
## Department of Electronic and Telecommunication Engineering

**Faculty of Engineering**

**University of Moratuwa**

# EN 2160 Electronic Design Realization

**Preliminary Design Report**

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**200500L**

# The Implemented Initial Preliminary Design

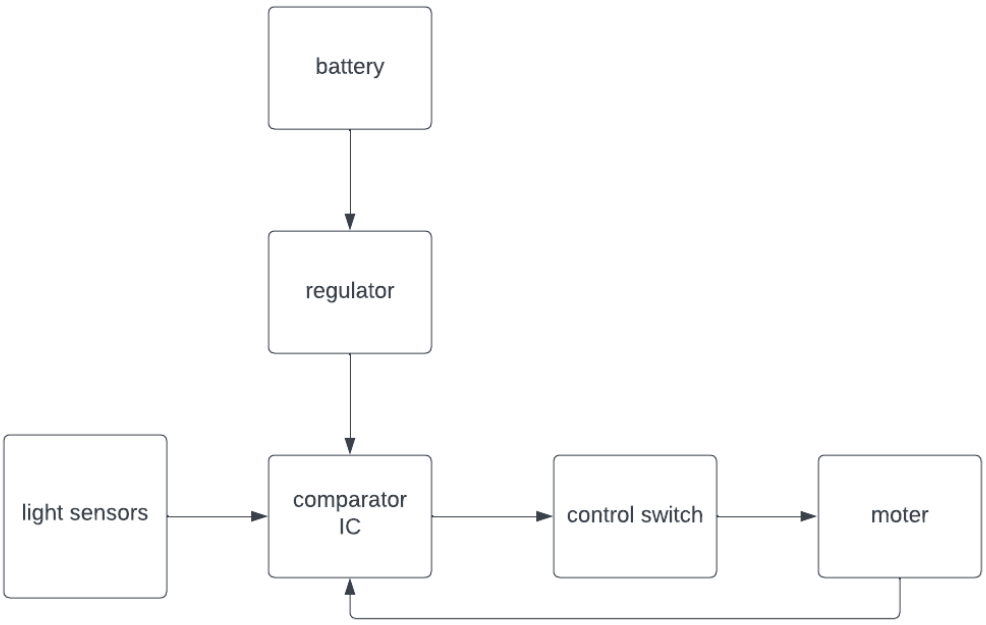
There is a cable from the device which can connect to the door (or any other light weight object that need to pull). The cable is connected to a gear motor that can pull the cable back to the initial position. This device keeps track of the light intensity of the environment. When the light intensity falls below the given threshold value, it pulls the cable..

# Product Specifications

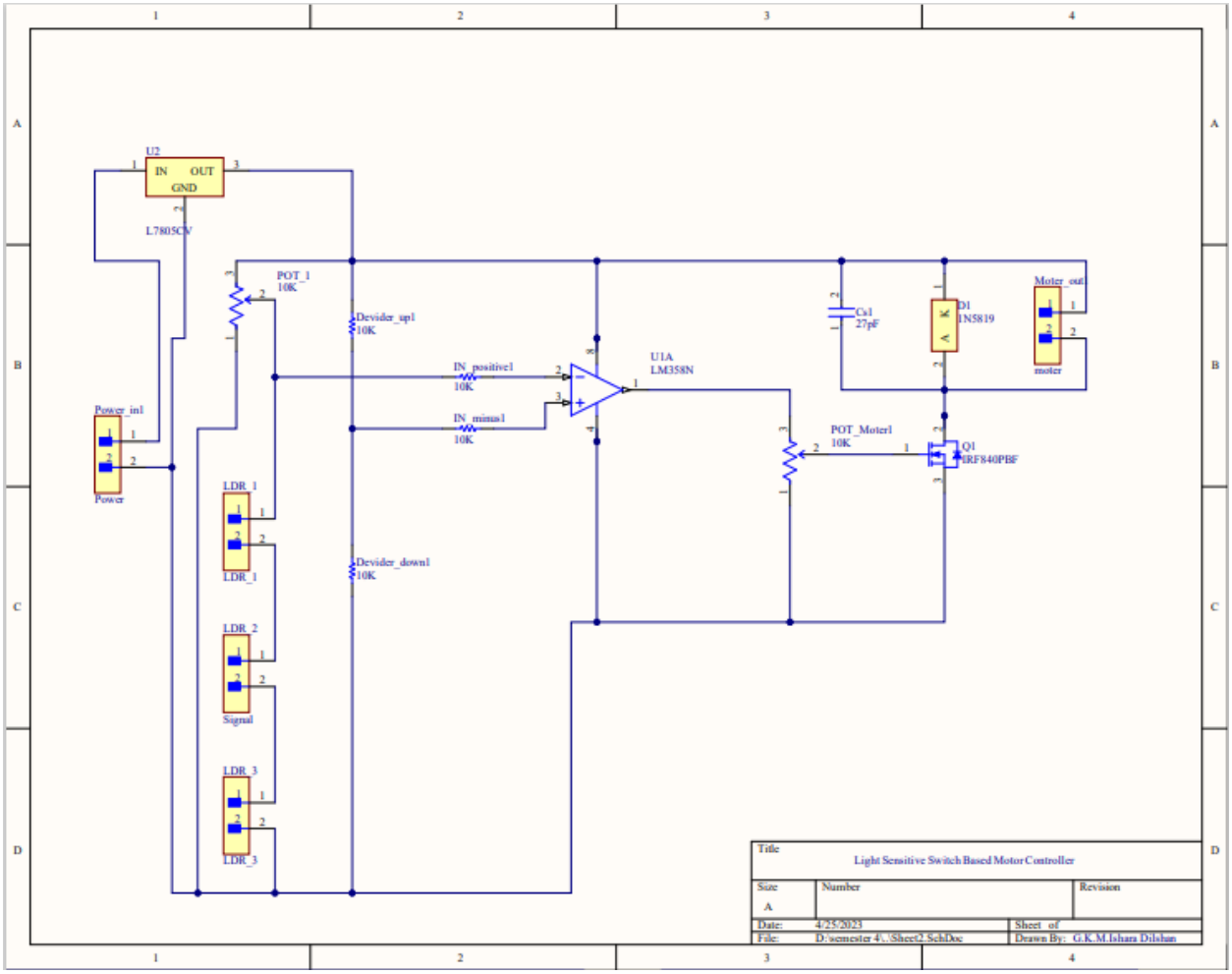
- Power source – 7.4V Lithium Ion Battery (rechargeable)
- Operating voltage – 5V
- Operating temperature – (20 to 60) °C
- Operating light intensity (threshold value) – (20 to 50) lux (this may change in the application)
- Door pulling force – 10 N (average)
- Cable length – 90 cm
- Cable diameter – 0.9 mm
- Product dimensions – 12 × 10 × 3 cm (may change depending on the requirements)

