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CONTENTS

CHAPTER ONE: Mechatronics System Design and Applications

CHAPTER TWO: Modelling and Simulation

CHAPTER THREE: Intelligent Systems

CHAPTER FOUR: Instrumentation, Dynamics and Control

CHAPTER SIX: Speech and Image processing

CHAPTER SEVEN: Robotics and Automation

CHAPTER EIGHT: MEMS and Materials

CHAPTER NINE: MEMS and Materials

CHAPTER TEN: MEMS and Materials

CHAPTER ELEVEN: MEMS and Materials

Traffic Light Sequencing - an Element of Adaptability

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Abstract

Traffic light control system provides smooth and uninterrupted traffic flow in order to reduce accidents at junctions on heavily used roads. In this work a microcontroller is programmed to implement traffic light sequencing times, which are varying in response to values obtained from analog signals. These analog signals, assuming that they are representing traffic density, are digitized before they are used for calculating the GREEN light timings using an algorithmic approach. The YELLOW, RED, and GREEN traffic lights are shown by LEDs of corresponding colors in this project.

The value for YELLOW light is fixed, and the time for the GREEN light is set according to the analog values obtained from potentiometers. A novel way of sequence calculation of RED light is used from the above values of YELLOW and GREEN. In the beginning one of the four RED lights (Rb) LEDs to 2 seconds and GREEN light to zero, then the programming follows a recursive algorithm for calculating every subsequent value of RED based on the values of RED and next GREEN set as per values obtained from potentiometer values from the timing sequence preceding it.

1. INTRODUCTION

Traffic congestion has been a major problem throughout the world in the case of metropolitan cities. Thus, traffic control is one of the hot topics for the traffic authorities of such cities. Traffic light systems are installed at the major junctions on roads in cities and towns. Such systems are aimed at making the traffic flow smoother and reduce traffic jams caused by traffic in rushing hours of the day.

Two main categories of traffic light controllers are used currently, namely, predetermined time controller and traffic driven controller. Most of these traffic light systems follow fixed timing approach, which means the timings for the GREEN, and RED lights are fixed irrespective of the traffic volume in a given direction. Therefore, junctions with varying traffic density, commuters suffer from traffic congestion leading to unnecessary long delays in peak rush hours. Presently, efforts have been underway to make the GREEN and RED light timings responsive to the volume of the traffic at a certain time of a day.

Many approaches have been introduced in the design of traffic light controllers. For an optimal traffic light control for a single intersection, a model is available that can describe the evolution of the queue length in each lane as a function of time [1]. It discusses how optimal traffic switching schemes for such system can be determined. The arrival rates and the maximal departure rates of vehicles at the intersection will be compute traffic light switching scheme that minimize criteria such as average queue length, average waiting time and the effects of traffic congestion. It shows that for a special class of objective functions that depends strictly monotonously on the queue length at the traffic light switching time.