University of Moratuwa

Department of Electronic & Telecommunication Engineering

EN2074 Communication Systems Engineering

EN2160 - Electronic Design Realization

Conceptual Design Report

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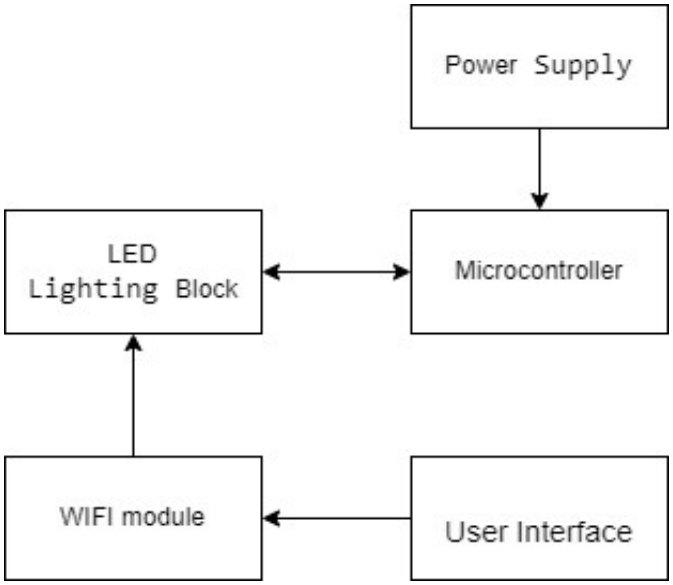
Introduction

This report aims to provide a comprehensive and detailed overview of the conceptual design for a mood lamp product. The design includes three potential functional block diagrams and three enclosure designs, which will be evaluated and refined based on specific criteria. Additionally, a user survey was conducted to gather valuable insights on user preferences, which will be considered in the modified functional block diagram and enclosure design. The subsequent sections of this report will present the findings, evaluations, and selection process, taking into account a set of comprehensive evaluation criteria for both the functional block diagrams and enclosure designs. By following a systematic approach, the most suitable design that aligns with user requirements and addresses the functional objectives of the mood lamp will be identified and recommended.

Functional Block Diagrams

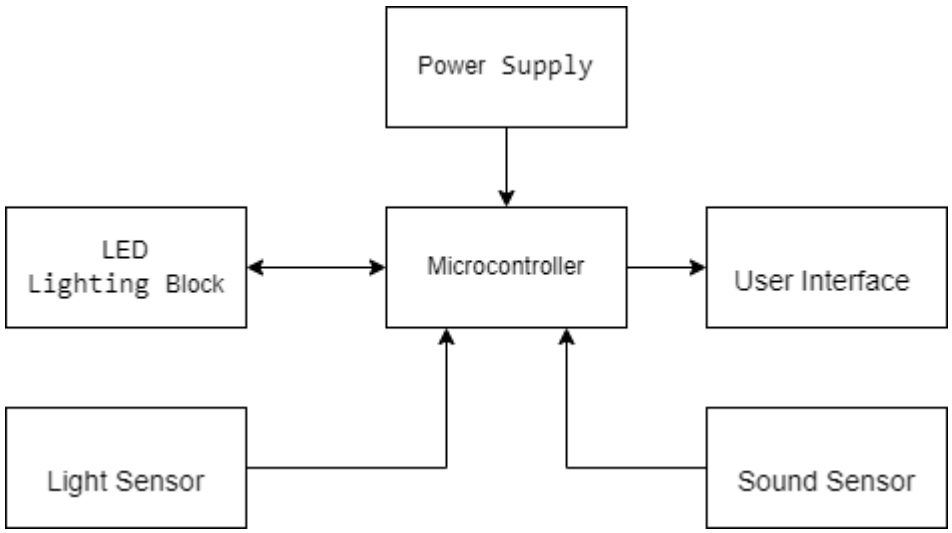
Design 1:

This design features a power supply for the mood lamp, a microcontroller unit that controls the operation, an LED lighting block with RGB LEDs and LED driver circuitry, a user interface block for user interaction and an optional Wi-Fi module for internet connectivity and remote control capabilities.



