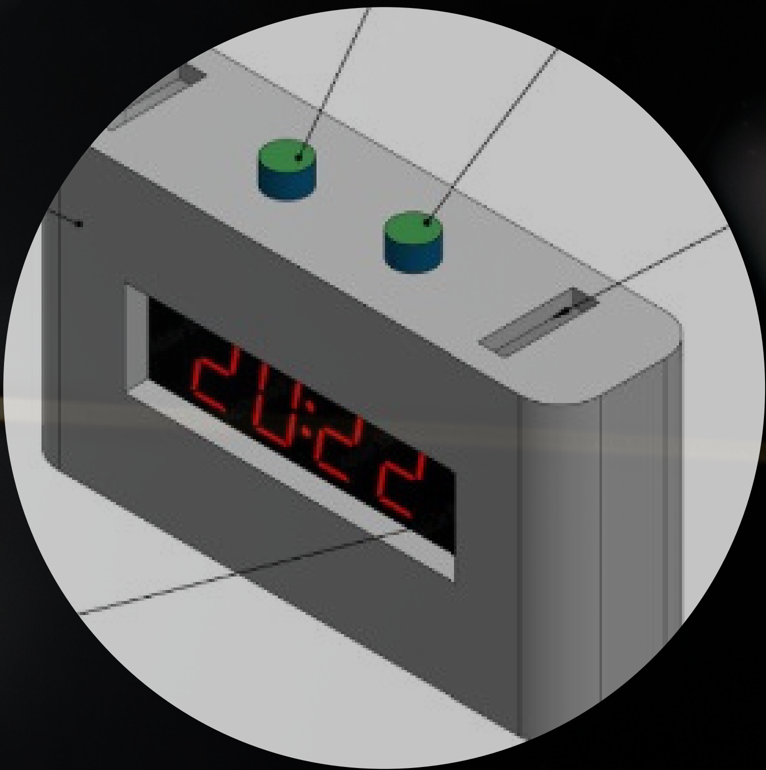
ADVANCED ALARM CLOCK



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Introduction: Pioneering the Advanced Alarm System

In our relentless pursuit of innovation, our team embarked on a comprehensive exploration of alarm system design concepts. Through an iterative process of refinement, we meticulously crafted our ultimate solution—the Advanced Alarm.in a world where time is of the essence, reliable and efficient alarm systems are more important than ever. Traditional alarms, however, often lack the versatility and user-friendliness needed to navigate the complexities of modern life. Our project aims to address this gap by developing an Advanced Alarm, a cutting-edge system that seamlessly blends functionality with intuitive design.

This sophisticated project seamlessly integrates state-of-the-art components, such as the ESP8266 or Arduino microprocessor, IR sensor module, and a versatile breadboard, to redefine conventional alarm systems. Our project proposal outlines the key components and features of the Advanced Alarm. We'll delve deeper into each of these aspects, from the microprocessor and IR sensors that power its operation to the customizable buttons and visual timer that enhance user experience.

Objective: Transformative Alarm Experience

The primary objective of the Advanced Alarm project is to revolutionise traditional alarm systems, offering users a customised and interactive experience. Leveraging the capabilities of advanced technology, our alarm system introduces novel features like hand gesture detection using Infra-Red sensors, allowing users to trigger alarms with ease.

The inclusion of programmable buttons, coupled with a microprocessor, empowers users to set modes effortlessly, providing a unique and tailored alarm experience.We believe that the Advanced Alarm has the potential to revolutionise the way we manage our time and routines. By combining cutting-edge technology with user-centric design, we hope to create a system that is not only functional, but also enjoyable to use.

Problem Statements

The aim of this project was to produce an interactive product that could serve as an alarm, as well as a timer. The functionality of the project was to completely rely on a battery, by utilising an arduino and breadboard as its main circuitry, and using a 16 bit LCD screen as its display, as well as three analogue buttons to serve as the setting buttons, and two infra-red sensors on the side of the assembly allowing interaction. Primarily the problem statement focuses on constructing this project economically and sustainably.

Although this project is heavily involved with electronics and coding, in essence it is not too difficult to set-up and execute. The principles of the project simply use a microprocessor with an external battery and a set of code running in its memory that executes a series of actions following any interaction with the setup, such as a button press or a sensor being triggered.

Hence, the final problem statement can be summarised as a need for an interactive system, that is easy to use, easy to power and portable. A system that displays the current time, and allows users to freely set a timer.

