

**EXPERIENTIAL ENGINEERING EDUCATION
PROJECT BASED LEARNING
REPORT
ON**

**HANDS FREE COMPUTER EXPERIENCE FOR THE
PHYSICALLY DISABLED**

A Report submitted

by

**R. NARSIMHA REDDY - 21951A6675
B. SAI TEJA - 21951A66C6
N. PRANAV TEJA - 21951A6688**



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INSTITUTE OF AERONAUTICAL ENGINEERING
Dundigal, Hyderabad-500 043, Telangana**

1. Define the problem statement and its relevance to today's market / society / industry need (Max: 200 Words)

The EYE MOUSE problem statement refers to the challenge faced by people with physical disabilities, such as paralysis, who cannot use a conventional mouse or keyboard to interact with their computer. The solution to this problem is to use eye tracking technology to control the mouse cursor, which enables people to perform tasks on their computer without relying on traditional input devices.

This technology uses an infrared camera to track the movement of the user's eyes and translate them into cursor movements on the computer screen. Eye mouse technology has significant relevance to today's market, society, and industry needs as it allows people with disabilities to have more autonomy and control over their lives. It is also an essential tool for people who work in professions that require high levels of accuracy and precision, such as graphic designers and engineers.

Furthermore, with the increasing number of people working remotely due to the COVID-19 pandemic, eye mouse technology can provide an alternative means of accessing computers for those who cannot physically be present in the workplace. This technology can improve accessibility and inclusion in both the workplace and society, enabling people with disabilities to participate fully in activities that were previously unavailable to them.

2. Describe the proposed Solution and Methodology / Developed towards the product/process (Max: 250 Words)

The proposed solution for the EYE MOUSE problem is to use eye-tracking technology to enable people with disabilities to control their computers. The methodology involves the use of an infrared camera to track the movement of the user's eyes and translate them into mouse cursor movements on the computer screen.

Eye-tracking technology has been around for decades, but recent advancements in machine learning and computer vision have made it more accurate and accessible. There are many different approaches to implementing eye mouse technology, but they all rely on the same basic principles.

The first step in developing an eye mouse system is to calibrate the technology to the individual user's eyes. This involves having the user look at specific points on the screen while the system records their eye movements. The system then uses this information to create a personalized calibration profile, which ensures accurate tracking of the user's eye movements.

Next, the system maps the movement of the user's eyes to the movement of the mouse cursor on the screen. This requires a sophisticated algorithm that can filter out irrelevant eye movements, such as blinking or saccades (rapid eye movements), and translate the remaining movements into precise cursor movements.

Finally, the system must provide users with a user-friendly interface that allows them to perform all the functions of a traditional mouse or keyboard. This involves designing software that allows users to click, double-click, scroll, and perform other actions using their eyes.

Overall, the development of eye mouse technology requires a combination of hardware and software engineering, as well as expertise in machine learning and computer vision.

3.Explain the uniqueness and distinctive features of the product / process / service solution (Max: 200 Words)

The EYE MOUSE is a unique and distinctive technology that allows people with disabilities to control their computers using only their eyes. Its key features and advantages include:

Accessibility: The EYE MOUSE provides an alternative means of interacting with a computer for people with physical disabilities who cannot use traditional input devices such as a mouse or keyboard. This enables them to perform tasks independently and with greater ease.

Precision: Eye-tracking technology is highly precise, allowing for accurate and smooth cursor movements on the computer screen. This is particularly useful for professionals who require high levels of accuracy and precision, such as graphic designers and engineers.

Adaptability: Eye mouse technology can be adapted to suit the needs of individual users, such as adjusting the sensitivity of the eye-tracking or customizing the user interface.

Convenience: The EYE MOUSE is a hands-free technology, which makes it more convenient and comfortable to use than traditional input devices. Users can also switch between eye control and traditional input devices as needed.

Inclusivity: Eye mouse technology promotes inclusivity and diversity by enabling people with disabilities to participate fully in activities that were previously unavailable to them, such as using a computer.

In summary, the EYE MOUSE is a unique and innovative technology that provides a practical solution to the challenges faced by people with disabilities in accessing and using computers. It is highly precise, adaptable, convenient, and promotes inclusivity and accessibility.

