VIT-AP UNIVERSITY

AUTO-PROTECT +

A Smart System for Vehicle Safety and Security

Under the guidance of

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Identification of the Problem

Road accidents and vehicle thefts are major concerns worldwide, causing loss of lives and property. Despite advancements in vehicle technology, many issues remain unsolved, such as preventing accidents, ensuring driver alertness, and protecting vehicles from unauthorized access. These problems demand a smart and reliable system that can enhance safety and security for drivers and their vehicles.

Key problems:

- **Accidents Due to Collisions:** Vehicles often crash because drivers cannot detect obstacles in time or fail to control their speed.
- **Vehicle Theft:** Many cars lack proper systems to prevent unauthorized access or theft.
- **Drunk Driving:** Accidents happen when drivers are under the influence of alcohol.
- **Delayed Emergency Response:** When accidents occur, there is often no quick way to alert emergency services or loved ones.
- **Parking Problems:** Drivers struggle with parking due to poor visibility and lack of distance measurement tools.
- **Driver Fatigue:** Long drives make drivers sleepy, leading to accidents.

Title of the Project

Auto-Protect +: A Smart System for Vehicle Safety and Security

This project aims to protect drivers and vehicles with advanced safety features like obstacle detection, speed control, anti-theft systems, and accident alerts, offering a comprehensive solution.

Identification of Required Components

Hardware Components

- Ultrasonic Sensors (HC-SR04)**:** For collision detection and parking distance measurement.
- RFID Module (RC522): To enable the vehicle starter system with authorized access.
- Alcohol Sensor (MQ-3): To detect alcohol levels in the driver's breath.
- Accelerometer (ADXL345): For accident detection by sensing sudden impacts.
- IR Sensor **(**KY-032/TCRT5000)**:** For eye blink detection to monitor driver drowsiness.
- GPS Module (NEO-6M): To locate the vehicle and send location data in case of an accident or theft.
- GSM Module **(**SIM800L or SIM900A): To send alerts for accidents or theft notifications.
- Microcontroller (e.g., Arduino or Raspberry Pi): To process data from sensors and control actions.
- LCD Display (16x2 LCD with I2C Module): To show system status and warnings.
- Buzzer/Alarm: For alerts in case of theft or safety warnings.
- Power Supply: Battery or DC supply to power the system.

Software Components

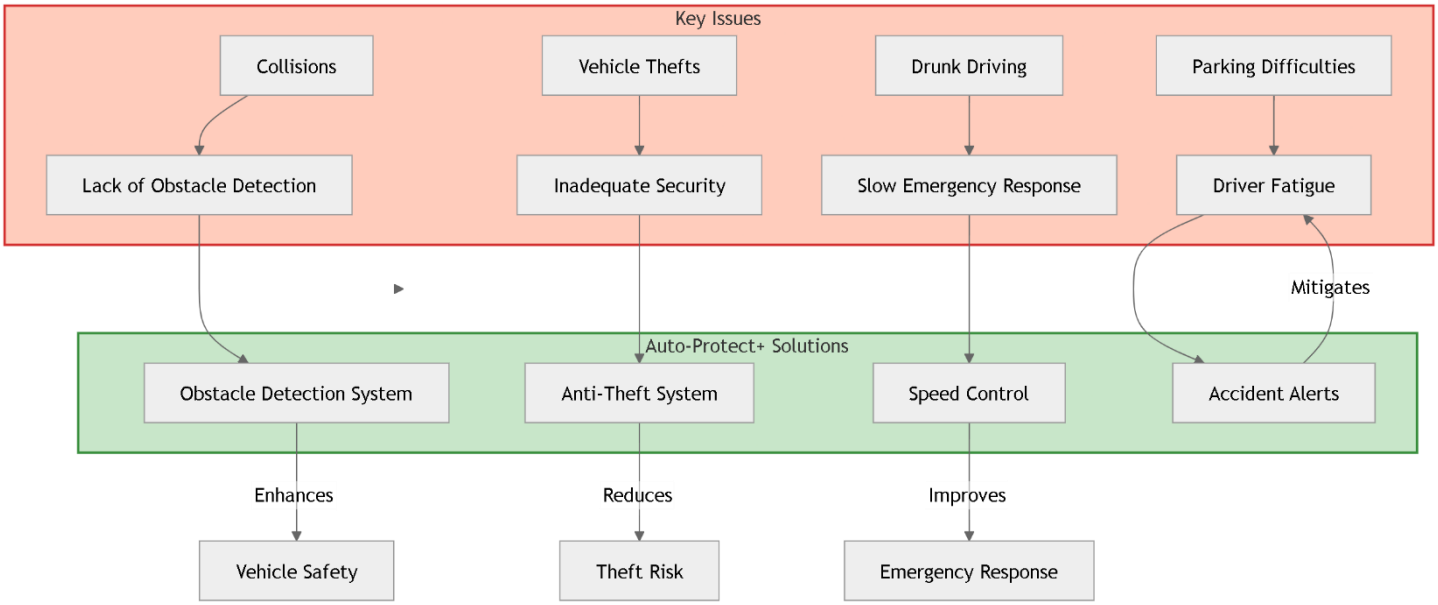
- Programming Languages: Python & Arduino IDE
- Mobile Application (Optional): To receive alerts.
- Communication Protocols: For GSM and GPS integration.

