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A Review: Innovative Home Automation Using COB AC LED

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Abstract - An up-to-date overview of various technologies which are existing to provide home automation from different sources is provided. This review covers some evolving technologies in the field of home automation using COB AC LED. A separate review on home automation and COB AC LED is provided. The use of regular LED in various domains is more expensive than the newly developed driverless AC LED, the total cost to build a driverless AC LED and the life span is much higher than the regular LED devices. This paper compared the performance of different ways of home and different ways of controlling the appliances.

Key Words: Flex sensor, Bluetooth, Accelerometer

1. INTRODUCTION

Home domotic is a technique for enabling communication between the operator and the appliances via a specific module. A module is the component that connects the controller and the appliance. “Domotic” refers to both the use of machines in place of human labour and the process of developing a device, a procedure, or a system that executes itself without human intervention. A rapid and stationary control of appliances in a busy living schedule is provided by the Home domotic.

Using a home automation system, controlled devices are frequently connected to a central smart home hub. The user interface for system control can be implemented using wall-mounted terminals, tablet or desktop computers, mobile phone applications, or Web interfaces that can be accessed remotely over the Internet.

In the lighting sector, driverless AC LED light engines are already a standard piece of merchandise. To intelligently adjust the number of LEDs in a string during a power line cycle so that the voltage of the LED string matches the instantaneous power line voltage, nearly all of them use high voltage integrated circuit switching chips. Customers, however, are calling for more efficiency, reduced prices, and most importantly, less flicker in the light that is being produced. Using innovative circuits for AC LED light engines, Peter W. Shackle, president of the consulting firm Photalume, provides a non-dimming solution with lower costs, more efficiency, and greater light quality as perceived by the human eye.

2. LITERATURE SURVEY

According to the research done by [1], an AC-DC LED driver with an additional active rectifier was created in order to extend the lifespan and increase the efficiency of the LED. In order to absorb double-line-frequency power ripple from the ac supply, traditional ac-dc LED drivers need a huge storage capacitor, which may shorten the lifespan of LED lamps or raise the price of the lighting systems.
Regarding full-load efficiency, the recommended LED driver performs better than the majority of solutions. Moreover, Config. II's auxiliary circuit's efficiency loss at Vcb0 = 40 V is comparable to the value reached under full load, validating the use of low power processing on it. Be warned that the efficiency loss might, in the worst-case situation, amount to 2.8% at full load or 4.1% at half load. The efficacy may still be greatly improved, though. The conduction loss and the magnetic loss, for instance, can be further reduced by operating the auxiliary circuit in continuous conduction mode (CCM) as opposed to direct conduction mode (DCM).

In the study conducted by [2] they designed a direct AC driver to the led so that the additional components which are required in traditional LEDs can be removed hence an advantage over these LEDs can be taken. As they don't need big, expensive inductive components, direct AC LED drivers are more compact and affordable than traditional LED drivers. Current direct AC LED drivers, however, do not support TRIAC at low flicker rates. By creating a relationship between phase-cut ratio and brightness and utilizing always-on multi-arrays, this work tackles this issue and achieves both TRIAC dimmer compatibility and low percentage flicker without the use of a specific IC. A phase-cut/DC converter, a switch controller, a current regulator, and three LED arrays compensate for the suggested LED driver. Based on the outcomes of testing utilizing 15W

commercial LEDs, the driver produced a flicker rate of 18.6% at 120Hz while achieving a power factor of 97.4% and an efficiency of 84.7% at 120V. Nowadays, LED drivers must comply with the IEEE PAR1789 standard for the sake of switching to LEDs from conventional lamps and lower health concerns by a higher percentage of flicker. Moreover, a TRIAC dimmer-compatible LED driver can be widely employed for a variety of applications. Up until now the only method to obtain an AC LED driver directly with each of the aforementioned characteristics was to employ a bespoke IC. Instead of requiring a special IC, the proposed direct AC LED driver can achieve these qualities. Comparable to other direct AC LED drivers in terms of efficiency and power factor outcomes is this driver.

In the study conducted by [3], they designed highly reliable LED for high-temperature applications using the AC-Driver which drives the AC supply directly.

