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BUILDING A MOUSE BY EYEBALL MOVEMENT USING MACHINE LEARNING

Muppalla Pujitha[1], Jirra Meramma[2], Kota Sahithi[3] , Jajjari Sasi Kumar[4] ,

Y.Vamsi Krishna Teja[5]

[1,2,3,4] *Student, Department of Computer Science and Engineering, Tirumala Engineering College*
[5] *Professor, Department of Computer Science and Engineering, Tirumala Engineering College*

Abstract - An individual Human computer interference system is being introduced. In oldentimes, as an input device the mouse and keyboard were used by human computer interference system. Those people who are suffering from certain disease or illness cannot be able to operate computers. The idea of controlling the computers with the eyes will serve a great use for handicapped and disabled person.

Also this type of control will eliminate the help required by other person to handle the computer. This measure will be the most useful for the person who is without hands through which they can operate with the help of their eye movements. The movement of the cursor is directly associated with the center of the pupil. Implementing a controllingsystem in it enables them to move without the help of another person is very helpful.

First detect pupil center position of eye. Then the different variation on pupil positiondifferent command set for virtual keyboard. The signals pass the driver to interface with virtual keyboard itself. The driver will control both speed and direction to enable virtual keyboard to move forward, left, right and stop.

Key Words: Human computer interference, Keyboard, Mouse, Eye, Cursor, pupil.

1. INTRODUCTION

As the computer technologies are growing rapidly, the importance of human computer interaction becomes highly notable. Some persons who are disabled cannot be able to use the computers. Eye ball movement control mainly used for disabled people. Incorporating this eye controlling system with the computers will make them to work without the help of other individual. Human-Computer Interface (HCI) is focused on use of computer technology to provide interface between the computer and the human.

There is a need for finding the suitable technology that makes the effective communicationbetween human and computer. Human computer interaction plays the important role. Thus there is a need to find a method that spreads an alternate way for making communication between the human and computer to the individuals those who have impairments and give them an equivalent space to be an element of Information Society. In recent years, the human computer interfaces are attracting the attention of various researchers across the globe. Humancomputer interface is an implementation of the vision-based system for eye movement detection for the disabled people.

This results the center position of the human eye (pupil). Then the center position of the pupil is taken as a reference and based on that the human or the user will control the cursor by moving left and right. Some people cannot operate computers because of some diseases. The idea of eye control is very useful not only for the future of natural input but especially for the handicapped and disabled. In addition, the implementation of the control system allows them to control the computers without the help of another person.

This gadget is most useful for a person who can control the cursor by eye movement. In this project, the camera is used to capture the eye movement image. First, it detects the center position of the pupil. Then a different change in the position of the pupil causes a different movement of the cursor. The implementation process for pupil detection is done using the OpenCV library in python, which is an open-source library for computer vision and image processing.

It can be used to process images and videos to identify objects, faces, etc. In this project, we instruct the mouse cursor to change its location based on the movement of the eyeball, connect to the webcam, and then extract each image from the webcam. and pass it to OpenCVto detect the position of the eyeball.

Once the position of the eyeball is detected, we extract the x and y coordinates of the eyeball from OPENCV and then instruct the mouse to change its current position to the givenX and Y coordinates of the eyeball.

2. LITERATURE REVIEW

The system proposed by G. Norris and E. Wilson focuses on eye movement with Electroencephalogram (EEG) which is set up consisting of an instrumentation amplifier and an inverting op amp and the system is set up by wearing it on your head and attaching the EEG specifically to the required points on the head . The EYE Mouse detects the change in EOG from looking up, right, down, left since there is a variation of potential and this is captured accordingly w.r.t the eye movement and it is recorded.

