DESIGN OF EMERGENCY PRIORITY TRAFFIC LIGHT CONTROLLER SYSTEM USING FPGA AND IOT BASED APPLICATION PLATFORM

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ABSTRACT

This project presents the Design of Field Programmable Gate Array (FPGA)-Based Traffic Light Controller (TLC) with Internet of Things (IoT). This approach is to control the traffics problem since traffic congestion is a phenomenon which contributed huge impact to the transportation system in Malaysia especially for the emergency vehicles. This problem has affected the emergency transportation such as ambulance to make way at the traffic light intersection which are always busy with many vehicles. This system was designed using FPGA based TLC with IoT platform to give priority to emergency vehicles especially ambulances at the traffic lights intersections. There are two objectives for this project which is to design and implement the Traffic Light Controller (TLC) using Field Programmable Gate Array at intersection roads and to notify the current Traffic Light System into more systematic way by implementing an IoT part in TLC. The IoT platform is use to connect the system with the emergency vehicles driver which it able to notify them the current traffics light state. The prototype of this project was simulated using Cyclone V and has been implemented on DE-10 Nano board as hardware. As for the IoT part, this project uses a Wi-Fi module ESP8266. This whole project was proven successfully on both part hardware and software.

ACKNOWLEDGEMENT

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CHAPTER ONE

INTRODUCTION

1.1   Research Background

Traffic light controller (TLC) is used to reduce or obviate disputes between various traffic streams called junctions in the shared region [1][2]. The aim of this research is to give priority to emergency vehicles especially ambulances at the traffic lights intersections. In particular, traffic lights are regulated with a fix-time control system on all primary highways, while the narrower streets are controlled by sensors autonomously. There will be two input sensors which is camera (picture) and microphone (sound) at the intersection's road. These sensors will detect the presence of emergency vehicles from a certain distance and turn the light to green.

There are significant drawbacks to conventional traffic control technologies which is because of the failure of traffic timing modifications signal for emergency vehicles to get through [3]. As for that, they have to queue and cannot make way to the required location. Therefore, a safe, fast and efficient traffic control system is necessary to control the traffic signal.

FPGA is an Integrated Circuit (IC) with an array of the same logic cells that the user can program. Many system designs that were previously assembled in custom silicon VLSI are now being applied in FPGA [4]. FPGA has many benefits rather than others controlling methods in terms of speed and performance. Besides, FPGA is better in efficiency, low in cost and reliability of the system. For this project, the Traffic Light Controller (TLC) will be implemented in hardware using Altera DE-10 board.