## Block Diagrams

### Block Diagram

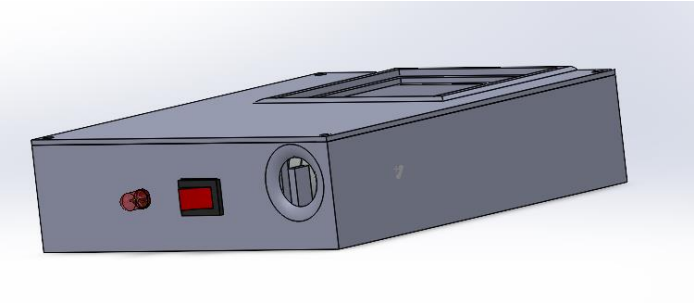


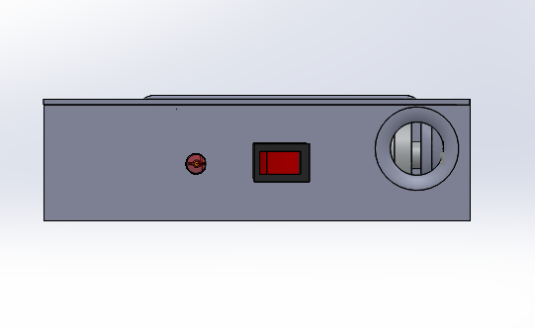
## Schematic Design

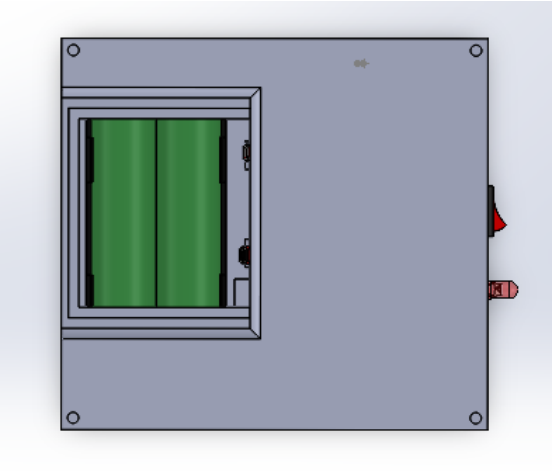


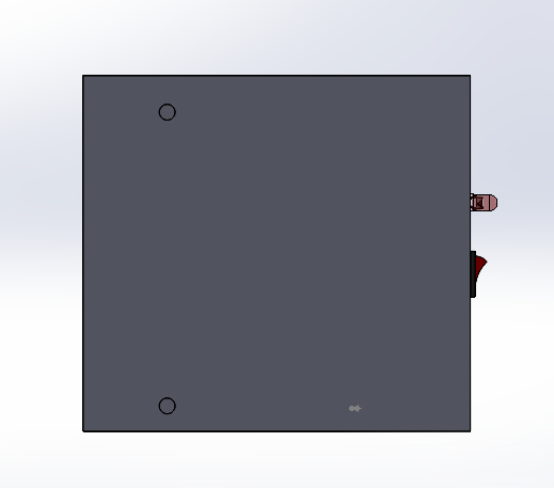

## Enclosure Designs

### Solid works design









## Problem identified considering the course content delivered by Prof. Jayasinghe

After conducting a thorough assessment of both the schematic diagram and SOLIDWORKS design, taking into account the principles and techniques emphasized in the lectures on professional product design, a number of pertinent issues have been recognized. These identified concerns have been meticulously evaluated and incorporated as essential considerations for subsequent design iterations. Adhering to the prescribed design guidelines, these concerns will be addressed with utmost care and attention in order to enhance the overall quality and functionality of the designs.

### Schematic design

- The existing designs exhibit a compact arrangement of numerous components within a single sheet, resulting in overcrowding. Additionally, functional blocks have been enclosed using inappropriate boxes, which undermines clarity and organization.
- Furthermore, the numbering of components lacks a systematic order, leading to confusion and inefficiency in the design.
- Another concern is the incorrect placement of input and output blocks, compromising the intended functionality of the system.
- Moreover, the direction of current flow has been neglected during the schematic design phase, potentially impeding the proper functioning of the system.
- Lastly, the designs deviate from the utilization of standard sheet sizes, which may hinder compatibility and integration with other design elements.

To rectify these issues, it is imperative to revise the designs by employing more proficient techniques that prioritize logical arrangement, clear numbering conventions, appropriate positioning of input and output blocks, consideration of current flow direction, and adherence to standard sheet sizes. These modifications will contribute to an improved and more professional design outcome.