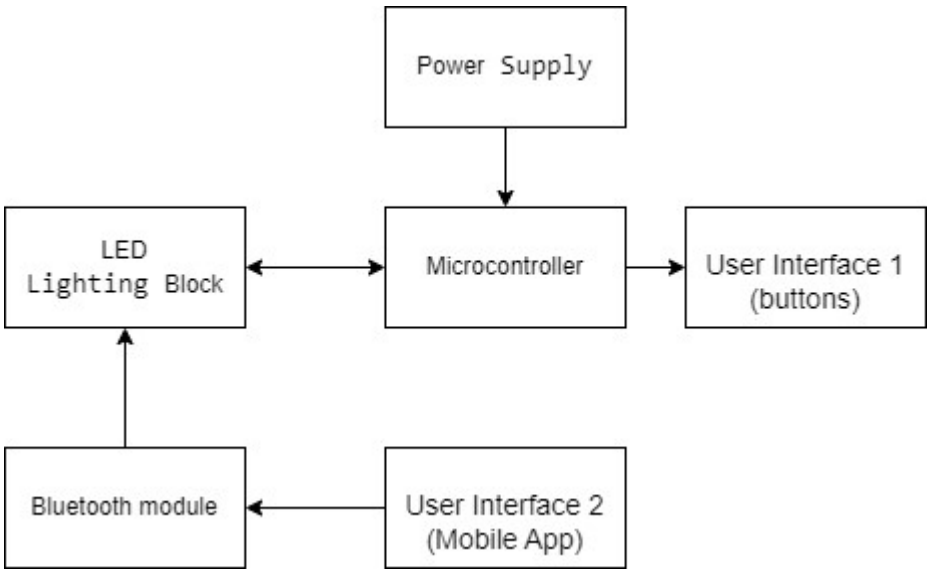
Design 2:

This design features a power supply for the mood lamp, a microcontroller unit that controls the operation, an LED lighting block with RGB LEDs and LED driver circuitry, a user interface block for user interaction, an optional Bluetooth module for wireless connectivity, and an optional sound sensor block for audio input synchronization lighting effects with audio input.



Design 3:

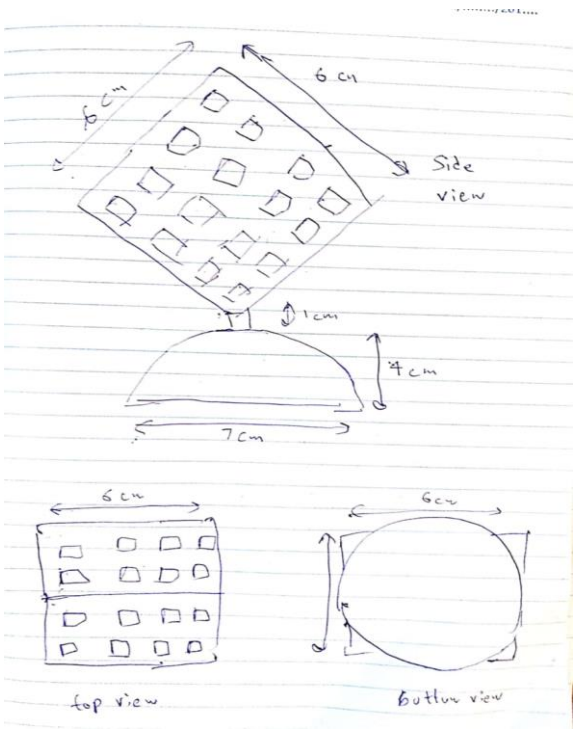
This design includes a power supply, a microcontroller unit, an LED lighting block with RGB LEDs and LED driver circuitry, a user interface block and an optional Bluetooth module for in remote control capabilities.