Vandana Khare, S.Gopala Krishna2, Sai Kalyan Sanisetty3, "Cursor Control Using Eye Ball Movement"[1], Because of their illness , a few people and groups are unable to use computers. In this case, it makes more sense to provide a computer operating method that is easily accessible, even when taking into account the infirmities of the differently abled. The human eye can be used as a suitable replacement for computer operating hardware. An Internet protocol camera was utilised to capture an image of an eye frame for cursor movement in this paper. In this regard, we must first concentrate on the role of the EYE. We use a Raspberry Pi for pupil identification since it can handle the computer's cursor, and in this task, an Eye Aspect Ratio (EAR) is calculated, which corresponds to the snaps of the eye (left or right) using the Python programming language's Open Source Computer Vision module.

The major purpose of our suggested methodology is to improve the computing experienceof physically challenged people by assisting them in overcoming challenges such as mouse usage Aditya Dave1 and C. Aishwarya Lekshmi ,"Eye-Ball Tracking System for Motor- Free Control of Mouse Pointer"[2], Recent developments in the field of image processing have resulted in a number of high-quality feature detection techniques. While there is a constant need for new algorithms, there is also a need for an equal number of applications of such algorithms in order toachieve their full potential and use by the general public. For building a robust eye ball tacking system for directing the mouse pointer, this work uses a combination of Viola-Jones, Kanade–Lucas–Tomasi (KLT), and Circular Hough transform algorithms. The system's new featureis the ability to represent clicks. A single click is represented by one blink, and a double click is represented by two blinks in a short period of time. Other methods that were tried but failed to track characteristics are also described in the study. Because computer dependence has risen so dramatically in recent years, this technique can help people with motor difficulties browse through their files on the computer more quickly. Different algorithms excel at different things.

So, rather than creating one algorithm extremely complex in order to perform well on all parameters, combining the best features of all three methods greatly simplifies the work and provides a better result than any of the three alone.

The system was tested in a variety of lighting settings and distances from the screen, and itsuccessfully tracked the iris with an accuracy of about 96 percent, which is impressive given thatthis is a real-time implementation.

The authors' ultimate goal is to create a software package out of this system and make it open source, therefore ease of implementation has been a top priority in order to improve user understanding of the algorithm Sivasangari.A, Deepa.D, Anandhi.T, Anitha Ponraj and Roobini.M.S "Eyeball based Cursor Movement Control"[3],

A human computer interference system is being introduced one at a time. Human computer interference systems used the mouse and keyboard as input devices in the past. Those who are afflicted with a specific ailment or ailment are unable to use computers. For handicapped and impaired people, the idea of controlling computers with their eyes will be extremely useful. This form of control will also eliminate the need for other people to assist with the Vol-7 Issue-3 2021 IJARIIE-ISSN(O)-2395-4396 14512 www.ijariie.com 1921 computer. This approach will be particularly effective for people who are unable to function with their hands and must instead rely on their eyes. The movement of the cursor is directly related to the pupil's centre. As a result, the initial step would be to locate the point pupil's centre. The Raspberry Pi and OpenCV are used to build this pupil detection procedure. The SD card is inserted into the SD/MMC card port of the Raspberry Pi. The operating system that is required to start up the Raspberry Pi is installed on theSD card. Once the application programme is loaded into the Raspberry PI, it will run. Pierluigi Cigliano, Vincenzo Lippiello, Fabio Ruggiero "Robotic Ball Catching with an Eye- in-Hand Single-Camera System "[4] This study proposes a unified control framework for realizing a robotic ball catching job utilising only a moving single-camera (eye-in-hand) system capable of recording flying, rolling, and bouncing +balls in the same formalism. To visually track the thrownball, a circle detection approach is used. Following the recognition of the ball, the camera must follow a baseline in the space to capture an initial collection of visual measurements. To obtain an initial estimate of the catching point, a linear technique is applied. Then, using a nonlinear optimization methodology and a more exact ballistic model, new visual measurements are acquired on a regular basis to keep the current estimate up to date. A typical partitioned visual servoing technology is utilised to operate the translational and rotational components of the camera separately. Experiment results on an industrial robotic system indicate the efficacy of the proposedsolution. Using a motion-capture system, ground truth is employed to validate the proposed estimating technique.

