SMART VEHICLE CONTROL SYSTEM FOR SAFETY IN SCHOOL ZONES AND TRAFFIC MANAGEMENT

PROBLEM STATEMENT:

- Ensuring the safety of **pedestrians, particularly in school zones**, and enhancing overall road safety during night time driving are pressing challenges in urban traffic management.
- Vehicles that fail to stop under specific conditions - such as when a traffic light turns red, when a zebra crossing is activated near school areas, or when vehicle headlights breakdown at night - pose significant risks to pedestrians and other road users.

SOLUTION OVERVIEW:

- By implementing this automated safety system, it ensure vehicles stop when there is a red signal and also when it recognizes zebra crossings in school zones, and alert the driver and stops the vehicle if its light has no proper light intensity during night.
- This integrated approach will enhance road safety, particularly for vulnerable users such as children and pedestrians.

TECHNICAL APPROACH/STACK:

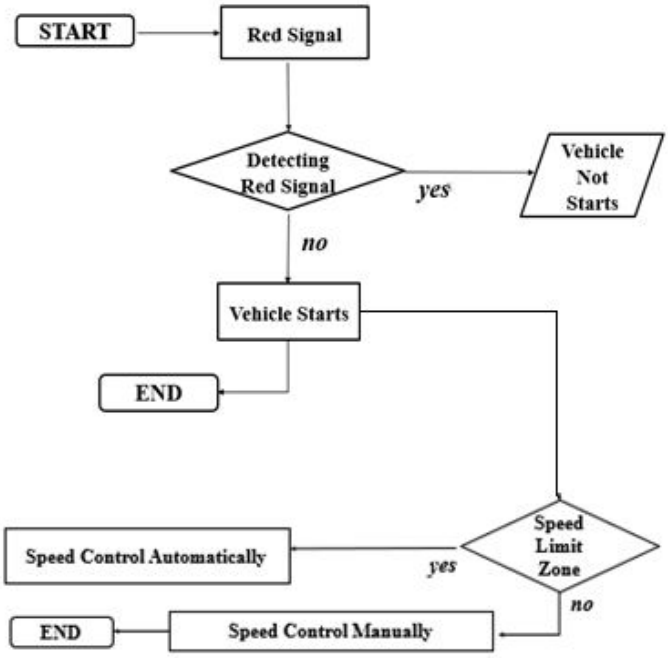
Hardware Requirements:

1. **Microcontroller: Arduino Uno or Mega**: Acts as the central processing unit to handle inputs from sensors and control outputs to motors
2. **Sensors:**
    a. **Speed Sensors**: Monitors the vehicle's speed (using ultrasonic or hall effect sensors).
    b. **Light Sensors**: Detects ambient light to determine nighttime conditions.
3. **Communication Module:**
    a. **RF Receiver/Transmitter**: Facilitates communication with traffic lights to receive their status (red, yellow, green).
    b. **GSM Module:** To send the messages
    c. **GPS Module:** Provides location data to manage speed limits in specific zones.
4. **DC Motors:**
    a. **H-Bridge Motor Driver**: Controls motor direction and speed using PWM (Pulse Width Modulation).

Software Requirements:

1. **Embedded Programming**: **C/C++:** For developing the firmware to control the microcontroller.
2. **Arduino IDE**: connects to the Arduino board to upload program and communicate with them.

WORK FLOW:



KEY FEATURES:

- **Red Light Detection**: Automatically stops the vehicle when a red traffic light is detected.
- **Zebra Crossing Detection**: Stops the vehicle at zebra crossings in school areas to ensure pedestrian safety.
- **Headlight Monitoring**: Stops the vehicle if the headlights are off during nighttime driving.

These features enhance safety, ensure compliance with traffic rules, and improve nighttime driving safety.