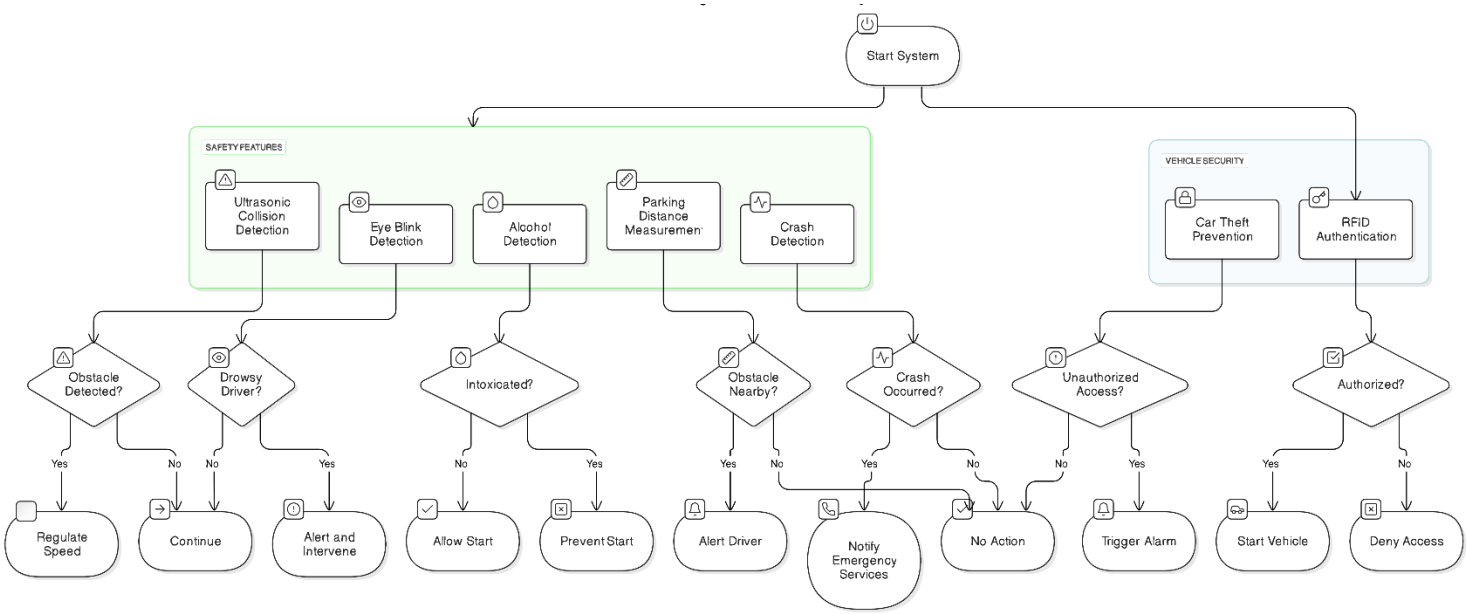
Additional Components

- Relay Modules (**5V Single Channel Relay Module)**: For controlling vehicle starter or ignition systems.