The mil-hdbk-217f technique was improved to explore the dependability and forecast the lifetime of various led driving technologies, and the results of accelerated life testing were validated in order to optimize the design for high reliability and a long lifespan. The study demonstrates that the ac-direct driving technology, which could run at higher temperatures and had long lived at the same temperature as the traditional switched-mode driving technology, was a better driving option for led luminaires used in high-temperature situations. This was based on the findings of an investigation of a switched-mode led driver and an ac-direct driving led driver
The study also explores how to build ac-direct drove circuits with longer lived and more efficient for high-temperature applications. This leads to the development of a 4000+ lumen ac-direct driving led luminaire that, in contrast to its switched-mode predecessor, had a lifespan that was 2-3 times longer at an ambient temperature of 65 °c and could operate safely at 80 °c ambient (15 °c higher)

The study conducted by [4] designed a COB LED driver which is a single-stage, non-isolated, and highly currently reliable COB AC LED.

This paper discussed about Both continuous conduction mode (CCM) and discontinuous conduction mode (DCM) architectures were designed in order to analyze current stresses in the semiconductors and overall efficiency (DCM). High-current cob led was driven using the single-stage non-isolated topologies. The drivers were anticipated to exhibit crucial traits when working with outdoor floodlighting, such as a high-power factor and a low harmonic distortion of the input current. Simulation experiments that used real intrinsic parasitic characteristics of commercially available semiconductors were conducted. The limits of these fundamental non-isolated high-current cob drivers were then thoroughly evaluated in light of the findings.to achieve more accurate results. The underlying structures were relatively confined in terms of durability, longevity, and stresses on semiconductors and the efficiency decreases, particularly when working with high current levels. Multilevel or interleaved topologies could be utilized to distribute current among several branches and improved heat distribution, enhancing efficiency, rather than finding a way to get around these limitations. Moreover, two-stage topologies had the advantage of coupling pfc and pc functions to two distinct converters, making it simpler to independently design for each stage. In contrast, the limits of the fundamental single-stage topologies utilized in high-power cob driving had been demonstrated using the information in this work as a helpful reference. It was important to note that the author's future efforts would be studied and recorded in these better structures.

In the study conducted by [5], they designed a COB AC LED with a small size, a long lifespan, high luminous effectiveness, minimal pollution, and quick response.

This research suggests two switching control strategies to lessen the disparity in energy usage across LED segments. One is to modify the order in which the LEDs are turned on and discover an ideal firing voltage that balances their energy usage using mathematical analysis. For experimental verification, a prototype 36 W AC LED driver is used. Methods for driving LEDs directly by AC voltage without the need for a switching power converter have been described in order to minimize the size and weight of the luminaire. The lifespan decrease issue brought on by electrolytic capacitors is avoided by this technique since it doesn't call for additional power conversion circuits. Yet, when the number of LEDs in a series rises, the input current's total harmonic distortion and output power decrease.

In the study conducted by [6], discusses the importance of simplifying human interaction with technology, particularly through automation, and the potential of voice-controlled systems in achieving this goal. The use of voice as an interfacing medium has several advantages, such as reducing the need for training, simplifying services, and increasing accessibility for individuals with disabilities. The article describes the Voice-controlled House Automation System, which utilizes an Android application and Arduino hardware to enable voice-controlled automation of electrical devices
This describes a home domotic system using a microcontroller device, Bluetooth module, and relay circuit. The system can be controlled through an Android-based application that utilizes voice recognition to switch appliances on and off. The microcontroller device receives instructions from the application through the Bluetooth module, which then signals the relay board to activate or deactivate the appliance. The article also mentions the possibility of using a GSM module instead of Bluetooth to control the system from anywhere with a mobile network

In the study conducted by [7], they proposed a Home domotic by Using Raspberry Pi And Android Applications. A user-friendly interface is necessary for setting up, monitoring, and controlling devices, and internet connectivity allows for remote control. The design and implementation of a remote home appliance-controlled system utilizing a raspberry pi and an android smartphone were discussed in this article. Users of the system may operate any household appliance from any location in the world. The publisher stressed the value of having remote access to one's house and note that a home's domotic system enables users to manage any electrical or electronic equipment in their residence or place of business whether they were physically there or not. This system was capable of supporting a broad variety of domotic household equipment, including fans, lighting, and other home appliances. The system made use of input from a raspberry pi model and the wi-fi network to monitor and operate various devices linked to the relay circuit.

