IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

MOUSE CURSOR CONTROL USING FACIAL MOVEMENTS

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Abstract-*People suffer from ailments from no longer running on computers. The concept of visual manipulate could be very beneficial for the improvement of natural intake and for people with disabilities. This software makes use of a webcam to seize facial moves. We used a fixed of tools known as Dlib, which not only plays fast face recognition, but additionally predicts facial capabilities. Using those symbols, you may create appropriate features that allow you to stumble on particular moves, including eye blinks programmed as triggers to manipulate the mouse cursor. PyAutoGUI library is used to control the mouse cursor. This program allows someone to open and close folders, files and programs using a click mechanism. It allows people with disabilities to work on personal computers. Algorithms available within the Dlib toolbox include Support Vector Machine (SVM), Convolutional Neural Networks (CNN) and Histogram of Orientation Gradients (HOG). Compared to preceding projects, this machine, based totally on facial recognition, offers several vital differences and improvements: recognition of facial signals and moves, integration of several algorithms, PyAutoGUI for mouse manage. The mixture of advanced facial reputation strategies, versatile algorithms, handy mouse control the usage of PyAutoGUI and emphasis on real-time interactions make this venture a unique and attempt-efficient precedent in this vicinity.*

Keywords- *PyAutoGUI, Support Vector Machine (SVM), Convolutional Neural Networks (CNN), Histogram of Oriented Gradients (HOG), Image processing, Machine Learning.*

INTRODUCTION

Personal computers have come to be an vital part of our everyday lives as we use them for business, education and amusement purposes. Computers had been designed to be without difficulty accessible to not unusual people. However, for people with physical disabilities along with

cerebral palsy or amyotrophic lateral sclerosis, the use of a laptop may be difficult. Disabilities including paraplegia, the situation of being unable to transport from the neck down, are growing in cutting-edge society. Their eyes are the only organ that may carry out numerous functions. Recently, there has been elevated interest in designing natural laptop-human interactions. Many studies have been carried out on human- computer interaction in pervasive computing. These interfaces consist of touchscreens, voice recognition

software, and other technologies. Most of them follow best to the commonplace man. As of February 7, 2018, almost 10% (or 650 million) of the arena's population suffers from a incapacity. They want a person else's assist even if they're consuming. These human beings want help to complete their daily duties. Today, disabled human beings maintain long chopsticks of their mouths and type on keyboards. The machine we are offering will enable the disabled to stay an impartial life. It offers them a hazard to have fun, socialize and revel in lifestyles.The proposed works encompass facial reputation, face monitoring, blink reputation, mouth second detection and actual-time blink collection interpretation for seamless human-device interface manage. Use human facial and eye actions to interact with the pc in place of a conventional mouse. It is designed to make computer use efficient and easy for humans with bodily

disabilities and people with out hands. In this challenge, we use a camera to song the position of the eyes and their movement, which helps in identifying in which the eyes are searching. This lets in us to tune our eye movements and use them as manipulate indicators.Only your eyes can have interaction with the computer. This is a easy solution for human beings with disabilities the use of eye tracking. All we need is a computer or laptop with a pre-established webcam at the pc or personal pc.

OBJECTIVE

The venture ambitions to make computer systems reachable to the disabled. This generation is being advanced to update the conventional pointing tool at the computer display for the benefit of humans with disabilities. Cursor movement is automatically adjusted based on function relative to the user's discipline of view. It is usually utilized by disabled or disabled humans. They can use computers independently and without help. This capability may be prolonged to encompass full mouse functionality and gadget click on activities together with green blinking for the complete HCI system. The generation has also been implemented to eye motion and blinks to achieve green and specific movements. It gives them a risk to have amusing, socialize with others and enjoy lifestyles.In the future, a multimodal machine becomes a feasible opportunity for many folks who cannot use a preferred computer mouse or keyboard because of physical barriers with their hands or arms to function a pc without the usage of a traditional mouse and keyboard. . Uses speech to provide manage instructions and head actions to transport the cursor at the computer display. Combining automated voice recognition with joint multi-modal active head tracking.

