FUZZY LOGIC CONTROLLER FOR ELECTRONIC BALLAST FLUORESCENT LAMP WITH FIBER OPTIC

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ABSTRACT

Engineering is concerned with the understanding and controlling the materials and forces of nature for the benefit of mankind. Controllers are devices which create changes, known as system response according to feedback information. Controllers play the critical role of maintaining the desired conditions. Fuzzy techniques have been successfully used in control in several fields, and engineers and researchers are today considering fuzzy logic algorithms in order to implement intelligent functions in embedded systems. This "Fuzzy Logic Controller for Electronic Ballast Fluorescent Lamp with Fiber Optic" is to improve daylight transmission and illumination performance in a building. Presented in the project will use fuzzyTECH-MP Explorer, PIC16F873 and PIC16F84A microcontroller and electronic ballast. A microcontroller is used as it has the advantage of fast design time, no need to design & built interfacing circuits, no compatibility problems, can be interfaced to anything and easy to determined external peripheral timing.

The primary objective of the project is to control dimming ballast for a fluorescent lamp lighting system to balance with daylight system by utilize large diameter solid core optical fiber and daylight from windows. The fuzzy logic control, employing the Center-of-Maximun (CoM) defuzzification, is shown to be successful in maintaining the illuminance of a suitably sized model of room. The light sensor and phase detector are developed for controlling and combining daylight with electrical light. This project demonstrates the application of fuzzy logic control technique to improve the energy efficiency if the entire system is implemented in a room. In this study, the electrical lighting is supplement with natural sunlight in order to reduce electrical demand. The amount of the sunlight to be transmitted through optical fiber is depends on application. It is controlled by using intelligent system.

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CHAPTER 1

INTRODUCTION

1.0 Introduction

Nowadays, there is a wide range of fuzzy logic implementation alternatives. Fuzzy logic has been used intensively and successfully in practical any application area for intelligent control or data processing system. There also used as a tool to help the development of fuzzy systems for concrete and real applications. The author decided to achieve a software implementation on a low-cost general use microcontroller. To this purpose, the author chose the PIC16F873 and PIC16F84A microcontroller. In this project, the author used the fuzzyTECH-MP Explorer, which is a fuzzy logic software development system for PIC16FXX microcontroller devices. The fuzzyTECH-MP Explorer is a limited version of the fuzzyTECH-MP Edition that allows for the definition of fuzzy logic rules with a maximum of two input variables and one output variable. It is necessary to develop several assembly code routines to provide for system gains, analog to digital conversion, and some other functions required by the fuzzy control algorithm. The author used the MPLAB IDE software, which is an integrated development environment for the Microchip PIC16 family's microcontrollers, to construct, integrate this code with the fuzzyTECH-MP Explorer supplied kernel, and simulate it. MPLAB IDE was also used to implant the code into the chip. PIC is responsible to determine the amount of sunlight required to be transmitted through optical fibers. Not only that, PIC will decide whether the system has to use fully solar energy without electrical energy or solar energy with a certain amount of electrical energy. Light sensor will detect the natural sunlight from outdoor.

This project elaborates on the fundamental concepts and development of new parameters and algorithms for lighting control systems. Fuzzy logic is a problem solving control system to implement in systems. It can be implement in hardware, software or a combination of both. Fuzzy logic systems are rule-based systems in which a set of so-