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TECHEVINCE 24 PROJECT
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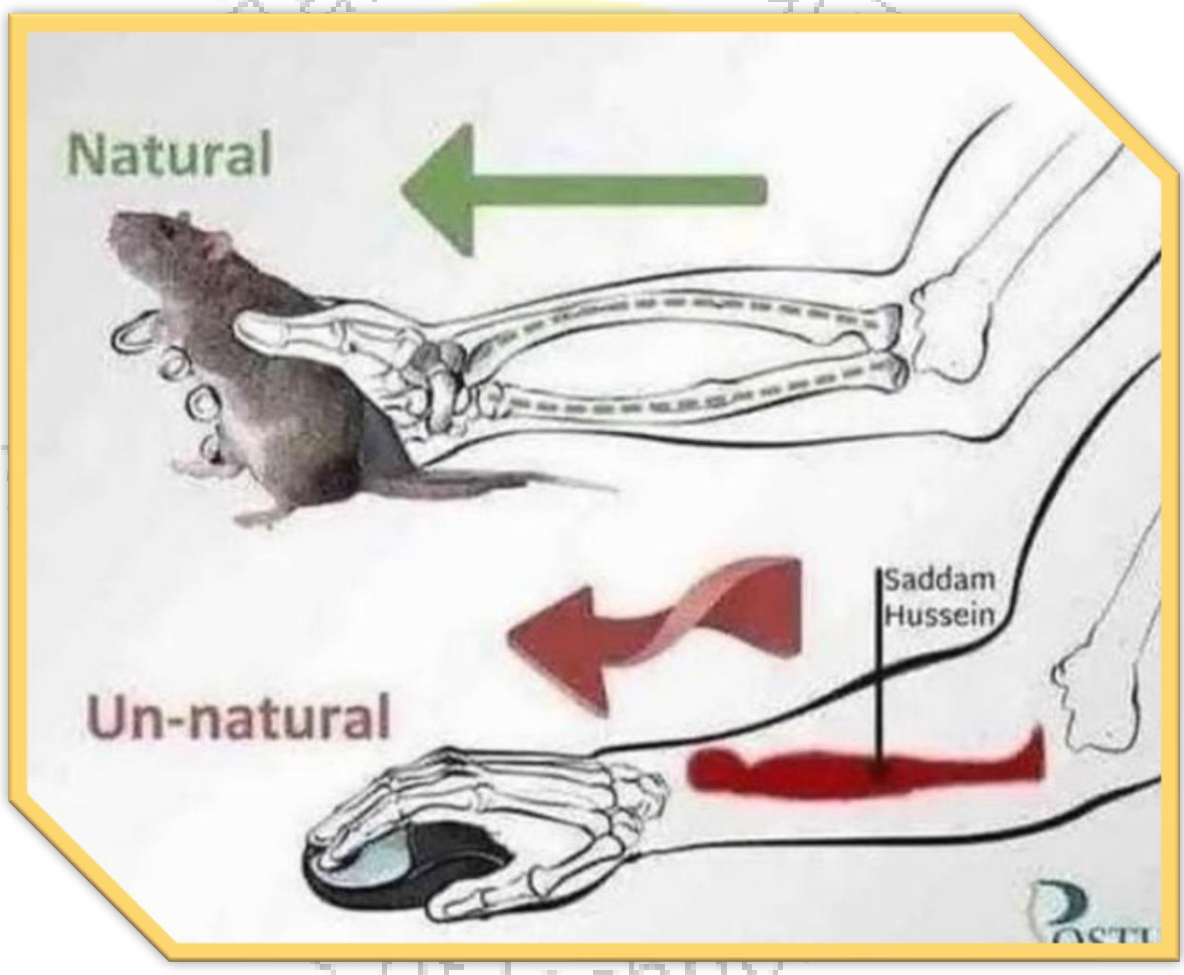
ABSTRACT

This project involves the design and creation of a space mouse. The space mouse is an innovative input device that allows for intuitive control in 3D space, ideal for applications in CAD, virtual reality, and 3D modelling. This report details the design process, materials used, 3D printing techniques, assembly, and testing of the space mouse.



