

#3 Smart Traffic Light Control System

Objective

Develop a traffic light control system that adapts to real-time traffic conditions.

Description

Use the suitable microcontroller to process data from traffic sensors and control light signals dynamically.

Hardware Required

1. CORTEX M4-STM32F405 Board
2. Ultrasonic Sensor
3. 7-Segment LED
4. Traffic Lights Signal Module
5. 4x4 Keypad
6. 16x2 LCD Display

Software Required

1. STM32 CUBE IDE

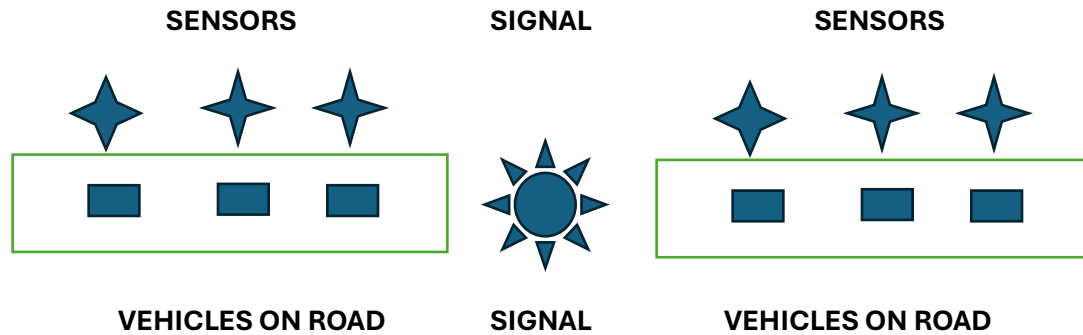
Expected Result & Test Cases

Security:

- The LCD will show "**Welcome**" message after Power On.
- When the user Press the * key, it will prompt "**Input Your Passkey**".
- The passkey must be entered followed by # key to Confirm.
- If the Passkey matches with the prefixed Passkey in the Source Code, then

- "Please Come In" must be Displayed and GREEN LED must TURN ON, else
"Wrong Passkey. Try Again!" must be Displayed and RED LED must TURN ON.

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Expected Result or Test Conditions

- 1) Verify Basic Functionality of Traffic Light Control System.
 - a. The traffic lights cycle correctly through Red -> Green -> Yellow -> Red with default timing intervals using Countdown Timer.
 - b. The Countdown Timer must be running in the Seven Segment Display during each phase.
- 2) Check Vehicle Detection at Junction.
 - a. Simulate the presence of vehicles (using some objects) that will reflect the ultrasonic sensor beam at a specific lane.
 - b. The corresponding lane's traffic light timing adjusted according to the traffic.
- 3) Power Failure Recovery
 - a. Power OFF the system.
 - b. Power ON the system.
 - c. After Power is restored, Signal should be in RED on both Sides for 10 secs.
 - d. After that the usual transitions must happen starting from the lane having more traffic.

Project Deliverables

1. Project Report containing
 - i. Flowchart
 - ii. H/w Circuit - Photos
 - iii. Code
 - iv. Output Screenshots/Photos
 - v. Live Expressions - Screenshots
2. Project Report to be Uploaded into LMS

Project Assessment

Project Activities	Weightage (%)
Architecture, Design & H/w Setup	25%
Development	25%
Testing & Debugging	25%
Documentation	25%