School of Science, Computing and Engineering Technologies

ENG200010

Engineering Technology Design Project

Assignment 5 Report

Project Title: Design of a Two-Way Traffic Light System Using NI-DAQ

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Declaration

I declare that this report is my individual work. I have not copied from any other student's work or from any other source except where due acknowledgment is made explicitly in thetext, nor has any part of this submission been written for me by another person.

Signature: Arnob

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Introduction

The design and construction of a two-way traffic light system utilising the NI-DAQ (National Instruments Data Acquisition) technology are thoroughly covered in this study. The goal of this project is to provide a continuous and effective traffic control system with exact cycle timings for each of the three-traffic light colour phases—Red (10 seconds), Amber (3 seconds), and Green (7 seconds).

Execution and Understanding of the Task

Task Understanding:

This project's effective completion started with a full comprehension of its complexities. The major criteria were developing a two-way traffic light system that could maintain a smooth flow of traffic while following predetermined timing intervals for each colour phase. The project's whole structure was built on this notion.

Selection and Integration of Components:

It took careful consideration to choose and integrate components throughout the hardware setup process. We linked LED indicators and, in certain cases, real traffic signals to the NI-DAQ system to build a trustworthy physical infrastructure. The establishment of a solid connection between the hardware elements and the NI-DAQ interface depended on this action.

Designing wiring and circuits:

The team made sure that all connections were safe and properly designed since they recognised the value of a well-organized wiring and circuit design. This involved giving considerable thought to the power needs, voltage levels, and signal paths. To avoid electrical risks and guarantee long-term dependability, appropriate insulation and protection measures were used.

Software Setup

Logic in Traffic Light Control

The LabVIEW software system was the project's beating heart. It was crucial to have a solid understanding of traffic light control logic. We used a while loop and a state machine method to do this. We were able to independently control the traffic signal statuses for both lanes of traffic thanks to this approach.

Control of Digital Output

The exact control of digital outputs using LabVIEW was at the heart of the software solution. A thorough grasp of LabVIEW's capabilities was necessary for this phase. Six outputs, representing Red, Amber, and Green lights for both directions of traffic, were expertly constructed. To make sure the system worked properly, it was crucial to map these outputs to the appropriate physical parts. Positive Pins are connected to **Red Line 0, Green Line 1, Yellow Line 2, Red Line 3, Green Line 4, Yellow Line 5.** And all negative pins are grounded.

Timing Control

It was essential to have a thorough grasp of timing management in order to precisely match the prescribed cycle times. To plan the time intervals for each traffic light condition, we used LabVIEW's timing functions like Wait (ms) and Wait (s). The smooth transitions between colours made possible by this granular control improved

traffic flow.

Safety and error-handling features

We incorporated reliable error management and safety features into the LabVIEW programme because we understood the importance of system dependability and safety. This strategy entailed creating fail-safe systems that treated faults or unforeseen situations kindly. The system's robustness was strengthened by these elements throughout continuous operation, averting any mishaps or traffic jams.

Continuous Operation

To provide continual traffic light management, the VI (Virtual Instrument) was carefully set up to operate continuously. We created a user-friendly interface with a Stop button so that users may manually terminate the programme when necessary. For the system to remain under control and to function safely throughout testing and operation, this functionality was crucial.

Conclusion:

In summary, this project served as an example of how to successfully design and build a two-way traffic light system utilising the NI-DAQ system. The success was supported by painstaking LabVIEW programming, exact hardware configuration, and a deep grasp of the project's needs.

Hardware integration, traffic light control logic, digital output management, timing accuracy, and error handling were all combined with LabVIEW to demonstrate the potential of NI-DAQ in practical applications. The end result was a traffic control system that was safe, dependable, and followed the required cycle periods.

This project serves as a reminder of how crucial job knowledge, meticulous execution, and effective error management are when creating intricate control systems. The compatibility of NI-DAQ with LabVIEW in practical engineering applications is demonstrated by the harmony between hardware and LabVIEW code, as well as by a user-friendly interface.

References:

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