The study conducted by [8] discusses the importance of simplifying human interfacing with technology and how automation, particularly voice-controlled systems, can increase efficiency while achieving simplicity. The article highlights the advantages of using voice as an interfacing medium, including ease of use and wider accessibility for people with disabilities. The article also mentions the use of an Android application as the user front-end and the use of Arduino and natural language processing to provide a holistic voice-controlled automation system for controlling electrical devices. Overall, the article emphasizes the potential for voice-controlled automation to humanize technology and increase its adoption in various spheres of life.

The system comprises an Arduino Uno microcontroller that processes user commands and switches devices and a control circuit that connects to the smartphone via Bluetooth. This technology enables users to have complete control over every device in their homes, making their lives easier and more convenient.

This paper [9] discusses the Smart Home project aims to utilize technology to reduce the cost of living while providing automated applications that optimize energy efficiency. The system allows for seamless control of the home's environment, regardless of whether the user is present or away. Through the implementation of this system, a range of engineering challenges can be explored, such as software programming, PCB design, Wi-Fi, TCP/IP protocols, web server logic design, and other aspects. This automation system offers insights into the challenges of software and hardware design and enables homes to perform at their best in terms of energy efficiency. The hardware interface module and the software communication module were the two key components of the low-cost, effective smart home system described in this study. The Arduino uno microcontroller, which serves as a microweb server and connects all hardware components, was the brains of the system. The microcontroller was the hub of all system communication and control. The smart home system had features like temperature, humidity, gas, and smoke sensors for monitoring the environment. Moreover, it provides switch capabilities for lights, fans, air conditioners, and other relay-connected household equipment. The system also had intrusion detection, which it provides via a motioned sensor. A web application or an android smartphone app could be used to operate the system The suggested system was a wi-fi-connected, Arduino-based home domotic system that may be operated via social media or an android app. The system was built to save money while enhancing the home's smart technologies and safety. The suggested system made use of a number of sensors, including an analog temperature sensor, a dht11 humidity sensor, a PIR sensor for motioned detection, and an mq6 sensor for flammable gas detection. In the home, electrical loads were switched and power plugs were connected using relay switches. Because there was no longer a requirement for cable connections between the Arduino board and the computer, the system was less expensive and may function independently. The wi-fi shield connects the system to the internet.

The study conducted by [10] discusses the concept of home domotic systems and how they are used to reduce human labor and save time and energy. The article highlights that the primary objective of home domotic systems has shifted from labor-saving machines to providing facilities for elderly and handicapped people to perform their daily routine tasks and control home appliances remotely. In this method, the article presents the design and implementation of a robust, low-cost, and user-friendly home domotic system using Bluetooth technology. The proposed system not only remotely controls the appliances but also monitors the sensors

In the study conducted by [11], discusses the design of a home control system that allows users to control home appliances using voice commands through their smartphones. The technology intends to assist parents and kids while consuming less power and human labor. The system, which is intended for a small, minimalistic home, uses a Firebase Web Database to receive instructions from the user's smartphone and transmit them to the microcontroller, which regulates the ON/OFF status of a number of devices, including the door lock and LED lights in the living room, bedroom, and bathroom. The suggested system has advantages over current systems, according to the comparative study in the paper that compares it to them. The developers of this system anticipate that it will provide insight into more smart home technology alternatives and be applicable to the creation of smart homes in all sorts of residences.

In the study conducted by [12], The concept of home domotic, also known as smart or intelligent homes, has been around for many years. Home domotic systems (HASs) offer a great opportunity for research in engineering, architecture, and computing. However, HASs can be complex and costly, making them less accepted by some users, especially the elderly and disabled. With the advancements in wireless technology, various types of connections, including GSM, WIFI, ZIGBEE, and Bluetooth, have been introduced. Bluetooth is a suitable option for home domotic due to its capabilities and the fact that most laptops and cell phones come with built-in Bluetooth adapters, reducing costs. Previous research has implemented microcontrollers, FM transmitters and receivers, GSM, and Bluetooth in HASs. However, some of these systems have limitations in terms of cost, compatibility with different phone operating systems, and the absence of physical electrical switches on the wall for control.

3. CONCLUSIONS

The consumption and production costs of conventional LED drivers are too high. The LED that was designed and passed down for this project is more inexpensive and power efficient, and its lifespan is also considerably longer than that of a standard one. To display one of these LED applications in a relevant environment such as a house or office, home domotic is one of the domains that heavily use LED lighting; as a result, conventional LED lights can be swapped out for more effective ones in daily life.

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