LITERATURE SURVEY

1) Development of real-time eye monitoring algorithms. Syed Hasan Adil, Azrina Abd Aziz, Sheikh Anwar

Many eye tracking strategies were developed to assist the visually impaired, expect human behavior, and assess driving cognizance. An vital step inside the development of eye monitoring is the identification of the iris center, which is commonly finished the usage of the traditional circular Hough remodel (CCHT). But when the ambient mild adjustments and the challenge's head isn't perpendicular to the digicam, the accuracy of the HVDC method suffers. To solve this trouble, face reputation is used to classify the eye position as left, proper, and middle. It allows the eye to perceive a area of hobby (ROI), tune and pick out the focus of attention. Python software program is used to enforce the eye monitoring algorithm in OpenCV to make sure portability. The effects display that iris detection and visual country type achieve a median accuracy of a hundred% and ninety%, respectively.

2) Blink detection technique in video surveillance structures based totally on eye frequency. Lam Than Hien, Do Nang Than, Ngo Tak Win

The eyes, one of the maximum striking functions of the human face, are critical for assessing and gauging a person's changing feelings and moods. In programs regarding human facial expressions, including monitoring driver fatigue and drowsiness to save you automobile injuries and shooting statistics thru human-machine interfaces, open eyes/closed state detection is an essential step in facial state detection. This take a look at makes a speciality of a method of figuring out whether a watch is open or closed the usage of changes in aspect ratio round the attention. This method became evaluated and discovered to be effective in fatigue detection from images.

3) Built-in blink detection gadget the usage of machine learning approach. R. Ibrahim, M. Khalifa, A. Usman, R. Zebari

This study provides a useful approach for calculating closed and open eyelid extent. We present a real-time blink detection method that mixes laptop imaginative and prescient and gadget studying. The proposed method is divided into 4 steps: taking a image the use of the Raspberry Pi camera attached to the Raspberry Pi three platform; Detect faces in detected pictures the use of the Cascade Hare algorithm; Identifying facial features using a facial recognition algorithm; Determine the placement of the eyes; and calculates the ratio of the eye. The proposed method correctly detects eye closure or opening with high accuracy. In this have a look at, a sturdy and inexpensive incorporated blink detection system using the proportional approach is implemented on the Raspberry Pi platform.

4) Assess motive force sleep based on a couple of attributes the use of photo processing strategies. Uma Maheshwari, MVV Prasad, Ketan Kotecha

This examine proposes an integrated approach primarily based on the calculation of PERCLOS (Eye and Mouth Closed Position) and a new proposed FAR (Face Aspect Ratio) vector comparable to EAR and MAR. It allows to locate the location of closed eyes or open mouth. The device also consists of gradient styles and patterns based on texture information to detect the driving force's face from special directions and to stumble on shades at the driving force's face. Scenes where drivers blanketed their eyes or mouth with their arms whilst sneezing or yawning have been additionally recognized and studied.

5) Eye Detection and Tracking in Video Streams. A. Fathi, MD. Sanction

This observe presents a singular technique for eye detection in continuous video photographs. Skin tone capabilities are to start with used to pick out the location of the face area, and then three alerts are carried out to the diagnosed face location to identify the vicinity of the eyes. The first clue is the depth and shade of the eyes, as each eye place is distinctly mild in depth and a distinct color than the encircling skin. The role and length of the eyes function a 2d sign. The 1/3 sign is based at the convolution of the candidate eye windows and the proposed eye dispersion clear out. Once the exact function of the attention is determined, it is tracked in the defined search body. We have evaluated and tested the proposed gadget the usage of exceptional body streams and the effects are encouraging.

EXISTING SYSTEM

Earlier systems worried very complicated gear and mechanisms. They rely upon biometric identification

techniques. Some technology, which includes lasers, need to be implanted into the consumer, that is impractical.

To carry out electrooculography, we use a couple of electrodes placed across the eyes. As the eye actions from the central function to one of the electrodes, the high-quality facet of the retina seems; When the eye is directed toward the opposite electrode the terrible side of the retina is seen. This results in a capability difference among the electrodes.

An accurate but invasive approach of measuring eye moves is the scleral seek coil technique. It relies on recording small currents precipitated by a magnetic area in a coil of very best wire in a bendy plastic ring that fits over the attention.

Disadvantages of the present-day gadget

- Some systems require gadgets which include lasers, electrodes and cameras to be mounted on the user, which turns into bulky.
- Some structures use biometric identification that requires customers to register before the usage of the gadget. The proposed file does not display something that has been corrected.
- Additionally, some current systems use complicated algorithms that require multiple calculations relying on special tokens.

