AUTOMATED LIGHT INTENSITY CONTROLLER USING FUZZY LOGIC

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ABSTRACT (MALAY)

Kajian ini menerangkan tentang pelaksanaan fuzzy logic dalam merekabentuk pengawal cahaya berautomatik. Pengawal cahaya fuzzy ini mengawal lampu-lampu berdasarkan kepada bilangan orang yang terdapat di dalam sesebuah bilik. Objektif utama pengawal cahaya ini adalah untuk menunjukkan bagaimana fuzzy logic boleh meminimumkan jumlah penggunaan bilangan lampu-lampu dan juga mengurangkan penggunaan tenaga elektrik. Di dalam kajian ini, pengawal fuzzy logic telah dilaksanakan dan diuji untuk meramal tingkah laku sesuatu pengawal di dalam suasana cahaya yang berbeza. Pengujian dilaksanakan dengan memantau fungsi keanggotaan parameter. Bagi pengawal lampu konvensional, perubahan lampu-lampu tersebut adalah mengikut penentuan daripada pengguna. Jika pengguna terlupa untuk memadamkan lampu, maka lampu tersebut akan kekal menyala. Walaupun adanya pengawal lampu berautomatik, namun kebanyakan sistem tersebut hanya boleh mengawal keadaan on dan off sesebuah lampu tanpa mampu untuk menerima input yang dinamik daripada pengguna. Fuzzy logic menawarkan kaedah yang lebih baik berbanding pengawal konvensional terutamanya di dalam kes pengiraan jumlah orang dan jumlah keamatan cahaya yang diperlukan. Di dalam kajian ini, fuzzy logic mempunyai keupayaan untuk membuat keputusan bagi menentukan jumlah keamatan cahaya yang diperlukan dengan mengawal bilangan lampu-lampu yang terdapat di dalam sesebuah bilik. Pengawalan ini adalah berdasarkan kepada bilangan orang yang keluar atau masuk dari bilik tersebut. Bagi pengawal lampu konvensional pula, ia tidak mempunyai keupayaan untuk menangani keadaan ini. Jika keamatan cahaya yang diperlukan berkeadaan sangat terang, adalah lebih praktikal untuk membiarkan lebih banyak lampu terpasang atau "on". Bagi kes ini, adalah sukar untuk membuat keputusan menggunakan kaedah konvensional berbanding menggunakan pengawal fuzzy logic. Pengawal fuzzy logic membantu memudahkan tugas di mana ia berupaya menentukan bilangan lampu yang diperlukan bagi kes di atas. Kajian ini telah mencapai objektifnya iaitu untuk merekabentuk sebuah sistem fuzzy logic yang disepadukan dengan litar perkakasan yang menggunakan fuzzy logic untuk mengawal keamatan cahaya di dalam sesebuah bilik. Di dalam kajian ini, kajian kes menunjukkan pengawal fuzzy logic merupakan satu kaedah alternatif yang sesuai untuk menggantikan kaedah pengawalan konvensional. Ini kerana pengawal fuzzy logic mampu mengurangkan penggunaan elektrik dan membantu membuat keputusan di dalam menentukan bilangan lampu yang perlu dinyalakan.

ABSTRACT (ENGLISH)

This study describes the implementation of fuzzy logic in designing fuzzy automated light controller. The fuzzy controller controls the number of lamps lighted up based on the number of people inside the room. Its main objective is to demonstrate how fuzzy logic can minimize the number of lamps used and therefore reduce the electricity consumption. In this study, fuzzy logic controller has been implemented and tested to predict the behaviour of the controller under different light conditions by monitoring the membership function parameters. In a conventional light controller, the lamps change according to user's specification. The light will remain on if the user forgets to switch off the light. Even if an automated light controller exist, at most the system can only be controlled as on and off without being able to adapt with dynamic inputs. Fuzzy logic offers a better method than conventional control methods, especially in the case of counting the number of people and how much the light intensity is needed. In this study, fuzzy logic has the ability to make decision as to how much the light intensity is needed by controlling the number of lamps in the room according to the number of people who have entered or left the room. On the other hand, the conventional light controller does not have the ability to solve this kind of issues. It would be more practical to let more lamps "on" if the light intensity needed is very bright. A conventional method controller for this decision is difficult to find while fuzzy logic controller simplifies the task. This study has achieved its objective, which is to design a fuzzy logic system integrated with hardware circuit of automated light controller using fuzzy logic to control light intensity in a room. In this study, tests cases have illustrated that fuzzy logic control method could be a suitable alternative method to conventional control methods that could save electricity consumption and offers ease of use to human being.

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TABLE OF CONTENTS

LIST OF FIGURES

PAGE

LIST OF TABLES

CHAPTER ONE

INTRODUCTION

This section briefly presents the background, problem statement, objective, research question, significance and scope of study. The main idea of this study is to implement Fuzzy logic in lighting control and as an alternative method of conventional lighting method.

1.0 Background

A control system is a device or set of devices to manage, command, direct or regulate the behavior of other devices or systems. A control system combinations of components (electrical, mechanical, thermal, or hydraulic) that act together to maintain actual system performance close to a desired set of performance specifications. In recent years, control system dependability has received much attention with the increase of situations where the systems that are controlled by computer such as home control systems are used (Izumikawa *et al. 2005)*.Neil (2004) defines control system as an interconnection of components to form a system configuration which will be provided or (supply) the required system response. Control is automatic unless if it is not accomplished by manual (human) effect. One of the most common home control systems is lighting control.

The contents of the thesis is for internal user only

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