INTRODUCTION

In the realm of digital design and three-dimensional modelling, the need for intuitive and precise input devices has grown exponentially. Traditional computer mice, designed primarily for two-dimensional navigation, fall short in providing the fluidity and control required for manipulating objects in a three-dimensional space. This gap has led to the development of the space mouse, an advanced input device tailored specifically for 3D applications.

A space mouse, also known as a 3D mouse, is engineered to allow users to interact with digital content in three dimensions seamlessly. Unlike conventional mice, which operate on a flat plane, a space mouse can detect and respond to movements and rotations along multiple axes, offering unparalleled control and precision. This makes it an invaluable tool for professionals working in fields such as CAD (Computer-Aided Design), animation, virtual reality, and other areas where 3D manipulation is essential.

The primary advantage of a space mouse lies in its ability to facilitate more natural and efficient navigation within 3D environments. It enables users to pan, zoom, and rotate objects or scenes with a single, fluid motion, significantly enhancing productivity and reducing the cognitive load associated with complex 3D tasks. As technology advances, the integration of features such as programmable buttons, haptic feedback, and wireless connectivity further enhances the user experience, making space mice an indispensable tool in the modern digital workspace.

In this project, we leverage the capabilities of 3D printing technology to design and construct a custom space mouse. By utilizing 3D printing, we can create a device tailored to specific ergonomic and functional requirements, showcasing the potential of additive manufacturing in producing specialized input devices. This report details the design

process, material selection, printing techniques, assembly, and testing of our 3D-printed space mouse, demonstrating its application and effectiveness in enhancing 3D interaction.

OBJECTIVES

- To create a very cost effective solution as compared to the present market solutions.
- To design a space mouse with ergonomic considerations.
- To utilize 3D printing technology for the creation of the device so that it can be customized as per the user.
- To assemble and test the functionality of the space mouse.

Materials and Methods

Design

The design phase involved creating a 3D model of the space mouse using Autodesk Fusion. Key design considerations included:

- Ergonomics: Ensuring the device is comfortable to use.
- Functionality: Incorporating necessary buttons and sensors.
- Aesthetics: Achieving a visually appealing design.

Materials

The primary materials used in this project were:

- PLA (Polylactic Acid) filament for 3D printing.
- Electronic components including joysticks and microcontroller.
- Adhesives and fasteners for assembly.

3D Printing

The 3D printing process involved the following steps:

1. **Modeling:** The space mouse was modeled in CAD software.
2. **Slicing:** The 3D model was sliced using slicing software to generate G-code for the 3D printer.
3. **Printing:** The components were printed using a 3D printer, layer by layer.

Assembly

For assembling the device, we have placed 3 joysticks at the vertices of an equilateral triangular prism wired it to our main micro controller and uploaded our code. Using some mathematical computations, we can infer rotation angles and the space mouse works as it is supposed to.

Testing

The functionality of the space mouse was tested by connecting it to a computer and running 3D modelling software like Blender. Various tests were conducted to ensure:

- Responsiveness of the device.
- Accuracy of the calibration.
- Durability of the printed components.

Results

The space mouse was successfully created and tested. The device demonstrated high precision and ease of use in 3D environments. The ergonomic design provided comfort during extended use, and the 3D printed components were durable and aesthetically pleasing.

Cost Analysis

Understanding the cost involved in building the space mouse is crucial for evaluating its feasibility and potential for broader application.

The present products available in the market costs roughly 15k-20k Indian rupees whereas our product can be made at very cheap rates nearly 1k-1.5k Indian rupees. The cost can further be reduced if we produce it on a large scale.

Discussion

The project highlights the potential of 3D printing in creating custom input devices. The space mouse performed well in various tests, indicating that 3D printing is a viable method for prototyping and manufacturing such devices. Future improvements could include refining the design for better ergonomics and incorporating advanced sensors for enhanced functionality.

Conclusion

The space mouse project successfully demonstrated the integration of 3D printing technology in developing a functional and ergonomic input device. This project paves the way for further exploration into custom-made input devices, leveraging the flexibility and precision of 3D printing.