PROPOSED SYSTEM

Our system is a actual-time, non-invasive technique that captures mouse cursor movement thru face and facial characteristic reputation. It is better than the present-day device with the aid of avoiding the use of external devices that may cause extreme damage to the eye. It uses a sample matching technique to capture eyes without the usage of hardware as previous systems skip or forget about small blinks.

This putting will hard flash handiest pick out specific report or folder. After spotting a face, it could as it should be predicting its features. Using those inferred facial capabilities, we will create associated features that permit us to understand precise moves and deal with related activities.

Advantages compared to modern system

- Hands-unfastened mouse cursor manage system.
- Make computers handy to humans with disabilities.
- Facial expressions used to manipulate the mouse pointer.
- Human-device visual interplay makes it viable to tune eye movements and are expecting imaginative and prescient in real time.
- Simulate mouse movements which includes left-click, proper-click on, double-click and different actions the use of eyes and mouth.

SYSTEM ARCHITECTURE

To test the person's eyes, a unique video digital camera is set up above the display in front of the person's personal pc or non-public laptop screen. The laptop continuously analyses the video photograph that attracts the consumer's interest and makes use of the show display screen to perceive in which the consumer is looking. Nothing is hooked up to the person's head or frame.

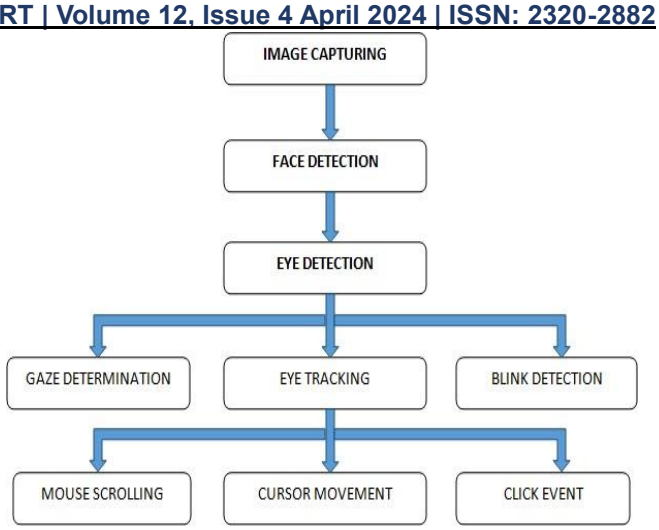

Fig 1. System Architecture

METHODOLOGY

First of all, the video should be recorded thru a webcam. Scenes are converted into photos. Frames are further transformed to grayscale to dispose of the historical past. After eliminating the background, you want an accurate picture of the face to discover the functions and edges of the image. It detects eyes and mouths in the body primarily based on edges and counters.

Eye/mouth ratio is decided after identity. The Dilips set of rules determines the timing of head movement and eye blinks. For better or quicker treatment time, both eyes are used in this example.

TECHNICAL NECESSITIES

Recommended Hardware Configuration

- Processor - Intel(R) Core (TM) i5-8265U @ 1.60 GHz 1. 80 GHz
- Memory - eight GB RAM

Software Requirements

- About Windows 10 or eleven
- Python programming language
- About PyAutoGUI
- Python libraries for model development - NumPy, OpenCV
- DLib Toolbox

USED TECHNICAL LANGUAGES

1) Python:

Python is a excessive-degree programming language used to expand software and internet pages. It is descriptive language. Python normally has much less code than many different languages, which makes it less complicated for a programmer to create software program.

Python is a current, fast and clean-to-use open-source programming language that works well with different languages. This adaptive programming language is used for conversation. Because of its compatibility, ease of use, and established reputation, it forms the basis of many A-based programs.

2) NumPy:

Python would not have an array facts shape, so we imported NumPy from libraries to apply the array data structure. NumPy has other records systems consisting of matrices. NumPy is beneficial for running with linear algebra. NumPy is used to carry out diverse operations on arrays or matrices. NumPy additionally has trigonometric features.