In a paper proposed by S. R. Fahim, et al, it focus on the uses HOG system and motion vector with python programming and Haar Cascade Algorithm which is a training based algorithm, and it is used mainly with programming in machine learning , eye dataset is given in this, by having multiple dataset of eyes, then the eye data is collected and the following system works accordingly to the eye movement and clicking is done with the help of the eye blinking.

3. SYSTEM ANALYSIS

3.1 EXISTING SYSTEM

Mat lab detect the iris and control curser. Eye movement-controlled wheel chair is existing one that controls the wheel chair by monitoring eye movement. In mat lab is difficult topredict the Centroid of eye so we go for OpenCV.

We are instructing mouse cursor to change its location based on eye ball movement, in this application using

OPENCV we will connect to webcam and then extract each frame from the webcam and pass to OPENCV to detect eye balls location. Once eye ball location detected then we can extract x and y coordinates of eye balls from OPENCV and then using python pyautogui API we can instruct mouse to change its current location to given eyeballs X and Y Coordinates.

3.2. PROPOSED SYSTEMS

In our proposed system the cursor movement of computer is controlled by eye movement using Open CV.Camera detects the Eye ball movement which can be processed in OpenCV.By thisthe cursor can be controlled. The user has to sit in front of the display screen of private computer or pc, a specialised video camera established above the screen to study the user's eyes.

The laptop constantly analysis the video photo of the attention. To "pick out" any key, theuser seems at the key for a exact period of time and to "press" any key, the user just blink the eye.

This aims to develop a system for controlling the computer cursor using the movement of the user's eyeballs, providing a hands-free alternative to the traditional mouse. We developed a program using image processing techniques and machine learning algorithms in Python to obtain the eyeball movements and blink and translate them respectively into cursor movements and clickactions.

Our system was able to achieve a high level of accuracy in tracking the user's eye movements. Users were easily able to adapt to the new input method.

This system has great potential to improve the accessibility and usability of computers for individuals with motor impairments or disabilities. This hands-free control method has great potential in the area of applications in gaming and virtual reality environment etc.

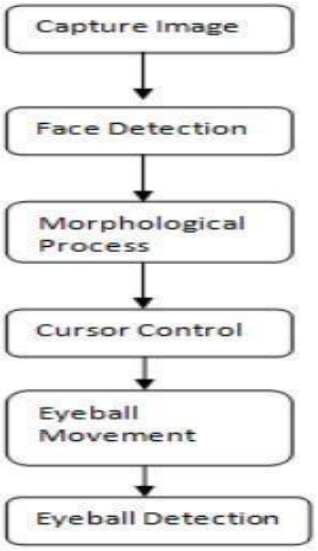


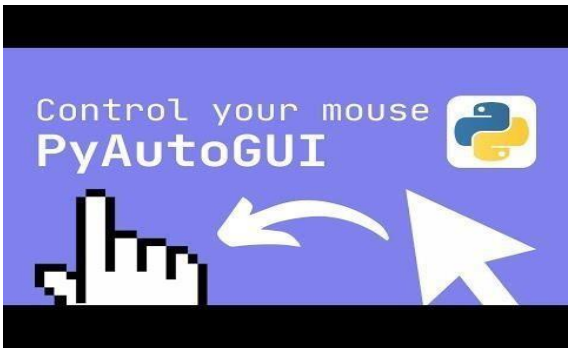
Fig. 1. Flow of Proposed Work

4. IMPLEMENTATION

ABOUT PYTHON

Python is an interpreted high-level programming language for general-purpose programming. Created by Guido van Rossum and first released in 1991, Python has a design philosophy that emphasizes code readability, notably using significant whitespace. It provides constructs that enable clear programming on both small and large scales.

Python features a dynamic type system and automatic memory management. It supports multiple programming paradigms, including object oriented, imperative, functional and procedural, and has a large and comprehensive standard library.