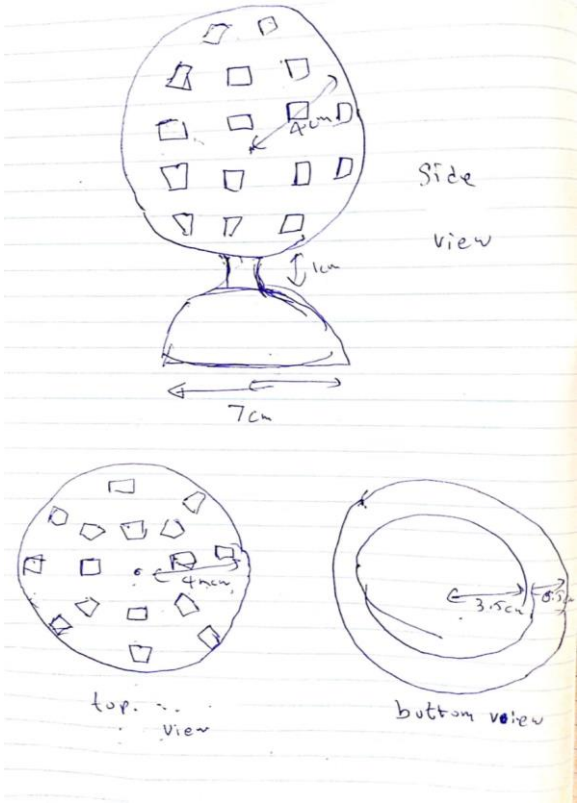
Enclosure Designs

The enclosure designs section of this report focuses on the physical presentation of the mood lamp. It explores three distinct enclosure designs resulting from a brainstorming session, each aimed at capturing the desired ambiance and enhancing the overall appeal of the product. By evaluating factors such as aesthetics, functionality, and user preferences, this section aims to identify the most suitable enclosure design that aligns with the mood lamp's purpose, user expectations, and market trends.

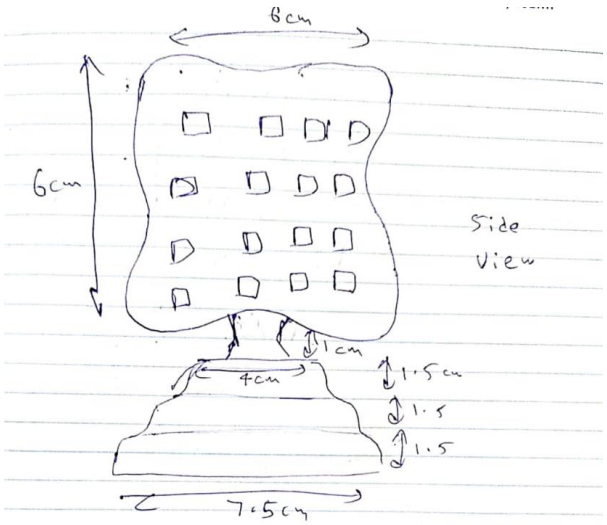
Design 1:

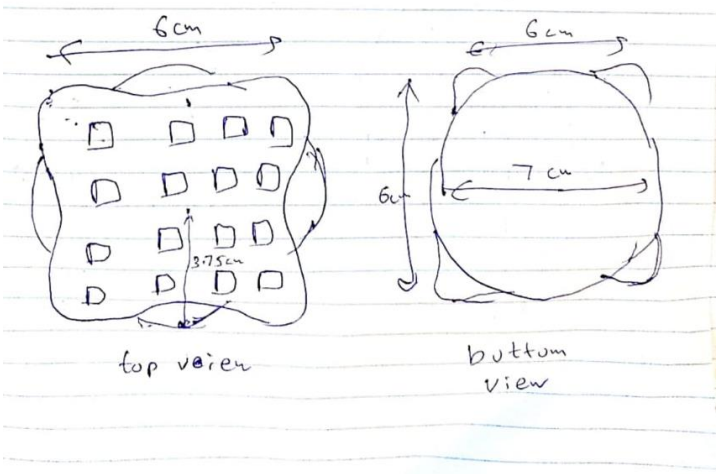


Design 2:



Design 3:





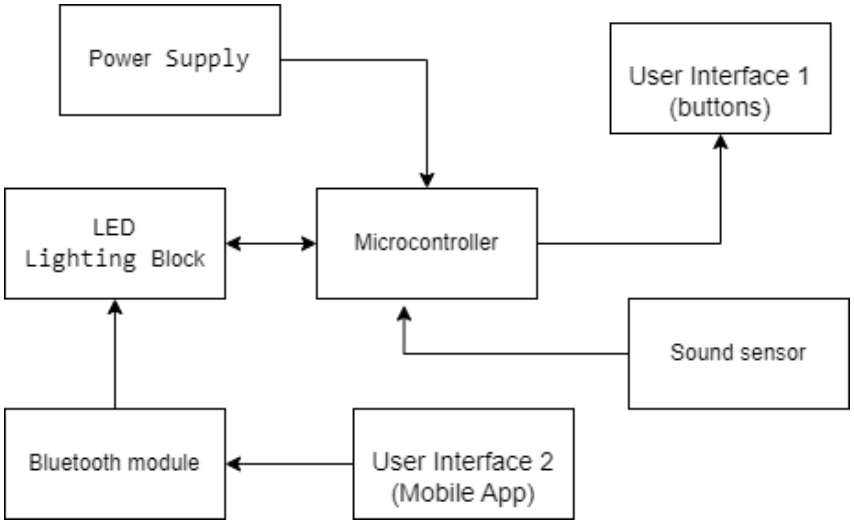
User Survey

A user survey was conducted to gather feedback on user preferences for the mood lamp design. The survey aimed to obtain insights regarding design aesthetics, usability, durability, preferred display options, and desired additional features. The survey involved a sample of 7 participants within the University premises. The questions asked in the survey and the corresponding answers are attached as **Appendix.** The feedback obtained from the user survey will be instrumental in informing the decision-making process and ensuring that the final mood lamp design aligns with the expectations and preferences of the target users.

Based on the user survey results, a modified functional block diagram and enclosure design were developed to better align with user preferences

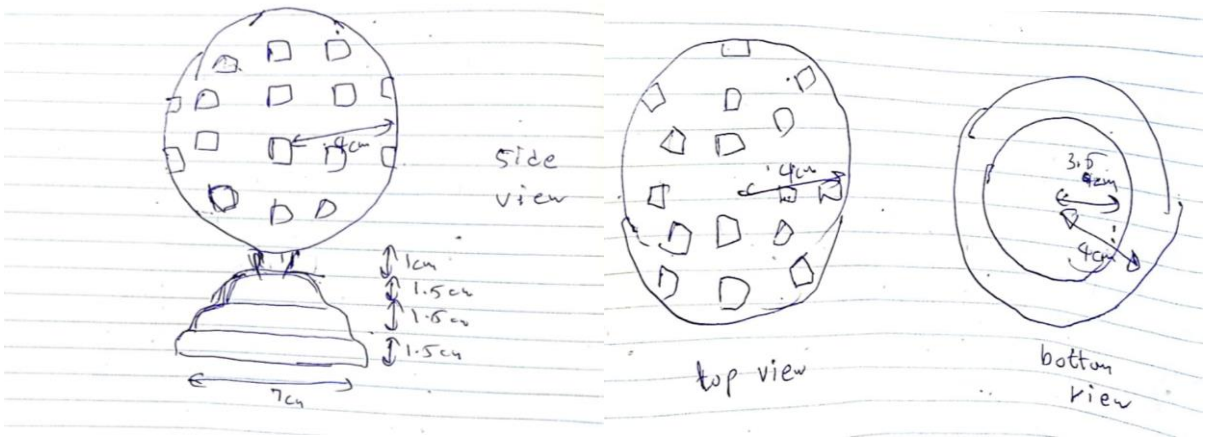
Modified Functional Block Diagram (Design 4):

