Senior Design Project Proposal for Year 2023

***Real-Time Traffic Monitoring System***

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1. **Introduction**

Traffic congestion is a complex issue that exists in every metropolitan area around the world. According to the INRIX 2022 Global Traffic Scorecard, Las Vegas was ranked as the 22nd most congested city in the United States. The average Las Vegas driver spent on average 41 hours last year sitting in traffic [1]. A 2019 study conducted by the Texas Transportation Institute (TTI) found that nationwide cost of gridlock had grown to 153 million [2]. Traffic congestion not only wastes time and money but increases the likelihood of car crashes.

The Real-Time Traffic Monitoring System automatically detects vehicular and pedestrian traffic in city roads and sends the traffic information to a central location where algorithms are designed to help estimate traffic congestion and adjust the traffic lights based on real-time road congestions.

The main goal of the system is to minimize congestion and promote traffic flow, which will save time and money for individuals, as well as having a lesser impact on the environment. Improving traffic congestion will improve an individual’s ability to maximize their time in other activities, which can lead to higher productivity and happiness.

The Real-Time Traffic Monitoring System’s main functions are using computer vision to detect and count the number of motorized vehicles and pedestrians traversing a given road. A microcontroller is used to automatically control the traffic lights depending on traffic flow.

There are existing infrastructures that exist today, such as induction loops and cameras capable of monitoring traffic, but the Real-Time Traffic Monitoring System uses AI to determine the best way to keep traffic moving.

The main advantage of this system over the others is the ability to optimize traffic flow adapt to unexpected changes of traffic in a cost-effective manner.

1. **Proposed Design**

*Function description and breakdown*

The Real-Time Traffic Monitoring System utilizes a Yolov5 running on a Raspberry Pi and a camera to monitor traffic flow of both vehicles and pedestrians commuting through a given intersection. A microcontroller is used to adjust the traffic lights based on the data provided by the Raspberry Pi. The traffic data gathered from the Raspberry Pi is sent to a central location where the AI software reads the traffic data and determines the optimal flow of traffic through an intersection by changing the lights to keep traffic moving. Ultimately, the goal of this project is to improve city traffic by minimizing congestion and improving traffic flow.

*List of the functions.*

* Camera counts the number of vehicles and pedestrians commuting through an intersection.
* Microcontroller changes traffic lights depending on traffic flow.
* Machine learning algorithm to determine optimal traffic flow.

*Skills needed for the project.*

The skills needed for this project require electrical and computer engineering concepts such as machine learning for developing the AI to make traffic management decisions, computer vision for monitoring the flow of traffic and determining, and embedded systems.

*Table of employed standards:*

|  |  |
| --- | --- |
| Standard | Link or References |
| TBD | TBD |
| TBD | TBD |

1. **References**

[1] INRIX, “Scorecard,” *Inrix*, 2022. https://inrix.com/scorecard/

[1] “New Study Underscores Economy/Traffic Jam Link,” *Texas A&M Transportation Institute*, Aug. 22, 2019. https://tti.tamu.edu/news/new-study-underscores-economy-traffic-jam-link/