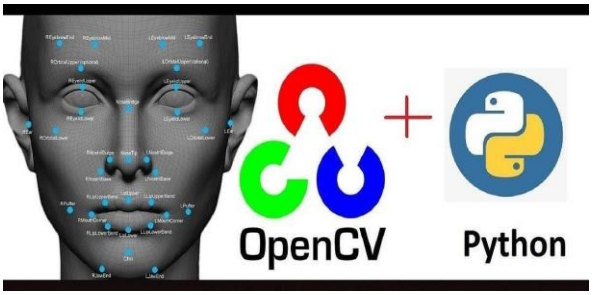


OpenCV-Python

OpenCV-Python is a library of Python bindings designed to solve computer vision problems. Python is a general purpose programming language started by **Guido van Rossum** that became very popular very quickly, mainly because of its simplicity and code readability. It enables the programmer to express ideas in fewer lines of code without

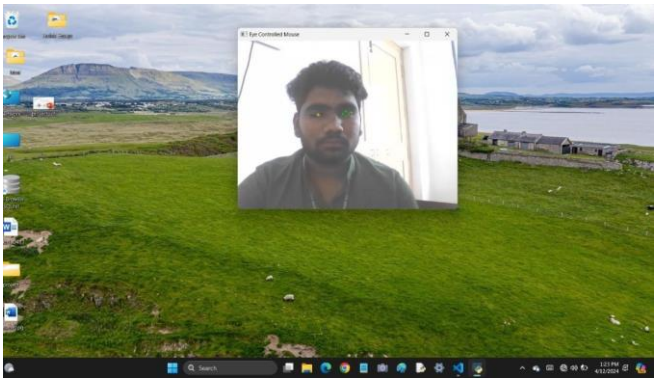
reducing readability.

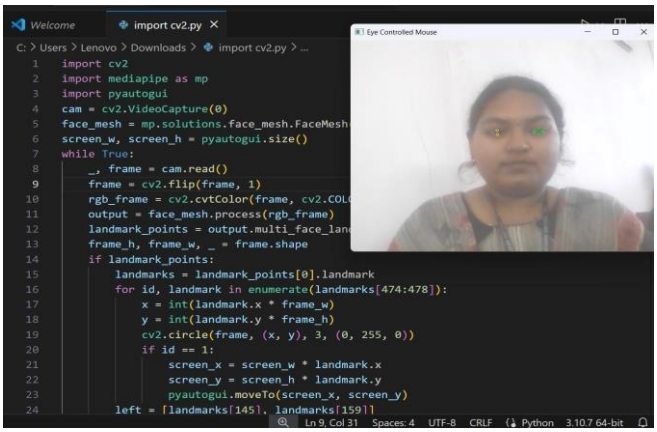
Compared to languages like C/C++, Python is slower. That said, Python can be easily extended with C/C++, which allows us to write computationally intensive code in C/C++ and create Python wrappers that can be used as Python modules. This gives us two advantages: first, the code is as fast as the original C/C++ code (since it is the actual C++ code working in background) and second, it is easier to code in Python than C/C++. OpenCV-Python is a Python wrapper for the original OpenCV C++ implementation.

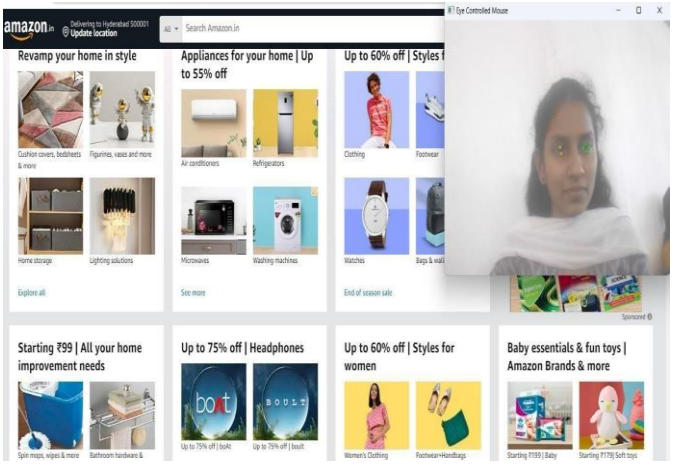


OpenCV-Python makes use of **Numpy**, which is a highly optimized library for numerical operations with a MATLAB-style syntax. All the OpenCV array structures are converted to and from Numpy arrays. This also makes it easier to integrate with other libraries that use Numpy such as SciPy and Matplotlib.