Draft Ideas:

In our quest to develop an alarm system, we engaged in a thorough exploration of various design concepts. Before arriving at our ultimate solution, we carefully considered and refined multiple designs. This iterative process was crucial in shaping our final product, ensuring it meets the highest standards of functionality. That was our Drafted idea with its disadvantages.

- ***Casing Material (Plastic Alarm Body):***

***Durability*:**

The impact resistance and durability of plastic may be weaker than those of metal alloys or premium composites. Plastic casings are susceptible to damage in settings where the alarm system is subjected to physical stress or possible tampering.

Temperature Sensitivity:

Extreme temperatures can harm plastic alarm casings, especially with electrical parts. Cold can make it brittle, leading to cracks, while heat can cause distortion. This jeopardises the alarm system's structure and function. Choosing materials with better thermal stability is crucial for reliability.

Litter and Waste:

Because single-use plastics are so widely used and don't break down quickly, they accumulate as rubbish in landfills, seas, and other natural areas. This may result in detrimental effects on the ecosystem and health risks for both people and wildlife.

Display screen:

The alarm's initial concept is alarming alone. There was no screen here to display the time.

Rechargeable Batteries:

Continuous Availability:

While charging, devices with internal rechargeable batteries won't work.

Longevity and Maintenance:

Rechargeable batteries may only hold a certain amount of charge before losing capacity, they may need to be replaced more frequently.

Durability and Reliability:

Situations with temperature extremes may affect the performance of rechargeable batteries.

No Interactivity:

Typical alarms and timers are not as interactive as needed and hence are not easy to use, and require pressing too many buttons.

Problem Solutions:

Casing Material (Steel alloy Alarm Body):

Durability:

When it comes to impact resistance and durability, steel alloy is superior to plastic. Steel alloy casings offer strong protection against physical stress and possible tampering, lowering the risk of damage in alarm system setups.

Temperature Sensitivity:

Steel alloys are more resistant to high temperatures than plastic. It doesn't warp in the heat or grow brittle in the cold. Because of this, steel alloy is a more dependable material to use for preserving the alarm system's functionality and structural integrity in temperature-variable conditions.

Litter and Waste:

Steel is an iron alloy, which means that it contains carbon, iron, and tin along with other non-metals. No matter what form or product it takes, steel can be continuously recycled without losing any of its qualities, just like the majority of metals, such as brass, copper, aluminium, and so on.

Implementing a display screen:

The alarm's primary function in our initial designs was to produce sound. We didn't think about displaying the time because we were so busy improving the alarm system. But as we improved our strategy, we chose to include a screen to provide users with the further advantage of being able to quickly check the time.

Disposable Batteries:

1. Batteries are generally more convenient, as they come pre-charged and can be used immediately.

2. Disposable batteries could be more economical for devices with low power consumption or infrequent usage than buying rechargeable batteries and a charging system.

3. Rechargeable cells usually have a shorter shelf life than batteries. This helps to ensure that devices have power when needed, especially when they are kept for long periods of time without being used.

Infra-Red sensors are added:

For precise timing control, enhancing the user experience and convenience.

Hence, the resulting design is as shown in the figure below.

Initial Design

ITEM NO.	PART Name	QTY.
1	Time Button	1
2	Set Button	1
3	Infra-Red Sensor	2
4	I2C Display	1
5	Alarm Body	1