The modified functional block diagram of mood lamp is powered by a standard power supply adapter, providing the necessary electrical power for its operation. The core component of the lamp is a microcontroller that controls various functionalities. It incorporates a Bluetooth module that enables wireless communication with other devices. Additionally, the lamp includes a sound sensor that captures audio inputs from the environment. These inputs are then analyzed by the microcontroller to generate corresponding visual effects on the LED lights. The lamp can be controlled and customized using a mobile app, allowing users to adjust the lighting patterns and colors according to their mood and preferences. Overall, the mood lamp provides a visually immersive and customizable lighting experience to enhance the ambiance and atmosphere of any space.



Modified Enclosure Design (Design 4):

The modified enclosure design for the LED mood lamp captivates users with its attractive and beautiful appearance. It enhances the visual appeal of any space while providing a delightful and mesmerizing lighting experience that can be personalized with customizable colours and patterns.



Evaluation Criteria for the Mood Lamp:

Functional Block Diagram Criteria:

1. Connectivity: How effectively does the lamp establish and maintain connections with external devices?
2. Sound Responsiveness: How accurately and promptly does the lamp respond to audio inputs?
3. Customizability: How flexible and extensive are the options for customizing the lighting patterns and colors?
4. User Interface: How intuitive and user-friendly is the interface for controlling and adjusting the lamp settings?
5. Power Efficiency: How efficiently does the lamp manage power consumption to ensure longer operation times?
6. Compatibility: How well does the lamp integrate with different mobile devices and operating systems?
7. Expandability: How easily can the lamp be expanded or upgraded with additional features or modules?

Enclosure Design Criteria:

1. Aesthetics: How visually appealing is the design of the lamp enclosure, adding to the overall ambiance?
2. Durability: How well does the enclosure withstand potential impacts and everyday wear and tear?
3. Portability: How lightweight and compact is the lamp for easy transportation and placement in different locations?
4. User Safety: How effectively does the design address safety concerns, such as insulation and heat dissipation?
5. Ergonomics: How comfortable is the lamp to hold and interact with for extended periods?
6. Versatility: How adaptable is the design for different environments and mounting options?
7. Cost Efficiency: How economically viable is the design, considering the manufacturing and materials costs in mass production?

Design Evaluation and Selection

Functionality Design:

	Design 1	**Design 2**	**Design 3**	**Design 4**
Criteria 1	**4**	**6**	**7**	**8**
Criteria 2	**5**	**6**	**7**	**7**
Criteria 3	**4**	**5**	**8**	**9**
Criteria 4	**6**	**5**	**8**	**8**
Criteria 5	**5**	**5**	**5**	**7**
Criteria 6	**7**	**6**	**7**	**8**
Criteria 7	**6**	**7**	**5**	**7**
Total	**37**	**40**	**47**	**54**

Enclosure Design:

	Design 1	**Design 2**	**Design 3**	**Design 4**
Criteria 1	**6**	**6**	**8**	**8**
Criteria 2	**4**	**6**	**9**	**7**
Criteria 3	**5**	**8**	**7**	**7**
Criteria 4	**7**	**6**	**9**	**6**
Criteria 5	**5**	**5**	**7**	**6**
Criteria 6	**6**	**7**	**8**	**8**
Criteria 7	**6**	**7**	**7**	**7**
Total	**39**	**45**	**55**	**49**

Design 4 for the functional block diagram and Design 3 for the enclosure design were selected as the most suitable options based on evaluation criteria.

Acknowledgment

The following is a list of the names and corresponding index numbers of my team members who made valuable contributions to the conceptual design during the brainstorming session.

200029B Amarasinghe Y.E.

200488E Pushpakumara H.M.R.M.

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200356A Lokugeegana D.L.

