Multi-node Wireless Sensor Networking System on LED Lamp Fitting Application

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Abstract

In this paper, simple moving average (SMA) algorithm is applied on smart light emitting diode (LED) for power lighting consumption monitoring of a building. Simple moving average algorithm is used for smoothing current sensor data fluctuations. Combine with fuzzy logic controller (FLC) method with smart LED to reduce the power consumption, FLC is used to assist controlling the intensity of light inside the building. Input for FLC are light intensity and human movement inside the building. In this condition the power consumption is controlled and monitored. Real experiment has been performed under proposed algorithm. The experimental result shows that the power consumption of smart LED can be saved up to 55.95% with the error rate 5%.

Keyword: Smart LED, Fuzzy Logic, Power Monitoring, Simple Moving Average.

I. Introduction

Electrical energy is the main support for human needs. This is due to the fact that all productivity systems used in human life use electricity as a power source. Light is the most critical component of all the power sources that humans use to be productive. A reasonable example to state that lighting is necessary is that there is a day and a night in the human life cycle, which means that lighting is needed for human productivity at night.

The drawbacks can be seen as a lot of electrical energy are used due to human needs, for their own productivity. These kind of excessive energy use can harm the ecosystem, which is bad for the future. Furthermore, inefficient use of electrical resources may have a detrimental effect on manufacturing and business, costing large amounts of money. As a result, developing technologies to save electrical energy, especially for lighting control, is important.

One of the way to save electrical energy is by developing a Smart LEDs. Smart LEDs are emerging as important components that can support basic lighting control services as well as future building applications for human needs. Inside a building a smart LEDs system can be installed as the lighting system consumes more than 7₩% of the electrical power [1]. The system of the lighting could be one of the main factor to reduce electrical power consumption [2]. To make the lighting system more adaptable depends on the human needs, a usage management of the lighting system could be proposed.

In order to increase power production, the novel of smart LEDs has been proposed in recent innovations of smart LED. The smart LEDs principle is to reduce the power consumption of the lighting system by using a person sensor to detect movement inside the building. Because of the systems limitations, smart LEDs were proposed to reduce power consumption with another reference sensor in order to maximize power consumption smart LEDs using power consumption monitoring and intensity sensors. The contribution of this paper is by optimizing the energy consumption using SMA method for smoothing result of the sensor and combine with FLC method to control the light intensity inside the building.

II. Proposed Method

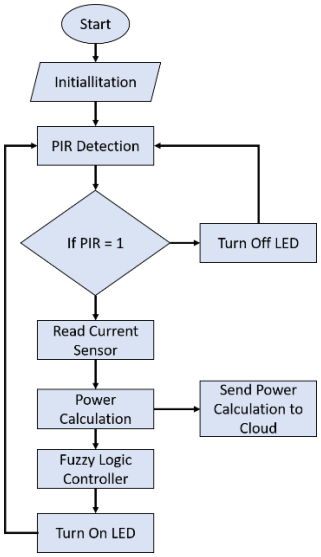

Figure 1 Flowchart Smart LED

In the proposed System, power monitoring is calculated the power usage of the LED then from power monitoring it will decided the intensity of LED. The input of FLC is intensity of LED. From the FLC the LED was controlled to keep the intensity of the environment. The power saving from simple moving average of data read from the current sensor and fuzzy logic controller to decided the intensity of LED. In this Fig. 1 the flowchart of smart LED is started from initialization. The PIR sensor normally "0" when there is no person inside the building and the PIR sensor value is "1" when the PIR sensor detect person inside the building. While the PIR sensor is "1", current sensor read the current consumption of LED. The power consumption referred to data from current sensor. From the power consumption calculation, the intensity of LED is decided, in this proposed scheme, the smart LED has 2 types of

intensity , first is 56 Lux for bright light and the second is 53 Lux for dim light. The fuzzy logic has 2 input intensity of environment and power consumption. The output of fuzzy logic is the intensity of light.

III. Simulation Result

In the following section, power consumption from ACS712 current sensor compared with power analyzer. As a reason SMA is effected the result of current sensor data, thus assumed the sensor data will smooth after processed on SMA. To make comparison at the same time, the current LED consumption measured by power analyzer device. In this fig 2 indicated the power value before entering the threshold KWh value the limit ranges from 27.1 Watt to 28.3 Watt, so the set point of intensity 56 Lux. When the energy value has gone through 0.141 KWh, the condition set points will change to 53 lux, so the power consumption also drops to a range of 25.3 Watts until 26.4 Watts.

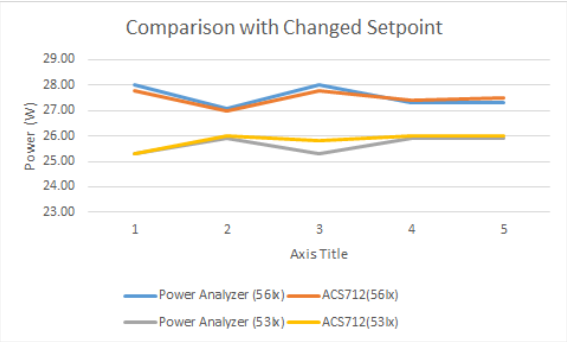

Figure 2. Graphic Result Smart LED

IV. Conclusion

This paper proposed a SMA algorithm for smart LED. The smart LED consumption monitored inside the building. Simple moving average algorithm is used for smoothing current sensor data fluctuations. Combine with FLC method with smart LED to reduce the power consumption. FLC is used to assist controlling the intensity of light inside the building, using the FLC the LED can control the dimmer. The real experiment has been performed under proposed algorithm. The result show using this method energy consumption is reduce and it is suitable for smart building in the future. The further work will improve to combine the energy consumption with prediction learning inside the building.

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