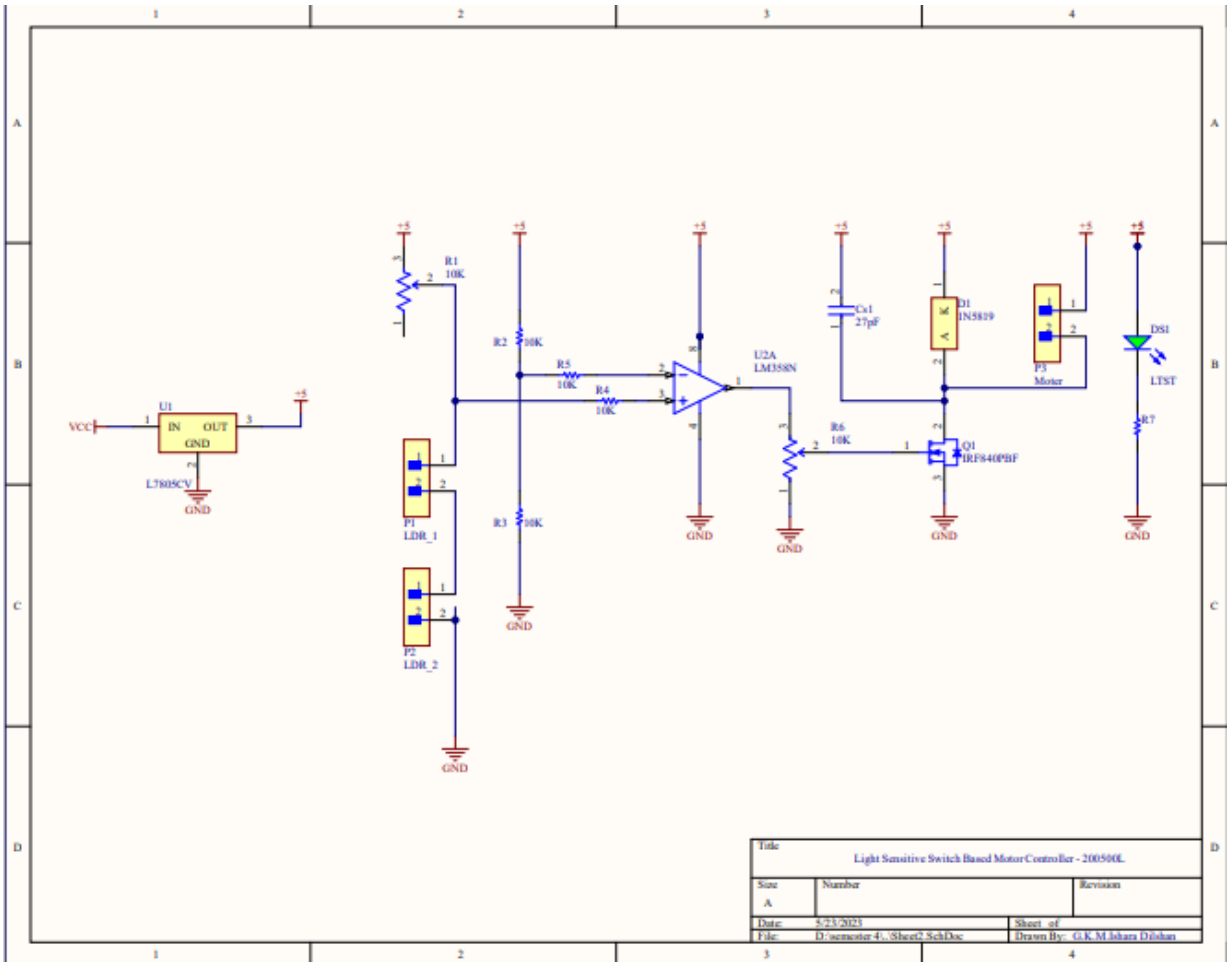
**Sledworks design**

- The existing designs lack consideration for moldability, as draft analysis has not been conducted and draft angles have not been applied to the design.
- Furthermore, the design lacks a professional and attractive appearance, as only basic features have been utilized in the design process.
- The correct designing procedures have not been followed, including initial sketching, which is an essential step in the design process.
- Moreover, features such as lips, grooves, and mounting bosses have not been incorporated into the design, which could enhance functionality and aesthetics.

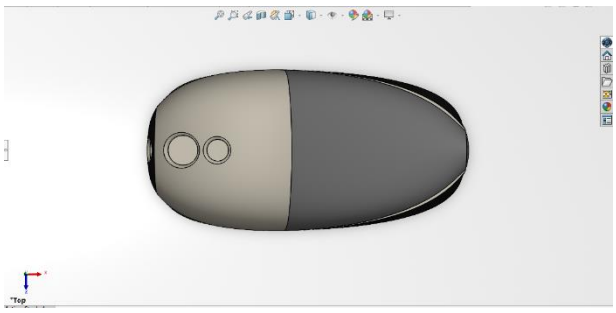
To address these deficiencies, it is crucial to incorporate moldability considerations by performing draft analysis and implementing appropriate draft angles in the design. Additionally, the design should be enhanced to reflect a more professional and visually appealing appearance, incorporating advanced features beyond basic elements. Following the correct designing procedures, including initial sketching, will ensure a more systematic and comprehensive approach to the design process. Finally, incorporating features like lips, grooves, and mounting bosses will contribute to improved functionality and overall design quality.

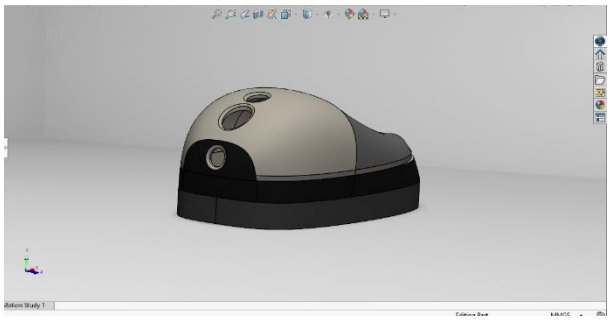
# Corrections after course

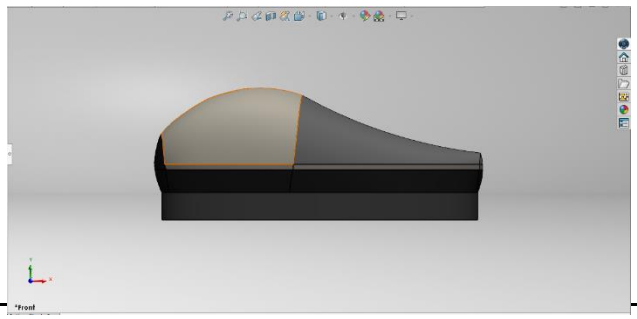
## Schematic design

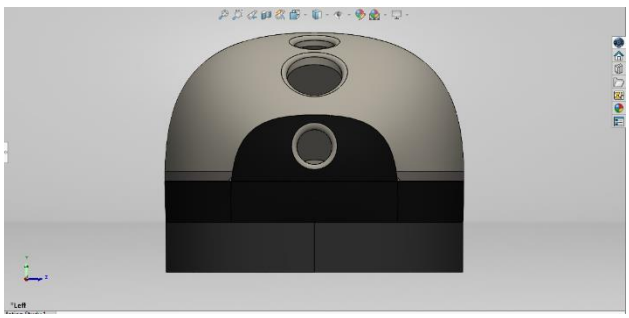



## Sledworks design

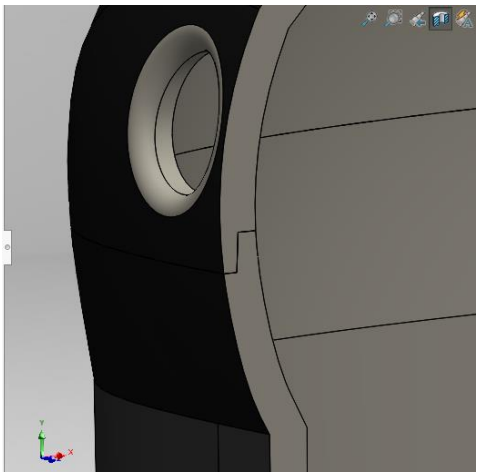








**Lips and Groos**

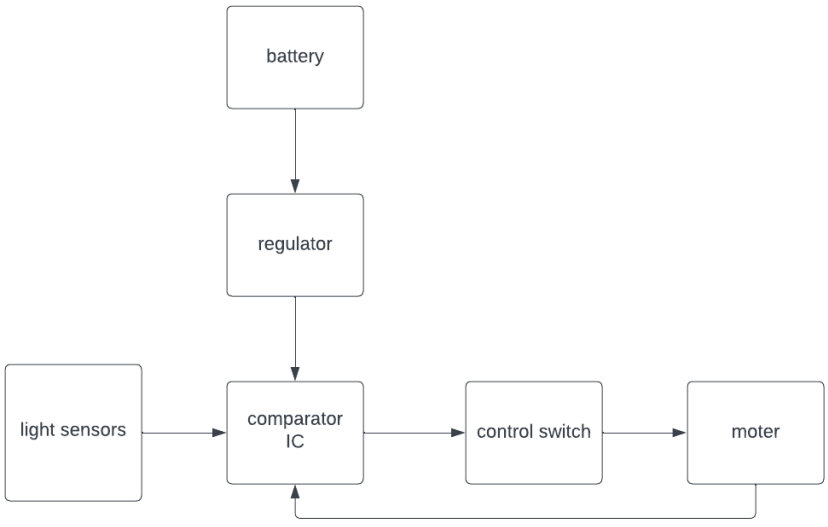


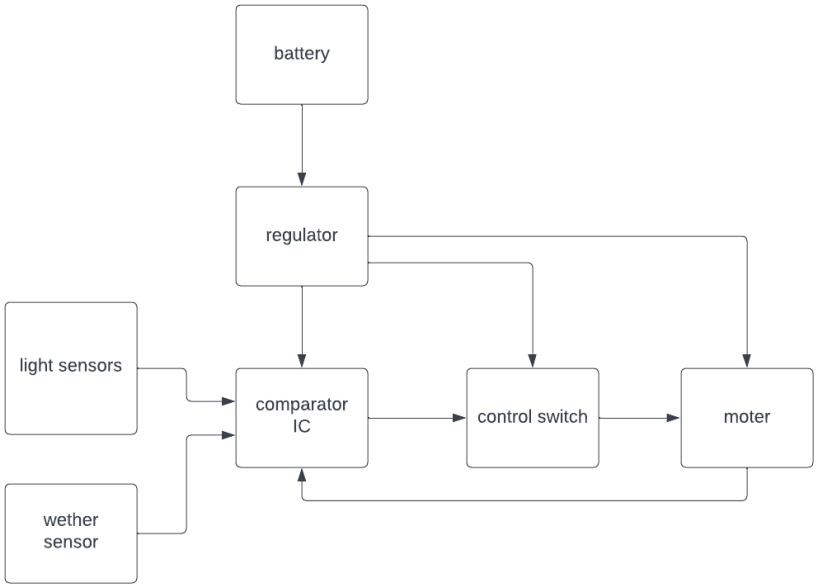
## Problems/Improvements identified/proposed by members of your group