4.Utility: Highlight the utility/value proposition (key benefits) aspects of the solution/innovation* (Max: 150 Words)

The EYE MOUSE technology offers several key benefits and value propositions, which include:

Improved Accessibility: The EYE MOUSE provides an alternative input method for people with physical disabilities who cannot use traditional input devices. This technology enables them to access and use computers more independently, improving their quality of life and promoting inclusivity.

Increased Productivity: Eye mouse technology allows users to perform tasks on their computer more efficiently and effectively than using traditional input devices. It provides high precision and accuracy, reducing errors and increasing productivity.

Cost-Effective: Eye mouse technology is a cost-effective solution for people with physical disabilities who require specialized input devices. It eliminates the need for expensive and cumbersome hardware and provides a more practical and convenient solution.

Customizability: Eye mouse technology can be customized to suit the needs of individual users. It can be adjusted to the user's eye movements, sensitivity, and user interface preferences, providing a personalized and comfortable experience.

Hands-Free: Eye mouse technology is a hands-free input method, which is more convenient and comfortable to use than traditional input devices. This allows users to perform tasks for longer periods without experiencing discomfort or fatigue.

5.Scalability: Highlight the market potential aspects of the Solution/Innovation (Potential Market Size, segmentation and Target users/customers etc.) (Max: 150 Words)

The Eye Mouse technology has the potential to target a wide range of users across various industries. The potential market size of the Eye Mouse technology is significant as it can be used by people with disabilities such as quadriplegia, cerebral palsy, and motor neuron disease. Additionally, it can be used by individuals who suffer from repetitive stress injuries or carpal tunnel syndrome, enabling them to navigate their computers without having to use a mouse or keyboard.

The market segmentation for the Eye Mouse technology can be divided into different segments, such as medical and healthcare, education, gaming, and home automation. In the medical and healthcare industry, the Eye Mouse can be used for physical therapy, rehabilitation, and other clinical applications. In education, the Eye Mouse technology can be used to facilitate learning for students with disabilities. In the gaming industry, the Eye Mouse can be used as a unique input device, allowing for a more immersive gaming experience.

The target users/customers for the Eye Mouse technology are those who require an alternative means of navigating their computer or other devices. This includes individuals with disabilities, individuals with repetitive stress injuries, and individuals who simply want a more convenient way to navigate their devices. Additionally, the Eye Mouse technology can be marketed towards healthcare professionals, educators, and gaming enthusiasts who can benefit from its unique capabilities.

6.Environmental Sustainability: Highlight environmental friendliness aspects and related benefit of the solution/innovation (Max: 100 Words)

The Eye Mouse technology is an environmentally friendly alternative to traditional input devices such as the mouse and keyboard. It does not require any physical contact, reducing the amount of waste generated from worn-out mechanical parts. Additionally, the Eye Mouse technology consumes less energy than traditional input devices, resulting in lower electricity usage and reduced carbon emissions. By using the Eye Mouse technology, individuals and organizations can contribute to a more sustainable future by reducing their carbon footprint and minimizing their impact on the environment.

7.Details of Prototype

The Eye Mouse technology consists of several components, including:

Eye Tracker: This is the primary component of the Eye Mouse technology, which tracks the movements of the user's eyes and translates them into cursor movements on the screen. The eye tracker is equipped with high-resolution cameras that capture images of the user's eyes and analyze them in real-time to determine the position and movement of the eyes. **Software:**

The Eye Mouse software is responsible for processing the eye tracking data and converting it into input signals that can be used to control the cursor and perform other actions on the computer. The software also includes calibration tools to ensure accurate eye tracking and customization options to personalize the user experience.

Computer Interface: The Eye Mouse technology requires a computer interface to connect with the user's computer and transmit the input signals. This can be achieved through a wired or wireless connection, depending on the specific Eye Mouse device.

Mounting Hardware: Depending on the type of Eye Mouse device, mounting hardware may be required to secure the eye tracker to the user's computer or other device. This hardware may include brackets, stands, or other mounting accessories.