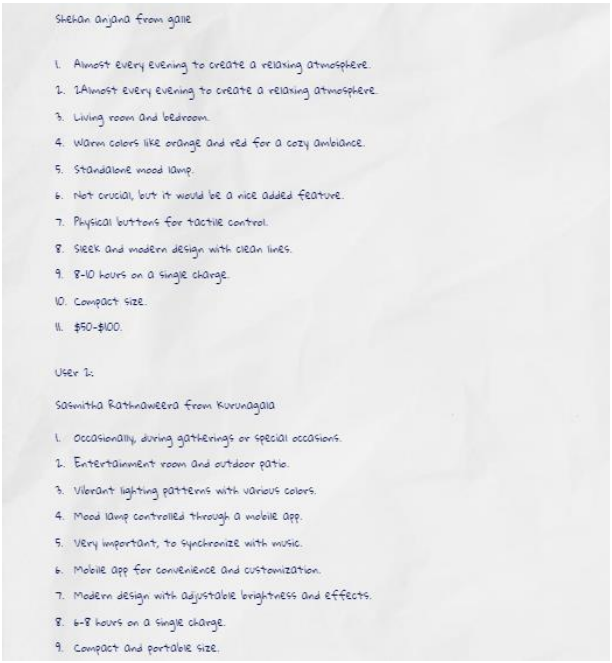
200014B Ahamed M.B.S.A.

200552V Sairisan .R

Appendix

Survey Questions :

1. *How often do you use mood lighting to enhance the ambiance of your space?*
2. *In what areas or rooms do you typically use mood lighting?*
3. *What specific lighting patterns or colors do you prefer for creating different moods?*
4. *Do you prefer a standalone mood lamp or one that can be controlled through a mobile app?*
5. *How important is the responsiveness of the mood lamp to sound or music inputs?*
6. *What is your preferred method of controlling the mood lamp (e.g., physical buttons, mobile app)?*
7. *Are there any specific design styles or aesthetics that you find most appealing for a mood lamp?*
8. *How long would you expect the battery of a mood lamp to last on a single charge?*
9. *Are there any size or form factor considerations for the mood lamp that would be ideal for your needs?*
10. *What price range would you consider reasonable for a high-quality mood lamp that meets your desired features and functionalities?*



Shehan Anjana from galle

1. Almost every evening to create a relaxing atmosphere.
2. 1Almost every evening to create a relaxing atmosphere.
3. Living room and bedroom.
4. Warm colors like orange and red for a cozy ambiance.
5. Standalone mood lamp.
6. Not crucial, but it would be a nice added feature.
7. Physical buttons for tactile control.
8. Sleek and modern design with clean lines.
9. 8-10 hours on a single charge.
10. Compact size.
11. $50-$100.

User 2:

Sasmitha Rathnaweera from Kurunagala

1. Occasionally, during gatherings or special occasions.
2. Entertainment room and outdoor patio.
3. Vibrant lighting patterns with various colors.
4. Mood lamp controlled through a mobile app.
5. Very important, to synchronize with music.
6. Mobile app for convenience and customization.
7. Modern design with adjustable brightness and effects.
8. 6-8 hours on a single charge.
9. Compact and portable size.

User 3:

Damith Chinthaka from Mathara

1. Frequently, almost every evening for a relaxing atmosphere.
2. Bedroom, living room, and home office.
3. Soft and warm lighting with blue and purple colors.
4. Mood lamp controlled through a mobile app.
5. Moderately important for added interactivity.
6. Mobile app for easy customization.
7. Sleek and modern design with minimalistic aesthetics.
8. 10-12 hours on a single charge.
9. Compact and lightweight size.
10. $60-$100.

User 4:

Ramsara Medhavi from Colombo

1. Occasionally, during special occasions or to create a specific atmosphere.
2. Living room, dining area, and outdoor garden.
3. Various lighting patterns and colors.
4. Standalone mood lamp with physical buttons.
5. Not a priority, focusing on overall lighting effect.
6. Physical buttons for tactile control.
7. Classic and elegant design with vintage or rustic aesthetics.
8. 8-10 hours on a single charge.
9. Medium-sized lamp for easy placement.
10. $40-$80.