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EXTENDED ABSTRACTS BOOK

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INTELLIGENT TRAFFIC CONGESTION SYSTEM DESIGN

Muhammad Arif Isham, Puteri Sarah Mohamad Saad, Yusnira Husaini

School of Electrical Engineering, College of Engineering,
Universiti Teknologi MARA Shah Alam

E-mail: yusni458@uitm.edu.my

ABSTRACT

Road congestion has been an issue in big cities, especially during peak hours. Traffic congestion occurs when overflowing cars on the roads and lanes resulting in slower speeds, longer travel times and increased delays for drivers. A few key factors leading to traffic congestion, specifically in Kuala Lumpur, are inefficient traffic control, vehicle accidents, insufficient parking space, and road work. A non-effective traffic light system will create worse traffic congestion during peak hours in the city (Abdelfatah et al., 2015). Hence, a newly designed solution is developed to solve those problems. In this project, the focus is on user-centric traffic management by improving inefficient control of traffic. The aim is to improve the traffic light system in the city so that users can have a pleasant traffic experience. The theory is to install sensors near the lane to provide inputs to the smart traffic light. Artificial intelligence (AI) vehicle detection in traffic lights decides a reasonable duration of green light for congested lanes. Another innovative feature in the system is the Kuala Lumpur Intelligent Congestion (KLIC) System application that integrates traffic monitoring and short messages notification system. All these three features, KLIC apps, camera live feed video, and notification system, have been developed as proof of concept. The current traffic light system can drastically improve the city's road congestion because users can start planning their journey before leaving their home after viewing live feed video of the traffic.

Keywords: *road congestion, traffic light system, artificial intelligence, sustainable, innovative*

1. INTRODUCTION

The Kuala Lumpur Intelligent Congestion System (KLIC) project focuses on controlling human disaster risks by reducing congestion on the road, particularly in the city. This project is one of the Industrial Revolution (IR4.0) initiatives of the modern approach to controlling disasters by applying sustainable construction for society (Rossi et al., 2020). The project focuses on solving all three broad themes: the environment, society, and the economy. Artificial Intelligent technology is used for car detection by scanning the existence of cars, calculating the number of vehicles, and deciding the severity of the congestion. By combining Internet of Things technology, road users will have access to all data from an application, and they can watch the view of the camera on the road through their mobile phones. Hence, they can always be updated with the current road conditions. The integration of the microcontroller with the ultrasonic sensors in the system helps the users to get accurate signals and notifications when the road is calculated as congested.

2. METHODOLOGY

The design concept of an intelligent system for a traffic light and monitoring city center road congestion has been successfully developed. There are three parts, namely smart traffic lights with sensor support, artificial intelligence (AI) algorithm, and a full backend mobile application, are integrated as a new concept for an improved traffic congestion monitoring system (Lu et al., 2021).

Vehicle detection and statistics are of considerable significance to intelligent traffic management and control of the highway. With the popular installation of traffic surveillance cameras, a vast database of traffic video footage has been obtained for analysis. At a high viewing angle, a more-distant road surface can be considered. The object size of the vehicle changes greatly at this viewing angle, and the detection accuracy of a small object far away from the road is low. In the face of complex camera scenes, it is essential to solve the above problems and further apply them effectively. In this project, the object identification algorithm of artificial intelligence to multi-object tracking and vehicle counting are applied (Wei et al., 2018). It will give better accuracy in congested traffic rather than solely depending on the ultrasonic sensors. This integration will also give more technical details, such as the number of vehicles on the road. The tools used for vehicle detection are OpenCV. Android Studio is used in this stage as the IDE and the editor because it can merge both iOS and Android systems from the programming language code used in this project (Dart).

The apps installed by the users on their mobile phone work efficiently and manage to send short message notifications when the traffic is congested and opt for it and give users access to the live feed video camera to watch the current road condition. The current traffic system can be improved drastically with less road congestion in the city if this innovative system is implemented in Kuala Lumpur City Center because users can start planning their journey before leaving their home after viewing live feed videos of the traffic themselves (Liang et al., 2019).