- Wires and Connectors: For interfacing components.

Flowchart


Key Issues
Collisions
Vehicle Thefts
Drunk Driving
Parking Difficulties
Lack of Obstacle Detection
Inadequate Security
Slow Emergency Response
Driver Fatigue
Mitigates
Auto-Protect+ Solutions
Obstacle Detection System
Anti-Theft System
Speed Control
Accident Alerts
Enhances
Reduces
Improves
Vehicle Safety
Theft Risk
Emergency Response


Start System
SAFETY FEATURES
Ultrasonic Collision Detection
Eye Blink Detection
Alcohol Detection
Parking Distance Measuremen
Crash Detection
VEHICLE SECURITY
Car Theft Prevention
RFID Authentication
Obstacle Detected?
Drowsy Driver?
Intoxicated?
Obstacle Nearby?
Crash Occurred?
Unauthorized Access?
Authorized?
Yes
No
Regulate Speed
Continue
Alert and Intervene
Allow Start
Prevent Start
Alert Driver
Notify Emergency Services
No Action
Trigger Alarm
Start Vehicle
Deny Access

Identification of Approximate Budget Required

Component	Quantity	Cost per Unit (₹)	Total Cost (₹)
Ultrasonic Sensors	2	150	300
RFID Module	1	350	350
Alcohol Sensor (MQ-3)	1	250	250
Accelerometer	1	400	400
IR Sensor	1	120	120
GPS Module	1	600	600
GSM Module	1	600	600
Microcontroller (e.g., Arduino/Raspberry Pi)	1	800/3000	800-3000
LCD Display	1	200	200
Buzzer/Alarm	2	50	100
Power Supply	1	500	500
Relay Modules	2	150	300
Wires and Connectors	-	200	200
Miscellaneous Costs	-	-	**500**
Total Estimated Cost	-	-	**₹7500**

Plan of Action

1. ***Initial Planning and Research.***

    - Identify the problem and finalize the project scope.
    - Research required components, tools, and technologies (e.g., ultrasonic sensors, RFID, alcohol detection).
    - Prepare a budget estimate and gather resources.
    - Design the system architecture and create initial schematics.

2. ***Component Procurement and System Design***

    - Procure hardware components and verify their functionality.
    - Develop detailed system schematics and wiring diagrams.
    - Start writing initial code for individual components (e.g., alcohol sensor, ultrasonic sensors).

3. ***Prototype Development and Integration***

    - Assemble the hardware components on a testbed (microcontroller, sensors, and modules).
    - Integrate sensors with microcontroller and test individual components.
    - Develop code for integrating features like collision detection, alcohol sensing, parking distance measurement, etc.

4. ***Testing and Debugging***

    - Test each integrated feature for functionality.
    - Debug and resolve hardware or software issues.
    - Conduct system-wide testing to ensure all components work together.

5. ***Final Documentation and Presentation***

    - Create documentation with project details, system architecture, and test results.
    - Prepare the final project presentation with a working prototype.
    - Discuss future enhancements and improvements.

Timeline of Progress

Phase 1: Review 1

Research and Initial Setup

- Identify the problem and finalize the project scope.
- Research required components, tools, and technologies.
- Prepare an approximate budget and gather resources.
- Procure hardware components and verify their functionality.
- Develop the system architecture and initial schematics.

Phase 2: Review 2

Development and Integration

- Begin hardware assembly (e.g., ultrasonic sensors, RFID, GSM).
- Write and test individual feature codes (e.g., alcohol detection, collision detection).
- Integrate hardware with microcontroller and test basic functionalities.
- Start building the accident alert mechanism and theft detection system.

Phase 3: Review 3

Final Development and Testing

- Complete the integration of all features (e.g., GPS, eye-blink detection).
- Conduct full-system testing and debug any issues.
- Implement the final design for a neat and functional prototype.
- Document the project, including system diagrams and testing results.