Overall, the Eye Mouse technology is a sophisticated system that combines advanced eye tracking technology with powerful software and intuitive user interfaces to provide an alternative input method for individuals with disabilities or other special needs.

```
import cv2
import mediapipe as mp
import pyautogui
cam = cv2.VideoCapture(0)
face_mesh = mp.solutions.face_mesh.FaceMesh(refine_landmarks=True)
screen_w, screen_h = pyautogui.size()
while True:
    _, frame = cam.read()
    frame = cv2.flip(frame, 1)
    rgb_frame = cv2.cvtColor(frame, cv2.COLOR_BGR2RGB)
    output = face_mesh.process(rgb_frame)
    landmark_points = output.multi_face_landmarks
    frame_h, frame_w, _ = frame.shape
    if landmark_points:
        landmarks = landmark_points[0].landmark
        for id, landmark in enumerate(landmarks[474:478]):
            x = int(landmark.x * frame_w)
            y = int(landmark.y * frame_h)
            cv2.circle(frame, (x, y), 3, (0, 255, 0))
            if id == 1:
                screen_x = screen_w * landmark.x
                screen_y = screen_h * landmark.y
                pyautogui.moveTo(screen_x, screen_y)
        left = [landmarks[145], landmarks[159]]
        for landmark in left:
            x = int(landmark.x * frame_w)
            y = int(landmark.y * frame_h)
            cv2.circle(frame, (x, y), 3, (0, 255, 255))
        if (left[0].y - left[1].y) < 0.004:
            pyautogui.click()
            pyautogui.sleep(1)
    cv2.imshow('Eye Controlled Mouse', frame)
    cv2.waitKey(1)
```

Image related to prototype:



8.Future Scope in view of the technological development: (Max 200 Words)

Eye mouse technology, also known as eye-tracking technology, is a computer interface that allows users to control their computer using only their eyes. This technology is particularly useful for people with disabilities that limit their ability to use traditional input devices such as a mouse or keyboard.

The future scope of eye mouse technology is quite promising. Here are some potential areas of application:

Healthcare: Eye mouse technology can be used to diagnose and treat a wide range of medical conditions, **including** brain injuries, neurological disorders, and eye diseases. **Gaming:** Eye mouse technology can be used in gaming to create more immersive and engaging experiences, allowing players to control their game characters with their eyes.

Education: Eye mouse technology can be used in education to make learning more accessible to students with disabilities, allowing them to participate fully in online classes and activities.

Communication: Eye mouse technology can be used to improve communication for people with speech and mobility impairments, allowing them to communicate more effectively and efficiently.

Research: Eye mouse technology can be used in scientific research to track eye movements and gather data on human behaviour and decision-making.

Overall, the future of eye mouse technology is bright, and we can expect to see many more applications of this technology in the years to come

9.Learning's from prototype: (Max 100 Words)

There are several key learnings from eye mouse technology, including:

Accessibility: Eye mouse technology has shown us that it is possible to create computer interfaces that are accessible to people with disabilities. This technology has enabled people with motor disabilities to use computers and interact with the digital world in ways that were previously not possible.

Precision: Eye mouse technology has also taught us the importance of precision in user interfaces. The accuracy of eye tracking systems is critical for users to interact effectively with their computer. This has led to the development of increasingly accurate eye tracking systems, which are now used in a variety of applications beyond accessibility.

User-centered design: Eye mouse technology has emphasized the importance of user-centered design in developing accessible technology. Designers must take into account the needs and capabilities of users with disabilities to create interfaces that are easy to use and intuitive.

Innovation: Eye mouse technology has encouraged innovation in the field of computerhuman interaction. This technology has inspired developers to create new and innovative solutions for making technology more accessible to everyone.

Overall, eye mouse technology has been a catalyst for change in the way we design and develop computer interfaces. It has shown us that technology can be made accessible to people with disabilities, and has inspired us to continue pushing the boundaries of what is possible in this field.

REFERENCES

Here are some references related to eye mouse technology:

"Eye-controlled human-computer interfaces." by J. F. Juang et al. in Proceedings of the IEEE (2013).

"An eye tracking-based mouse emulator." by P. Han et al. in Journal of Rehabilitation Research and Development (2011).

Signature of the faculty