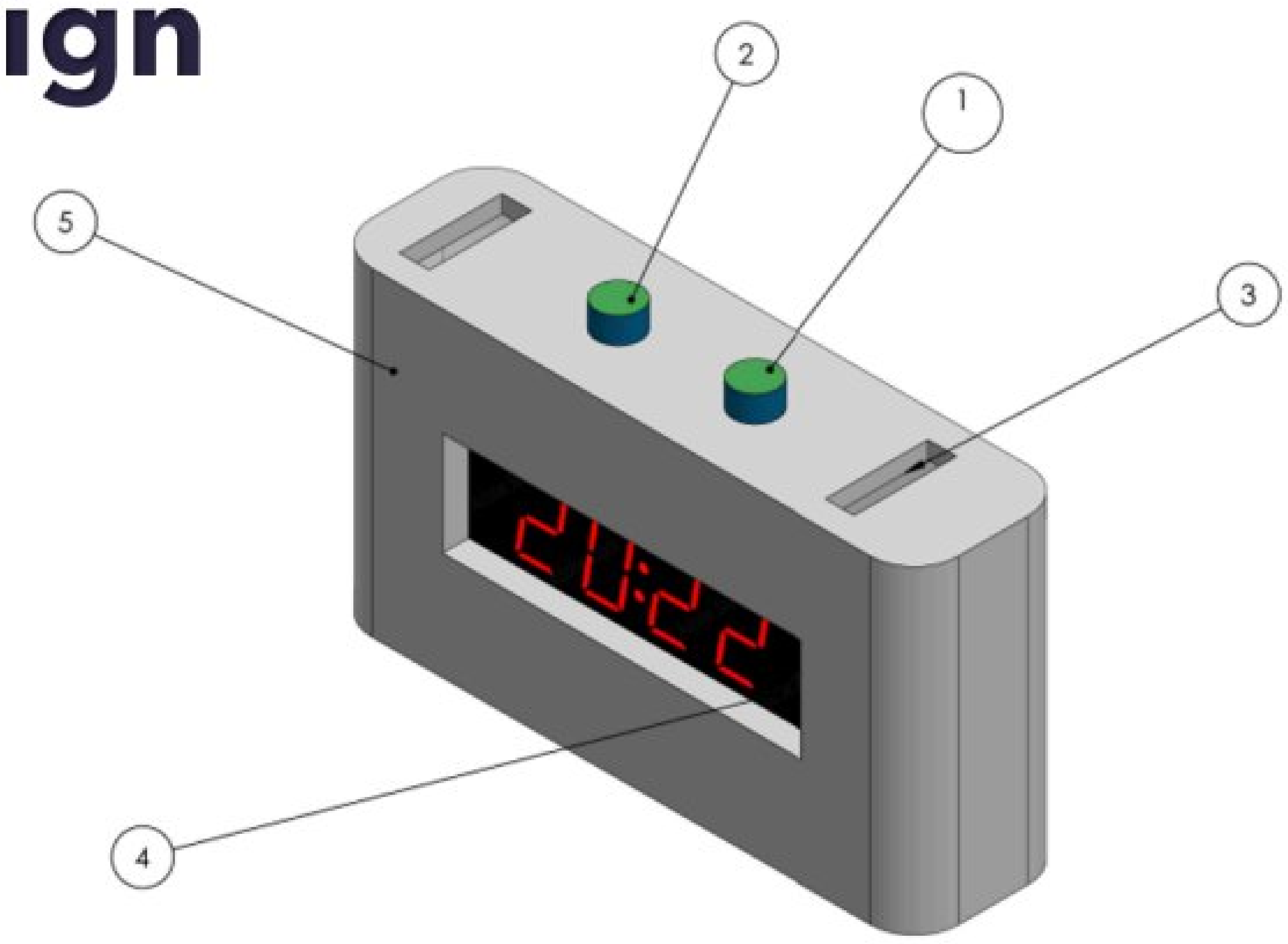

Fig. Initial SolidWorks Assembly

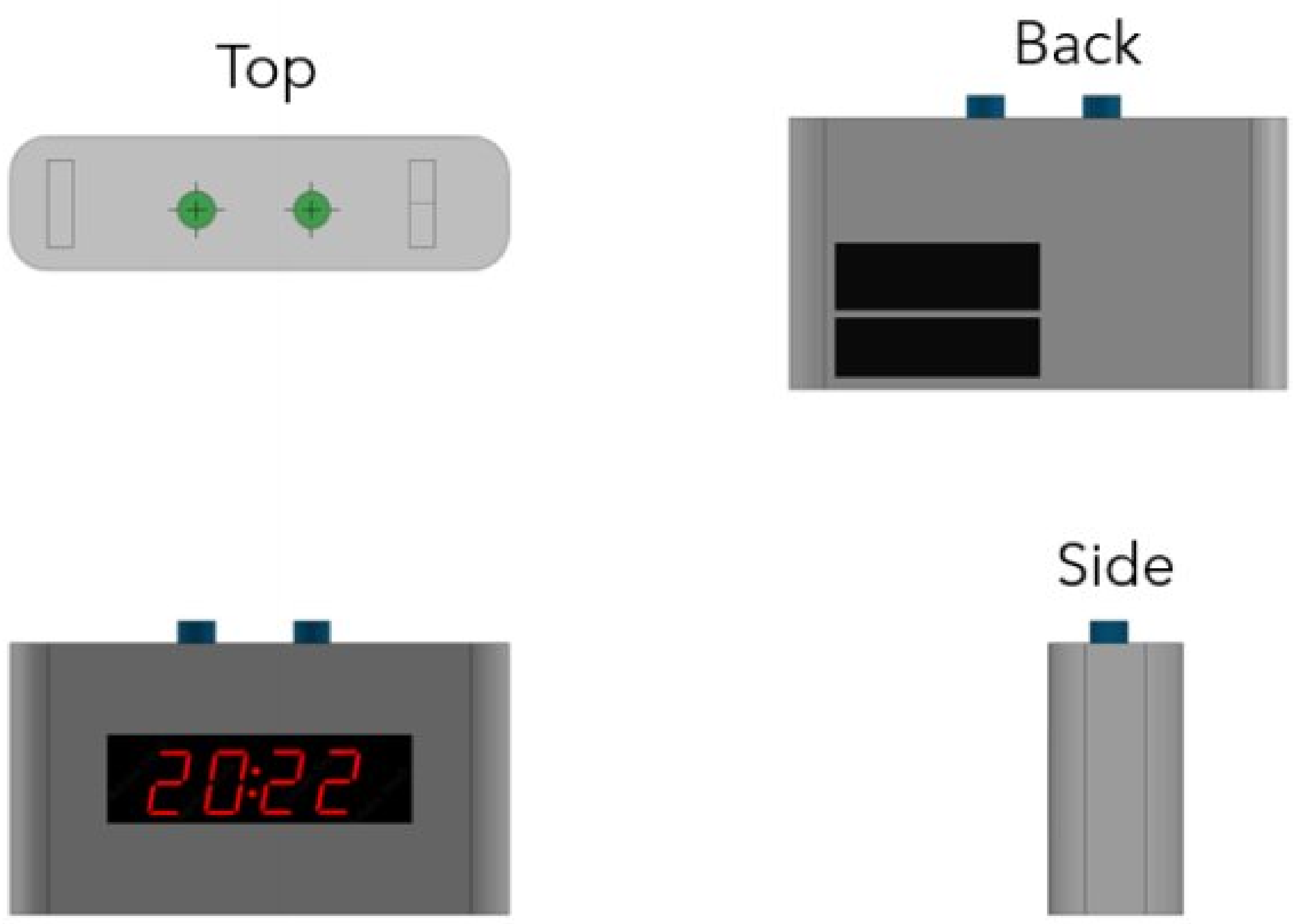

Fig. Multiple Views of Assembly

Product development costs

Observing the figure above, the resulting development costs for the list of components can be calculated. The involved components are listed below.

From this list we can approximate an initial cost, however it is important to consider that this cost is highly dependent on the location of the individual purchasing the components. prices are expected to fluctuate due to scarcity of components and high demand.

A conservative estimate for the price of breadboard is around 10~15 rm per piece, whereas jumper wires, buttons and a 5V battery pack is typically sold in kits and packets for enthusiasts and hence costs around 1~5 rm. The most expensive component is the arduino/esp8266 microprocessor which costs around 20 rm from a direct supplier or upwards of 30 rm from secondary suppliers. Lastly, the casing itself if 3D printed costs around 90 rm, due to the rarity of plastic material required for additive manufacturing.

However, a sustainable alternative is to use recycled cardboard or other materials that can replace the casing which lowers the cost substantially to 5 rm. Hence, an estimated overall cost is 45~50 rm.

Conclusion

This project was a highly beneficial practical demonstration of the combination of critical and creative thinking, innovation, and team-work. The unique functionality of the alarm allows for a new way to dismiss the alarm and adjust the time without fumbling with any buttons; adding a new level of convenience to a vital device in our everyday lives. The use of high quality material ensures this alarm feels premium if the need to be handled arises, as it is controlled by the integrated IR sensors. Most importantly, recyclability is maintained as the steel alloy body can be recycled and the components can be salvaged for other DIY projects; rendering this innovative alarm clock 100% waste free.

The sophisticated programming baked into the processing board ensures intuitive adjusting of the clock. The simplistic aesthetic of the alarm body showcases its minimalistic approach to an alarm clock; but more importantly, ease of maintenance (if need be) and robustness. To conclude, this project was definitely an exercise to both the left and right mind - the critical and creative mind - to produce an innovative design that makes people’s lives just a little better.

References:

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Appendix:

The First vs the Final Draft: