

A Sliding Lamp for Room Lighting

Lianly Rompis

Electrical Engineering Study Program
Universitas Katolik De La Salle Manado, Indonesia

Kristian Dame

Electrical Engineering Study Program
Universitas Katolik De La Salle Manado, Indonesia

Ronaldo Rottie

Industrial Engineering Study Program
Universitas Katolik De La Salle Manado, Indonesia

Steven Pandelaki

Informatics Engineering Study Program
Universitas Katolik De La Salle Manado, Indonesia

Victori Polly

Electrical Engineering Study Program
Universitas Katolik De La Salle Manado, Indonesia

ABSTRACT

Room lighting is very important because good lighting will nourish our eyes and minds when reading so that what is read can be applied correctly. Reading activities will not feel tiring, but rather fun for everyone, especially families and children. Reading is one of the main activities of humans that will continue needed for generations. Poor lighting will hamper the human ability to understand and recognize the development of science and technology in order to improve living standards and economic prosperity. So far, the lighting produced by humans with the creation of electricity and lamps has been very useful in helping human works, especially in helping to create good lighting for the needs of the learning process. Technological developments and the current era of the Industrial Revolution 4.0 require energy efficiency and proper treatment in helping the order of human life. There have been many technologies, methods and procedures created to support the advancement of electricity and the development of alternative energy. This paper describes the basic concept of designing a sliding lamp prototype for room lighting which is expected to contribute to science and technology and can offer good solution for creating better lighting according to the needs of society, institutions, and industry. The basic concept of our research will be further developed into a further concept by the Research Lecturers Team of the Faculty of Engineering, Unika De La Salle Manado. The research methodology is literature study, diagrams and drawings design, circuit design and simulation. The results provide something positive for future works that can be further developed and perfected.

Keywords: Sliding Lamp; Shifting Lamp; Room Lighting; Study Room; Lamp Installation.

INTRODUCTION

Considering the importance of human needs for lighting and the essential role of lamp in supporting the need for reading and learning, our team conducted research which has a relationship with study room lighting design using logic circuit [1, 2].

Several studies on lighting have been carried out previously by several lecturers and experts in the field of Electrical Engineering, which they conducted a study of efficiency, the comparison of the used lamps and the design of the layout of the lamps on the ceiling of the room to provide good and strong lighting that supports the implementation of practicum in the laboratory [3, 4, 5].

In conclusion, it is obtained that the approach/simulation to perform power calculations and the placement of strong points of lamps is very appropriate to do, as an approach that has an analysis of the strength of light with a profile diagram of the intensity of light [3]. Other studies that have been carried out are also related to the analysis of the light intensity of colored lamps in a room with white walls and the analysis of electric power absorption on the walls of a colored room [4, 5].

Those studies were conducted to create better lighting and energy saving lighting systems for the learning process [6, 7]. The design concept for our research was seen from a little bit different perspective but hopefully can complement the previous research where we suggest that good lighting can be generated from the position of the lamp that approach the subject or object in the room [8, 9-12].

That is the reason why this research will design a prototype of a sliding lamp for room lighting. Lamp can be slid or shifted according to its track and creates a better lighting for learning process.

RESEARCH METHOD

Based on the research method in references [4,5], we made a theoretical and analytical approaches through Literature Study, Diagram and Picture Design, Circuit Design, and Simulation.

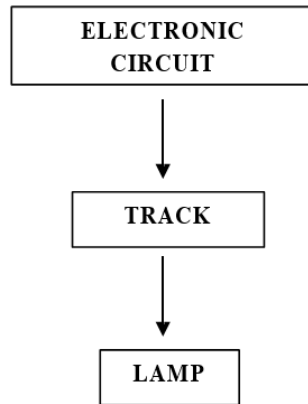


Figure 1. Sliding Lamp Block Diagram

For basic concept for our prototype, we use lamp as main component, and track together with electronic circuit as the supporting components. The block diagram for the sliding lamp design is shown in figure 1.

The transfer of lights requires a path or track that is designed according to the size of a room and lighting needs. An electronic circuit is needed to move the lamp so that it moves along the track and stops at the desired position.

The shape of the track can be different, and the size varies depending on the shape of the space and lighting needs. In figure 2 to figure 6 we describe the choices of track forms that considered to be designed for room lighting.

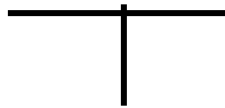


Figure 2. Horizontal and Vertical Line Track

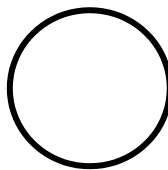


Figure 3. Circle Track

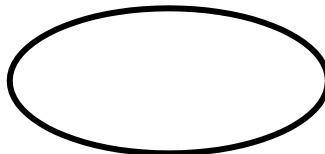


Figure 4. Ellipse Track



Figure 5. Rectangular or Square Track

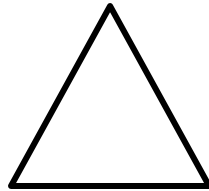


Figure 6. Triangle Track

The size and selection of the track depends on the size of the room and lighting requirements (e.g., position of tables and chairs, location and display of the LCD projector, front of the reader, and so on).

The selection of a suitable track and according to needs must also be considered along with the availability of supporting electronic components and flexible track construction.

For example, if the study room is rectangular in size and has 2 (two) reading areas or tables that are next to each other and parallel to each other, then using only a lamp and an electronic circuit, the position of the lamp can be shifted or slid following a straight-line trajectory.

RESULTS AND DISCUSSION

After conducting a literature study to understand more about electricity for lighting and room lighting, we chose a straight-line trajectory or horizontal line track for our initial research track. The first step we took to start the design was to design block diagrams and drawings for room lighting.

System Block Diagram

Given in figure 7, we can see from the system block diagram that there are several supporting components, including a microcontroller that functions as a data processor. The microcontroller is Arduino. This microcontroller is an open source, so it is free to use. The voltage source required for the microcontroller is 5–12-volt dc (direct current).

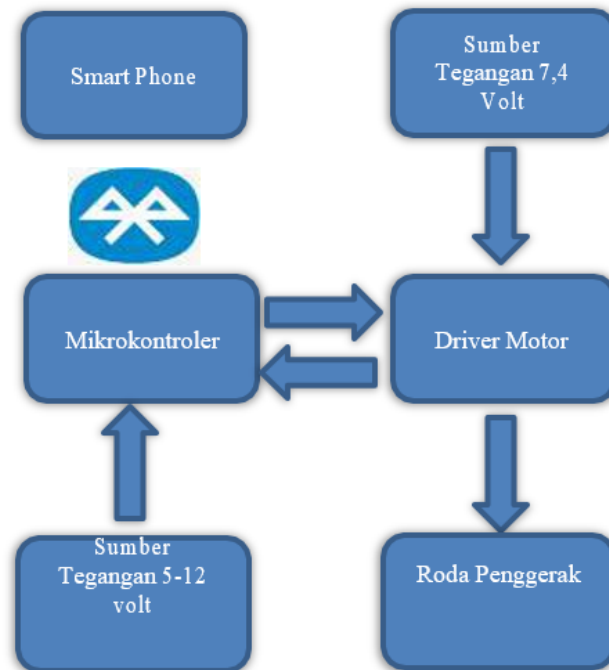


Figure 7. System Block Diagram

The motor driver connected to the microcontroller functions as a driver of the actuator or wheel in the system. The motor driver itself requires a voltage source of 7.4 volts dc to be able to move the wheels. This system uses a Bluetooth network that works at a frequency of 2.4 GHz. The Bluetooth network is a medium that connects the microcontroller with smart phones, where the control system can be carried out using a smartphone remotely within a range of ± 10 meters.

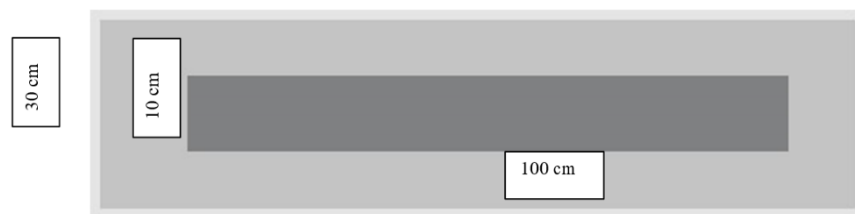


Figure 8. Test Arena

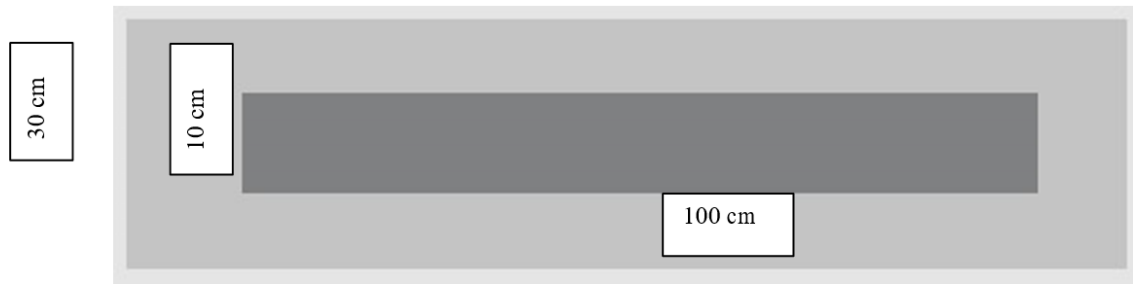


Figure 8 shows the design of the sliding lamp system test arena. The test arena was made of triplex with a length of 100 cm and a width of 30 cm, which has an inner box hole with a width of 10 cm

MATERIALS AND TOOLS

Several materials and tools were selected and chose to build the test arena and the electronic circuit, such as triplex wood, paint, microcontroller Arduino, power supply, lamp with fitting, driver motor, wheel, Bluetooth, smartphone, and cable.

