL.
  IT USES SENSORS AND PROGRAMMING TO MAKE DECISIONS, LIKE AVOIDING OBSTACLES WHILE NAVIGATING.
  SPECIFICALLY, OUR AGV IS DESIGNED FOR RECONNAISSANCE — IT EXPLORES AREAS, GATHERS INFORMATION, AND SENDS IT BACK SAFELY, REDUCING THE NEED FOR HUMANS TO ENTER DANGEROUS ZONES.

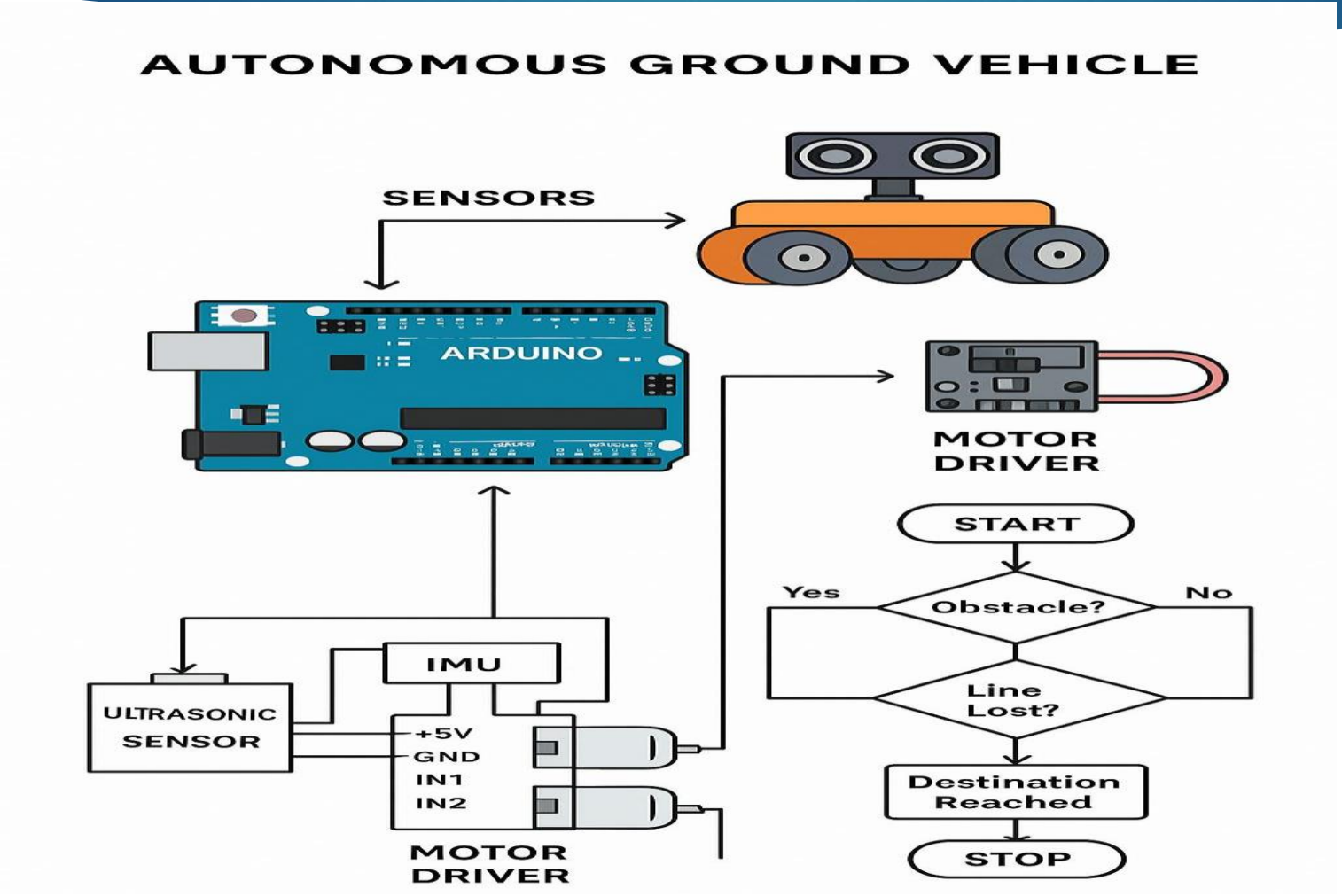
# OBJECTIVES

1. Autonomous Navigation : The vehicle must move without someone manually controlling it. It should decide the best path to move forward while avoiding obstacles.
2. Obstacle Detection and Avoidance
3. The vehicle uses sensors (like ultrasonic, infrared, LIDAR, or cameras) to detect objects in its path.
4. When it finds an obstacle (like a rock, wall, or ditch), it changes direction to avoid collisions.
5. Rough Terrain Handling ○ The vehicle should be able to move over uneven surfaces like dirt, sand, or grass. ○ This usually involves good wheel design, suspension, or treads for stability.
6. Reconnaissance/Data Gathering ○ The vehicle is equipped with devices to collect information, such as:
   - Cameras for video or photos.
   - Temperature or humidity sensors.
   - Gas sensors, if you want to detect hazardous materials.

# COMPONENTS USED

| COMPONENT | PURPOSE |
|---|---|
| ARDUINO / RASPBERRY PI | MAIN CONTROLLER |
| DC MOTORS + MOTOR DRIVER | MOVEMENT |
| ULTRASONIC SENSOR | OBSTACLE DETECTION |
| CAMERA MODULE | VIDEO STREAMING |
| BATTERY PACK | POWER SUPPLY |
| CHASSIS / WHEELS | BASE STRUCTURE |

# Arduino circuit diagram



# ADVANTAGES

- REDUCES RISK TO HUMANS IN HAZARDOUS AREAS.
- AUTONOMOUS MOVEMENT USING SENSORS.
- REAL-TIME VIDEO TRANSMISSION.
- PORTABLE AND ENERGY-EFFICIENT.
- CAN BE USED IN MULTIPLE DOMAINS (RESCUE, DEFENSE, INSPECTION).

# CONCLUSION

- THE AUTONOMOUS GROUND VEHICLE FOR RECONNAISSANCE SUCCESSFULLY DEMONSTRATES A COST-EFFECTIVE AND EFFICIENT WAY TO EXPLORE RISKY ENVIRONMENTS WITHOUT HUMAN INVOLVEMENT. IT CAN BE FURTHER ENHANCED WITH GPS NAVIGATION, AI-BASED OBJECT DETECTION, AND LONGER COMMUNICATION RANGE.