A Study on the Implementation Circuit for LED-ID Receiver Module

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Abstract. In this paper, We propose a new receiving method for an information providing system that uses LED-based Indoor Lights as the transmitter. We analyzed the improvements obtained when the conventional single-element photodiode used an amplification circuit. First, we discuss the receiver's circuit design when using basic amplification circuit. We show experimentally that by combining the Visible Light Communication system with the amplification circuit. it is possible to provide a transmit channel noise robust by using a visible-light LED at 60cm distance.

Keywords: LED-ID receive, Voltage amplification circuit, photodiode, amount of light

1 Introduction

Recent developments in LED technology have permitted the replacement of the conventional a fluorescent light with LED-based lights bulb. The principal advantages of the LED-based lights bulb are better power efficiency and much longer lamp life.
An information receiving system using LED based lights bulb and the photodiode receiver was proposed in [1].

This paper is organized as follows. We analyze the implement of the Photodiode receive module in Chapter 2. And then, we evaluate experiments of the photodiode receive module in Chapter 3. Finally, we make the conclusion of this paper.

2 The implement of the Photodiode receive module

In this paper, we select PIN Photodiode of high reaction rate to implement the receiver. Therefore, receiving circuit for Photodiode is designed through the Pspice simulation for based circuit. We built the designed circuit and experimented to identify the characteristics. We implement the final receiving circuit suitable for visible light communications.

It should be amplified by the output of the voltage for control a small amount of electrical current that occurs in the Photodiode. Also, the photodiode is possible to measure a voltage of up to 50mV. However, it is quite difficult to receive the VLC communication data by a small amount of voltage 50mV. Therefore, we implemented current and voltage two-stage amplifier circuit through amplification using Op-amp.

Amplification circuit is shown in Figure 1.

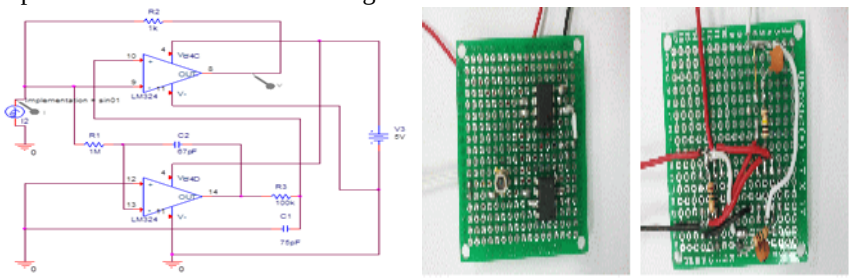

Fig. 1. The implement of Amplification circuit using the OP-amp

The implemented receiver is able to be configure the digital amplification circuit by the input data that is the minimum voltage of 0.1mV in the photodiode. In Figure 1, the photodiode and the implemented a two-stage amplification circuit are experimented to obtain data to receive the difference in the amount of light the LED from the oscilloscope.

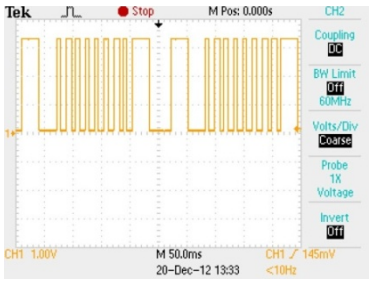

Fig. 2. The experiment of light on / off data

There is not the output signal the implemented the circuit when light is not incidence. You are able to see that the representation which case the incident light is amplified by a voltage of approximately 4.8V. Also, the proposed circuit was installed 1MΩ resistance at feedback roof for adjust to the changes in amount of light between the transmitter and receiver. Therefore, it was possible to adjust the amount of light by distance through the feedback resistor.

3 The experiment of the photodiode receive module

The results of transmitter and receiver using the signal generated by the characters is shown in Figure 3.

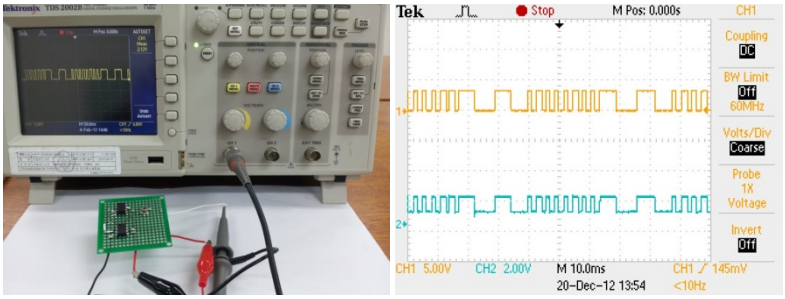

Fig. 3. The implement of receive module and the result of data

As shown in Figure 3, we confirmed that received data matches the transmitted data from the output. We have demonstrated the effectiveness of the VLC receiver through the experimentation and implementation of the receiver. Therefore, it is able to transmit a data of variety such as text, information data and sound sources.

4 Conclusion

In this paper, we introduced the implementation circuit for LED-ID receiver module. Our results in real indoor environments demonstrate the potential of the proposed the LED-ID receiver module. We are able to control the visible light communication of the proposed LED-ID modul. Our experiments show that the proposed approach is more general and more applicable in real indoor environment. In the future, we are interested in incorporating our method in more general building environments.

Acknowledgments. This work has been supported partially by 'Broadcasting-Communications R&D Program' of Korea Communications Commission/Korea Communications Agency (No. 11911-01111).

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