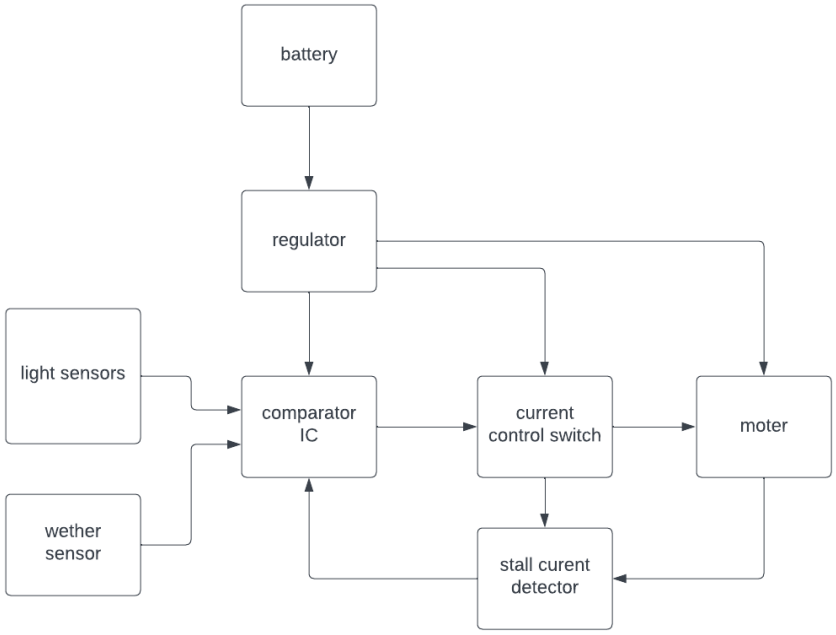
Inspired by the principles of design-driven innovation, our group of students engaged in several brainstorming sessions. These collaborative sessions yielded not only novel ideas but also revealed issues that had previously gone unnoticed in my initial design. As a result, we reached a conclusive decision to explore three alternative design ideas, all of which have been carefully considered with the aim of achieving a superior and more refined design.

The following are the 3 block diagrams proposed by the members of our group.

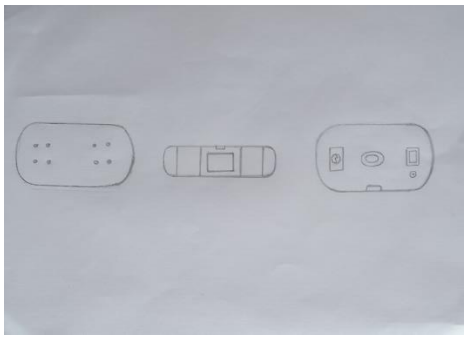
**Digammas**

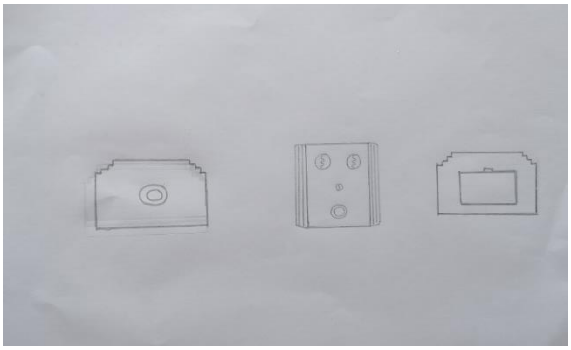


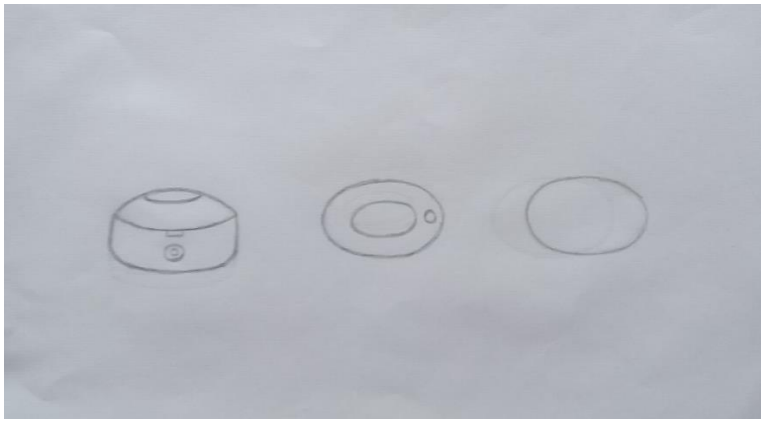



The following are the 3 enclosure designs proposed by the members of our group







## User Centered Design

User-Centered Design places a strong emphasis on incorporating user feedback throughout the conceptual design process to enhance the design. In this iterative approach, users are actively engaged by providing an overview of our initial design and soliciting their preferences and suggestions. If the users express approval and genuine interest in our design concept, we proceed to implement their valuable suggestions to further refine the product. However, if the users do not demonstrate a genuine need or enthusiasm for the product, it becomes imperative for us to explore alternative options.

During the user feedback sessions for the "Light Sensitive Door Closer," several suggestions were received, which led to notable improvements in the design. By actively listening to users' perspectives and incorporating their valuable insights, we were able to enhance the product's functionality, usability, and overall user experience.