3) OpenCV:

OpenCV (Open-Source Computer Vision Library) is a unfastened, open source software library for pc imaginative and prescient and device studying. A popular framework for pc imaginative and prescient applications become evolved the usage of OpenCV to boost up synthetic intelligence in merchandise. Apache 2 is a licensed product that permits companies to effortlessly use and adjust OpenCV code.

4) PyAutoGUI:

Essentially, PyAutoGUI is Python software that runs on Windows, MacOS X and Linux and allows users to simulate keyboard button presses in addition to mouse cursor moves and clicks.

MACHINE LEARNING

Machine gaining knowledge of is artificial intelligence (AI) that specializes in developing algorithms and statistical models that permit computers to enhance their overall performance at a particular venture via enjoy or exercise. In conventional programming, human beings explicitly code the regulations for the pc to comply with, but in gadget learning, the pc learns from information and makes predictions or selections without being explicitly programmed. Machine studying (ML) is a department of synthetic intelligence (AI) and pc science.

Focusing on the use of records and algorithms lets in AI to imitate the manner humans' study, steadily growing its accuracy. Machine studying is used in lots of applications inclusive of web search engines like google and yahoo, email filters to address junk mail, websites to provide personalised pointers, banking software program to locate uncommon transactions, and speech reputation. For instance, a gadget gaining knowledge of set of rules may be "trained" on a dataset containing hundreds of flower pix labelled with exceptional types of plants so that it is able to efficaciously identify a flower in a brand-new image based totally on a exclusive characteristic. Features he recognized in other movies.

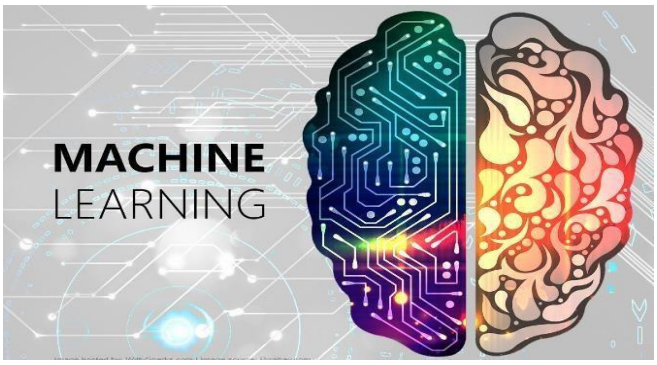

Fig 2. Machine Learning.

IMAGE PROCESSING

Before pix may be used for model education and output, they should first be subjected to photo preprocessing. This consists of, however is not restrained to, adjustments in length, orientation, and shade. The purpose of preprocessing is to improve the satisfactory of the photograph so that we are able to examine it extra efficiently.

Image processing is the method of appearing sure operations on a picture to attain a more advantageous image or to extract beneficial facts from it. It is a sort of signal processing in which the input is a photograph and the output may be a picture or features/features related to that image. A set of diverse branches of processing strategies (i.e. acquisition, extraction, detection, storage, enhancement, filtering, rationalization, drawing, transformation, coding, transmission, manipulation, and so forth.

Image processing is the software of particular strategies). Or a set of rules on a picture to enhance the photo or extract useful information from it. Image processing makes it possible to enliven a photograph taken in the darkish or apprehend a face in a surveillance digicam video circulation.

Fig 3. Image Processing

Use case diagram:

A use case diagram is a easy system for representing how a consumer will have interaction with a system. It is used to expose the relationship between the consumer and the distinctive use cases in which the user participates.

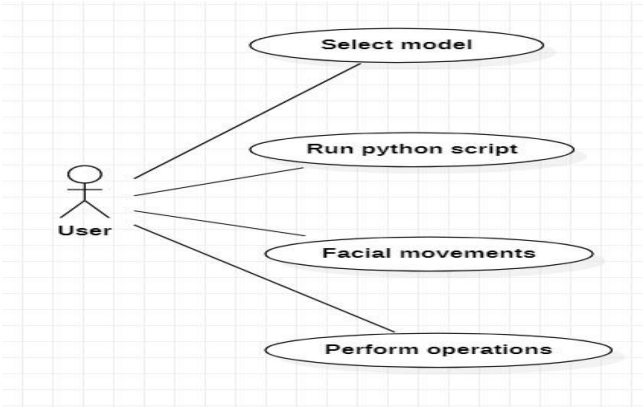

Fig 4. Use case diagram Sequence

Diagram:

A collection diagram is an interplay diagram that suggests the relationship between the items involved in a selected interaction and the messages exchanged in a temporal sequence. This diagram is also known as an occasion diagram and it helps us recognize the gadgets we use. It has dimensions: time is represented vertically and items are represented horizontally.

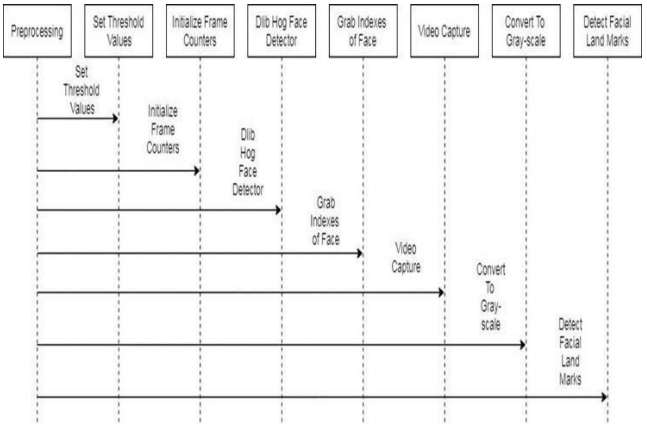

Fig 5. Sequence Diagram.

Activity Diagram

Another important UML diagram that describes the dynamic traits of a device is the pastime diagram. A hobby diagram is a flowchart that suggests the drift from one hobby to any other. This movement may be defined as a laptop operation.

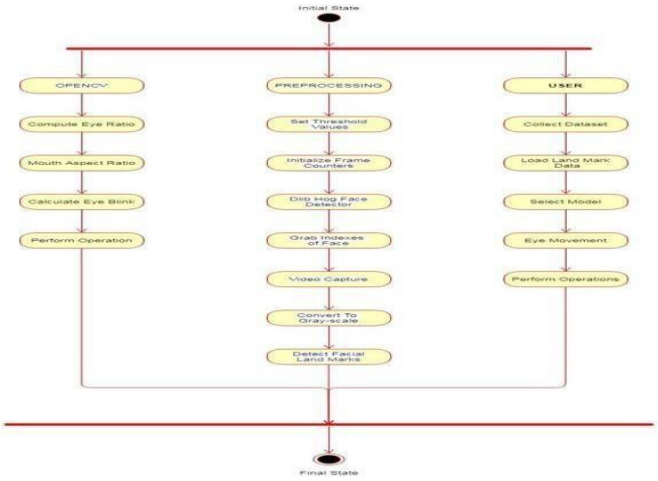

Fig 6. Activity Diagram.

ALGORITHMS USED

1. Support Vector Machine:

Support Vector Machine (SVM) is a powerful device learning set of rules used for linear or nonlinear type, regression and outlier detection responsibilities. SVM can be used for numerous tasks which include text class, image category, spam detection, handwriting popularity, gene expression analysis, face detection and voice detection. SVMs are adaptable and useful in various programs because they can cope with high dimensional statistics and nonlinear relationships.

The purpose of the SVM algorithm is to create a thin line or decision boundary that divides the n-dimensional space into training so that a new records factor may be easily placed in the best class within the future. This limit of the best answer is known as a hyperplane.

2. Convolutional Neural Network:

A convolutional neural community (CNN) is a kind of system mastering. It is one of the many varieties of artificial neural networks used for distinctive packages and information types. CNN is a sort of community structure for deep studying algorithms, in particular used for photo popularity and pixel information processing obligations.

There are other varieties of neural networks in deep mastering, however for object detection and recognition, CNNs are the desired community structure. It is properly perfect for laptop imaginative and prescient (CV) tasks and programs wherein object recognition is obligatory, including self-driving motors and facial popularity.

3. Histological plot of structured slopes:

Histogram of Oriented Gradients (HOG) is a extensively used function descriptor in item detection in computer vision and system learning. It became brought by way of Navneet Dalal and Bill Triggs in 2005 underneath the name "Oriented Gradient Histograms for Person Recognition". HOG is popular in packages consisting of pedestrian detection, face detection, and popular object detection.

Dlib's face detection algorithm is based totally on HOG features and uses linear guide vector system (SVM) for item detection.