3. FINDINGS

The Kuala Lumpur Intelligent Congestion System (KLIC) consists of three inputs which are ultrasonic sensors, cameras, and mobile app controller. The outputs consist of mobile notifications, LEDs, and live feed video (Cruz-Piris et al., 2018; Novikov et al., 2019; Rozlan, 2022; Gupta et al., 2020). The application shows that users can choose any location around Kuala Lumpur and set where they will receive notifications when there is bad traffic congestion based on their desired location.

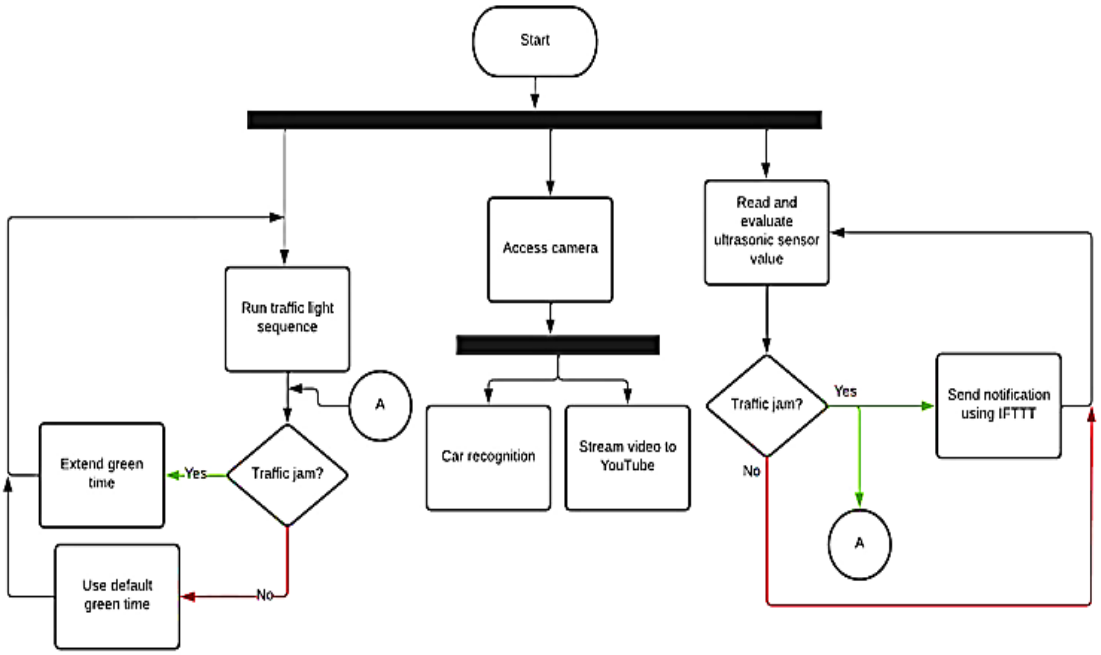

Figure 1 Flowchart of Intelligent Traffic Congestion System

Figure 1 shows the flowchart for the Kuala Lumpur Intelligent Congestion (KLIC) system. Firstly, this system will run a traffic light in sequence and at the same time, it will read and evaluate an ultrasonic sensor. If the sensor detects a traffic jam, it automatically will extend the green light time and send notification by using IFTTT. Otherwise, it will use the default green time. Access camera will function as car recognition at the traffic light, and then stream video to YouTube.

4. CONCLUSION

Reducing congestion is important as the number of private vehicles increases yearly. Vehicles on the road lead to pollution and indirectly harm our physical, emotional, and mental health. We have successfully developed a proof of concept of an innovative, intelligent traffic congestion system that can change traffic light timing based on traffic density. The integrated camera that streams to the internet allows the user to monitor the traffic condition from live feed video. Completed design apps to demonstrate monitoring in multiple locations also has been developed. With the innovation of traffic monitoring systems, the road users' experience in the city center will be better, creating a better quality of life for society.

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