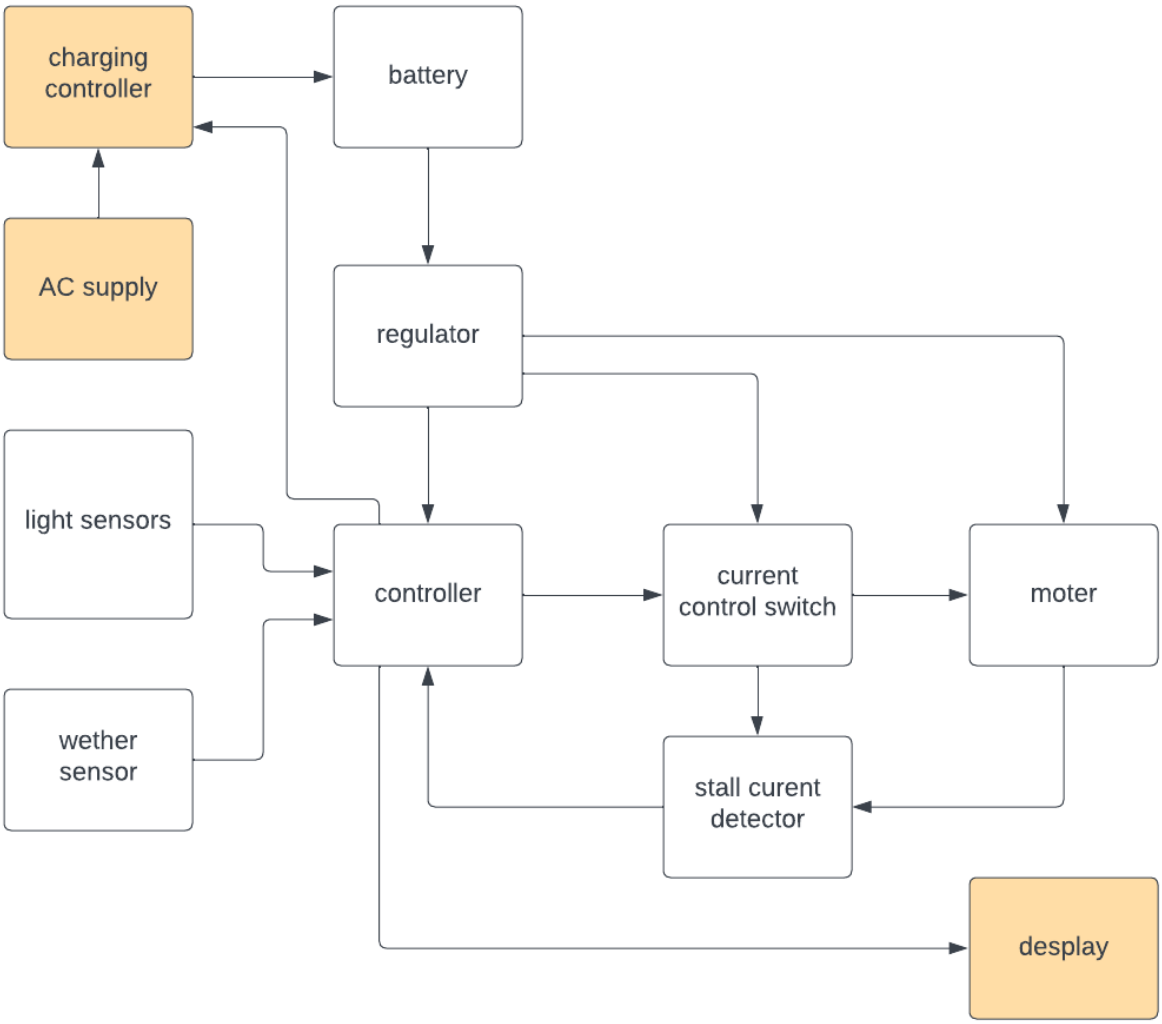
## Suggestions from the public survey

- Use a display to give feedback to the user.
- Reduce the power consumption.
- Give method to charge the batteries without replacing them.
- Increase the pulling force.

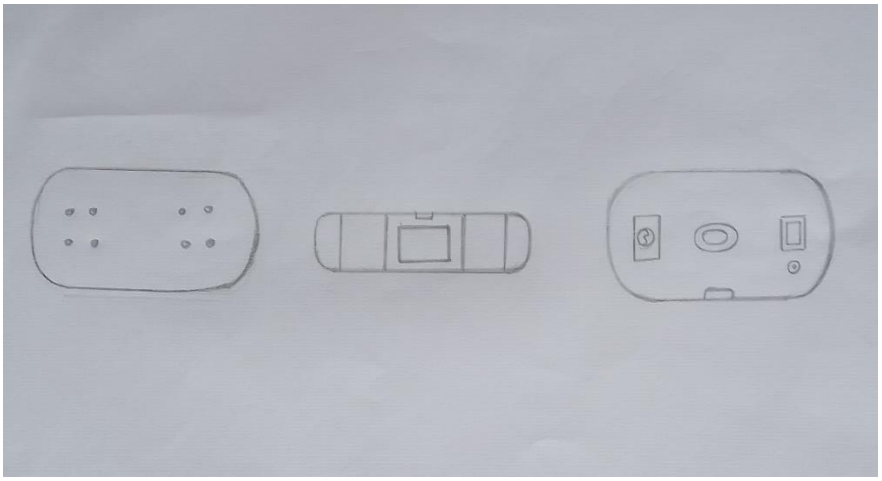
After the survey the encloser design did not changed.

## Block Diagram according to the user feedback.

**Block Diagram**



**Enclosure**



# Evaluation

## Evaluation of Block Diagram

### Criteria

- Functionality – (To what extend the design meets the intended needs)
- Accuracy
- User Friendliness
- Cost
- Power Consumption
- Reliability
- Compatibility – (capability of replacing devices or systems that perform the same process or part of the process)

| | Block Diagram 1 | Block Diagram 2 | Block Diagram 3 | Block Diagram 4 |
|---|---|---|---|---|
| Functionality | 5 | 5 | 10 | 10 |
| Accuracy | 8 | 5 | 10 | 10 |
| User Friendliness | 5 | 7 | 7 | 9 |
| Cost Effectiveness | 5 | 9 | 8 | 3 |
| Power Efficiency | 5 | 8 | 8 | 5 |
| Reliability | 1 | 2 | 7 | 8 |
| Compatibility | 2 | 2 | 5 | 7 |
| Total | 31 | 38 | 55 | 47 |