HOG is a function descriptor that captures neighbourhood depth gradients in a picture, and SVM is used for type primarily based on those functions. This aggregate is beneficial for figuring out objects, in this case faces.

IMPLEMENTATION

The point of this views went into to survey eye activities. To find out, you want to initially perceive the signs at the face Eye activities. These tips permit us to acquire loads. You can locate eye movements inside the video Blink and verify feelings. Understanding face recognition search function of dlibs: Dlib's version is not only proper at recognizing faces 68 Quickly however as it should be predicting 2D facial functions. Can be used to view recordings via image-in-image 68 In the rule of thumb implementation manner, step one is Set all required threshold values and to permit frame and body period counters, its Mouse is used to manipulate movements.

The subsequent step is getting Get the HOG face and face sensor angles Mouth, eyes, facial markings, And the nostril. The face inside the photograph frame is converted to a grayscale layout, which depicts the face The coordinates (x, y) are saved in a NumPy array. Next, the proportions of the eyes and the shape of the mouth Ratios are calculated. Finally, the bounding field is drawn Exactly from the centre of the nose, it's far necessary Functions can be finished inside this bounding container.

RESLUT AND DISCUSSION

The intention of this project is to take away mouse dependency through permitting hands-loose cursor manage. We are Specially supposed for humans with bodily disabilities who cannot use their fingers to perform a computer. Our machine It can provide desired consequences. A system that permits a disabled person to paintings efficaciously on a laptop Designed and tested. This method can be in addition advanced and applied to many programs.

Machine Home equipment like televisions, lighting fixtures, doorways etc. They may be modified to facilitate their use by way of humans with disabilities. People with overall paralysis also can adapt generation to perform a wheelchair. An eye pointer can be used to locate driving force fatigue to avoid visitors' injuries. Identification and analysis Eye actions have capacity packages in digital reality and gaming.

CONCLUSION

In conclusion, imposing mouse cursor manipulate thru facial gestures represents a promising and revolutionary method to human-computer interaction. The era uses facial popularity and monitoring abilities to provide users with opportunity and probably extra intuitive methods to navigate virtual interfaces. By the usage of facial gestures, users can manipulate the mouse cursor more exactly and correctly, establishing up new possibilities for accessibility and usefulness. This technology has sizable capacity for people with decreased mobility, imparting them with an available and intuitive manner to have interaction with computers.

Additionally, the combination of facial gestures for cursor control improves the enjoy for all users through imparting an opportunity enter approach to complement conventional mouse and keyboard interactions. Therefore, controlling the mouse cursor the use of facial movements isn't handiest a technological strengthen, however a step toward greater included and user-pleasant computing surroundings.

As this generation evolves, it has the capacity to trade the manner we have interaction with digital devices through making computing accessible and fun for users of all ability tiers.

FUTURE SCOPE

The future of controlling the mouse cursor using facial gestures gives interesting possibilities, and numerous capability enhancements may want to further enhance this era: Improve accuracy and precision: Future upgrades can focus on enhancing the accuracy and precision of facial movement reputation algorithms. These encompass advances in pc vision, gadget studying and neural networks to higher apprehend diffused facial gestures for particular cursor control. Adaptive mastering and personalization. Implementing adaptive studying mechanisms allows the machine to apprehend and adapt to each person's facial expressions over the years.

This personalization complements the person experience by means of adapting the system to the precise nuances of every person's facial movement. Gesture customization: The creation of a custom gesture popularity device allows customers to set their personal facial gestures for cursor control. Multimodal integration: Combining facial gestures with other enter strategies, inclusive of voice commands or conventional mouse and keyboard interactions, can create a extra flexible and incorporated person experience. Real-time feedback and calibration. Implementing actual-time comments mechanisms permits customers to recognize how the machine translates their facial movements.

Additionally, the automobile-calibration function constantly adjusts the putting based on changing environmental situations or facial expression changes. Advanced accessibility functions. Expanding accessibility features to a much broader variety of customers, inclusive of people with particular motor talents or facial manage troubles, makes the technology greater inclusive. This may additionally encompass allowing advanced accessibility structures or partnering with assistive era answers. By fixing those issues, destiny mouse face manage can be greater versatile, greater consumer-friendly, and integrated into numerous computing environments, thereby enhancing the overall human-laptop interaction experience.

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