System Design

Figure 9 shows the test arena together with lamp fitting and lamp itself that can move according to instructions from controller.



Figure 9. Prototype of A Sliding Lamp

Number 1 in figure 10 shows the driver of motor (dc actuator) and the wheel at sliding lamp system.



Figure 10. Motor and Wheel

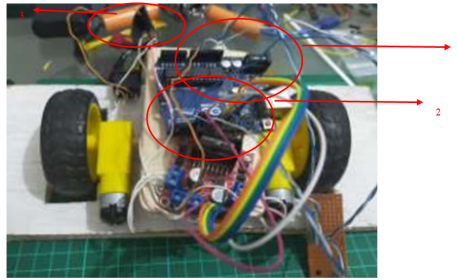


Figure 11. A Robot of A Sliding Lamp

Figure 11 above is a display of sliding lamp robot. From the figure, number 1 is a microcontroller that functions as a data processing. Number 2 is a driver motor and number 3 is power supply. The power supply for the design is a series of battery 18650.

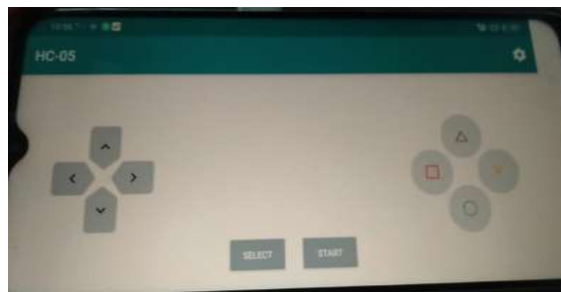


Figure 12. Sliding Lamp System Controller Testing

Figure 12 shows the display of controller application on sliding lamp system. This application is a supporting application for Bluetooth HC-05 and still can be modified according to system requirements.

CONCLUSION

In this paper, the new design of room lighting model has been generated and could be designed with line track and electronic circuit. The design could support better lighting where the lamp installation becomes flexible and energy saving because can be moved or slid to another lamp nodes according to track construction model. This research can be developed more advance in the future by Faculty of Engineering Team, Unika De La Salle Manado for a complex track prototype such as ellipse or circle.

References

- [1]. Budiharto, W. *Elektronika Digital dan Mikroprosesor*. Yogyakarta: Penerbit Andi, 2005.
- [2]. Sangadji, E. and Sopiah. *Metodologi Penelitian: Pendekatan Praktis dalam Penelitian*. Yogyakarta: Penerbit Andi, 2010.
- [3]. Joewono, A., R. Sitepu and P. Angka. *Desain Sistem Penerangan Ruang Laboratorium yang Efisien dalam Pemakaian Energi*. Prosiding Seminar Nasional Riset dan Terapan ke-7. Kupang: Universitas Widya Mandira, 2017. p. 93-102.
- [4]. Sampebatu, L., and S. Mahmud. *Analisis Intensitas Cahaya Lampu Berwarna dalam Ruangan Putih pada Prodi. Teknik Elektro UAJM*. Prosiding Seminar Nasional Riset dan Terapan ke-7. Kupang: Universitas Widya Mandira, 2017. p. 173-180.

-
- [5]. Mahmud, S., L. Sampebatu and W. Zamara. *Analisis Serapan Daya Listrik pada Dinding Ruangan Berwarna*. Prosiding Seminar Nasional Riset dan Terapan ke-7. Kupang: Universitas Widya Mandira, 2017. p. 181-192.
- [6]. Saputro, A.H., C. Imawan. *Local and Global Human Activity Detection for Room Energy Saving Model*. 2016 International Conference on Advanced Computer Science and Information Systems. 2016. P. 413-416.
- [7]. Wiśniewski, A. *The Calculation of Energy Saving in use Light Management Systems*, 2018 VII. Lighting Conference of the Visegrad Countries. 2018, p 1-4.
- [8]. Mercatelli, L., et. al. *Implementation and Test of a LED-Based Lamp for a Lighthouse*, International Journal of Photoenergy. Hindawi Publishing Corporation, 2014. p.1-6.
- [9]. Xiaocui, H. *Design of New Intelligent Bedside Lamp*, Proceedings of the 2019 3rd International Conference on Computer Science and Artificial Intelligence. USA: New York, 2019. p. 322–326.
- [10]. Kim, J., J. Seo, T. Han. *AR Lamp: Interactions on Projection-based Augmented Reality for Interactive Learning*. Proceedings of the 19th international conference on Intelligent User Interfaces. USA: New York, 2014. p. 353–358.
- [11]. Chenghao, Z., and Ling Long. 2021. *Design of Intelligent Management System for Study Room*. 2021 2nd International Conference on Artificial Intelligence and Information Systems. USA: New York, 2021. p.1–5.
- [12]. Gagnon, H., S. Creem-Regehr, J. Stefanucci. *Virtual Room Re-Creation: A New Measure of Room Size Perception*, ACM Symposium on Applied Perception. USA: New York, 2021. p.1–10.