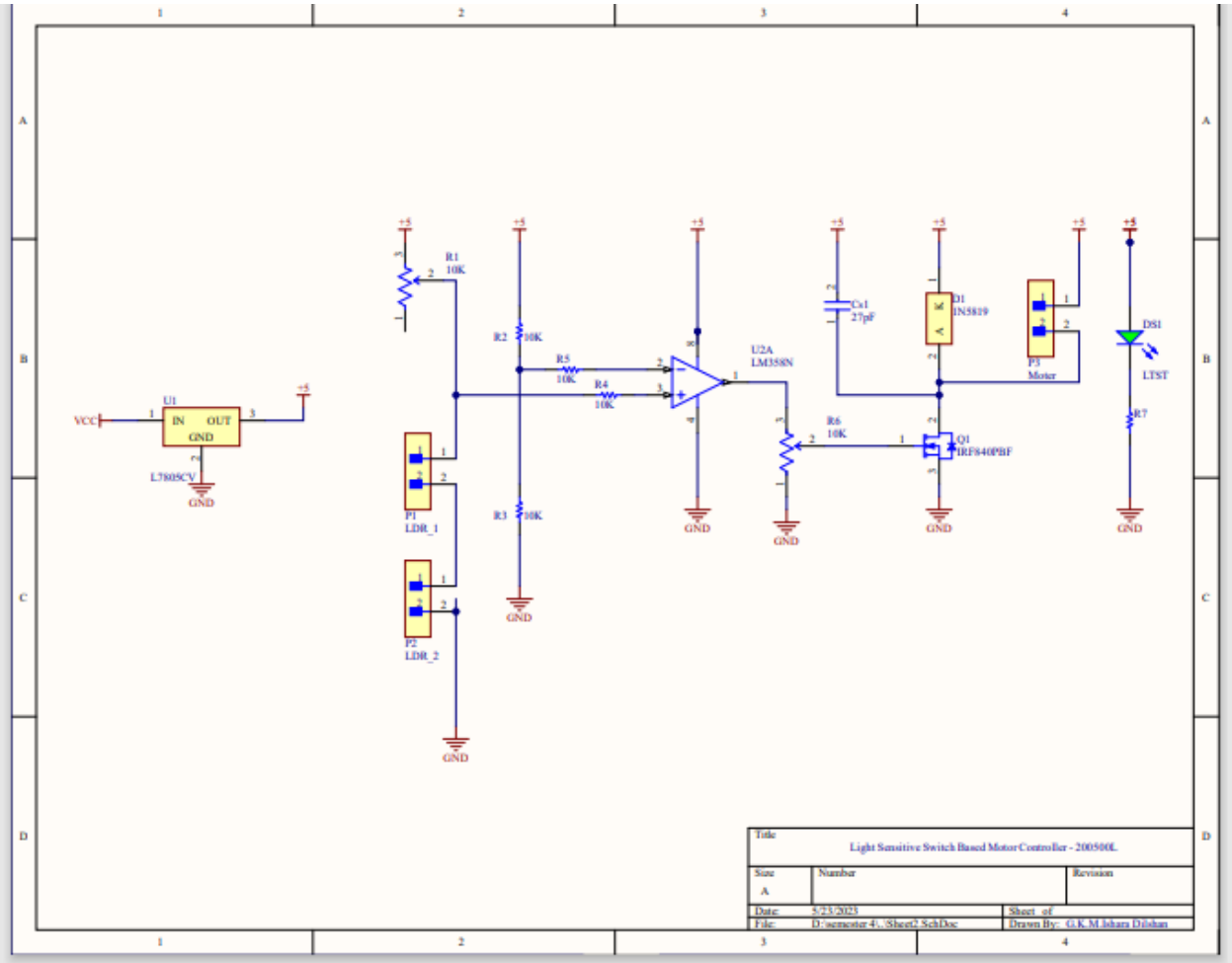
## Enclosure Evaluation

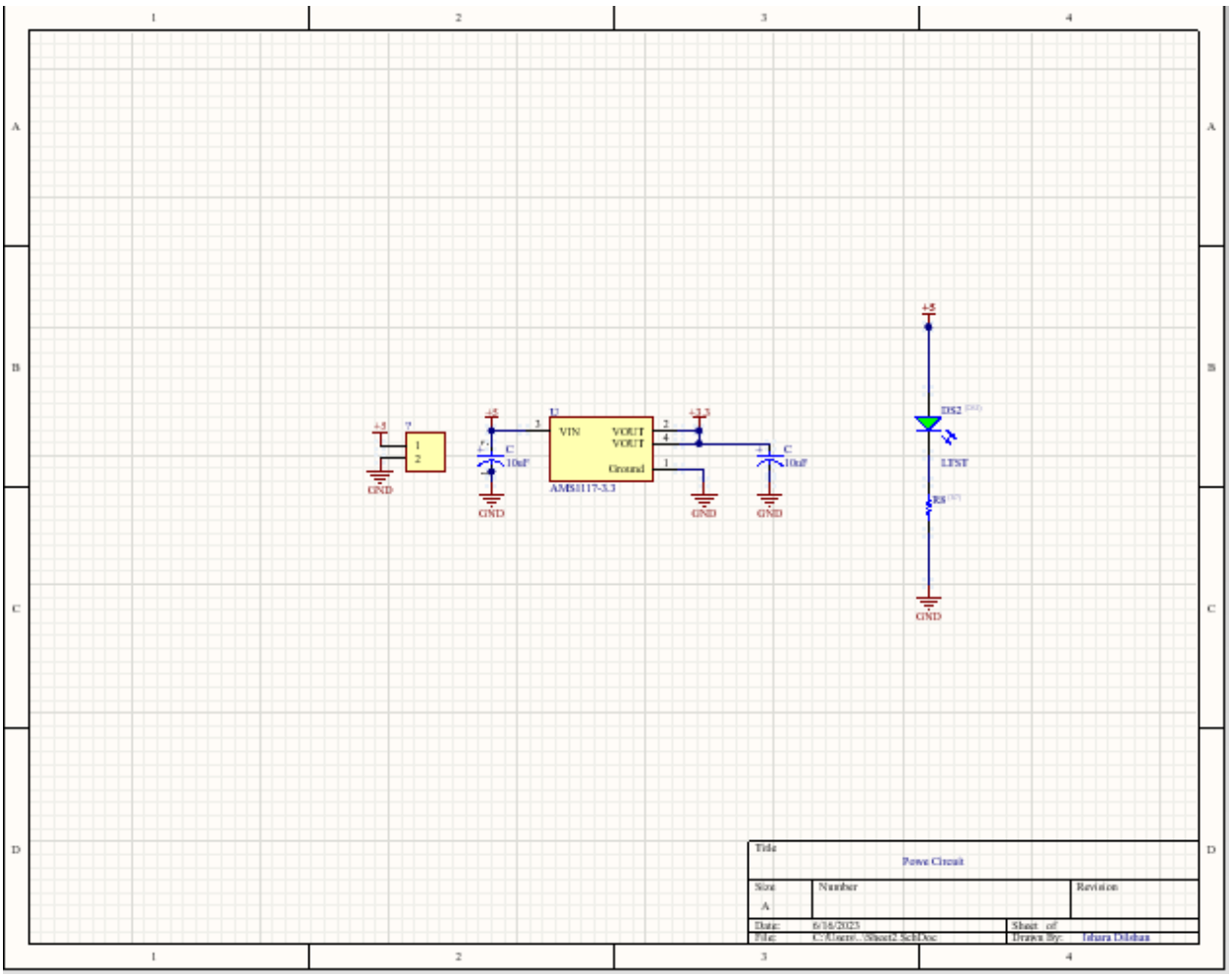
### Criteria

- Durability
- Attractiveness
- Cost Effectiveness
- User Safety – Prevention from electric leakage
- Compatibility – Capability of attaching the device to a certain place
- Repairability
- Weight and Hardness

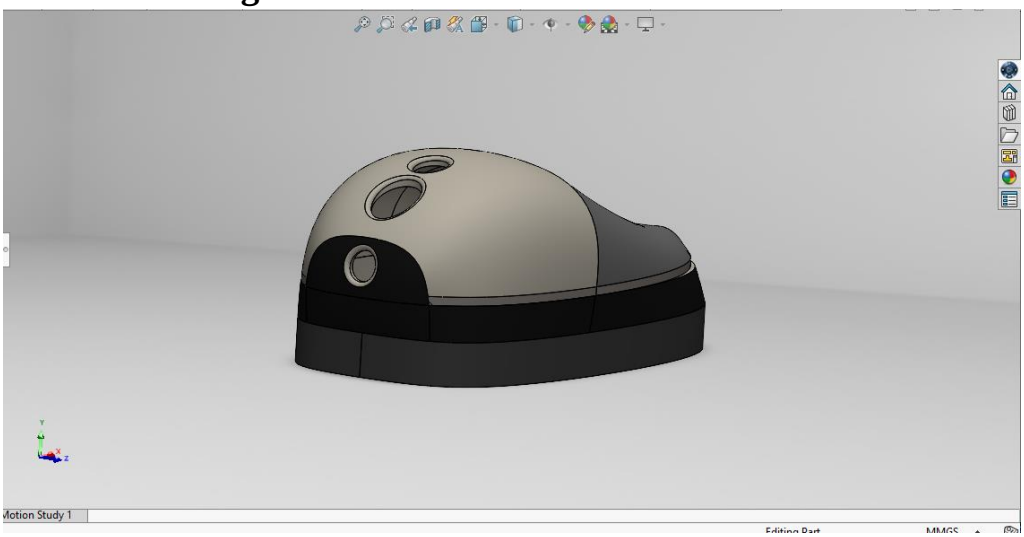
| | Enclosure 1 | Enclosure 2 | Enclosure 3 | Enclosure 4 |
|---|---|---|---|---|
| Durability | 8 | 8 | 10 | 10 |
| Attractiveness | 8 | 5 | 10 | 10 |
| Cost Effectiveness | 10 | 7 | 7 | 7 |
| User Safety | 5 | 5 | 8 | 8 |
| Compatibility | 5 | 8 | 8 | 8 |
| Repairability | 1 | 2 | 7 | 7 |
| Weight and Hardness | 2 | 2 | 5 | 5 |
| Total | 44 | 37 | 55 | 55 |

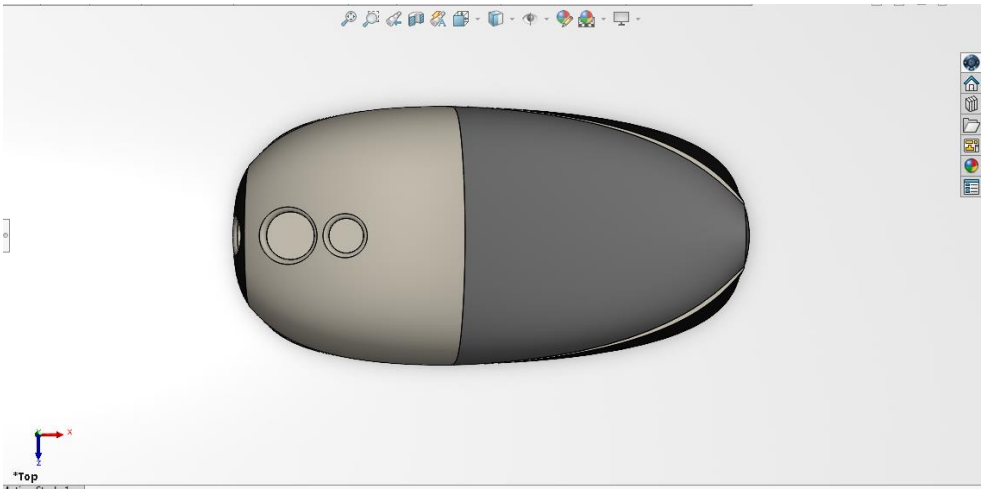
## Improved Schematic Design






## Sledworks design






## Feature tree