5. Output Screens







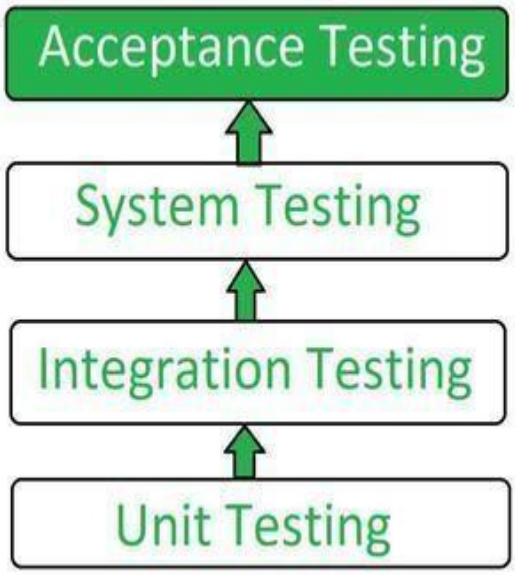
6. SYSTEM TESTING

The purpose of testing is to discover errors. Testing is the process of trying to discover every conceivable fault or weakness in a work product. It provides a way to check the functionality of components, sub assemblies, assemblies and/or a finished product.

It is the process of exercising software with the intent of ensuring that the Software system meets its requirements and user expectations and does not fail in an unacceptable manner. There are various types of test. Each test type addresses a specific testing requirement.

Software testing is a process used to help identify the correctness, completeness and qualityofdeveloped computer software.

Software testing is the process used to measure the quality of developed software. Testing is the process of executing a program with the intent of finding errors. Software testing is often referred to as verification & validation.



Initialization testing is the first level of dynamic testing and is the first responsibility of developers and then that of the test engineers. Unit testing is performed after the expected test resultsare met or differences are explainable/acceptable.

Unit testing helps tester and developers to understand the base of code that makes them able change defect causing code quickly. Unit testing helps in the documentation. Unit testing fixes defects very early in the development phase that's why there is a possibility to occur a smaller number ofdefects in upcoming testing levels. It helps with code reusability by migrating code and test cases.

Test strategy and approach

Field testing will be performed manually and functional tests will be written in detail.

6.1 Integration Testing

Software integration testing is the incremental integration testing of two or more integrated software components on a single platform to produce failures caused by interface defects.The taskof the integration test is to check that components or software applications, e.g. components in a software system or – one step up – software applications at the company level – interact without error.

6.2 Acceptance Testing

User Acceptance Testing is a critical phase of any project and requires significant participation by the end user. It also ensures that the system meets the functional requirements.

6.3 TYPES IN TESTING

Software testing can be broken down into three main types:

- **black box,**
- ***white box,***
- **gray box testing.**

While they all have the same goal of finding and fixing defects in the app, each approach uses different methods to achieve this, focusing on different aspects of the app.

6.3.1 BLACK BOX TESTING

Black box testing zeros in on the behavior the software exhibits on the outside, on the interface level, and therefore requires no knowledge of its inner workings.

This means that testers don't have to handle any code, algorithms, or other technical details. They approach the software purely from a user's perspective, without concerning themselves withwhat's going on under the surface.

Along the way, a black box test evaluates all relevant subsystems, including UI/UX,web server or application server, database, dependencies, and integrated systems.

6.3.2 WHITE BOX TESTING

While black box testing may give testers a broad view of a software system, it offers no insight into its internal code structure.

That's where white box testing comes in. With this approach, testers can see inside the white box and scrutinize every aspect of the software system, from its code and infrastructure to its integrations.

6.3.3 GRAY BOX TESTING

Gray box testing is a great amalgamation of both black box and white box testing. It allows testers to approach a software product from the point of view of a user, while also allowing them to access its internal code.

Therefore, with this type of testing, testers need to have some understanding of the system's internal mechanisms, but not as much as white box testing would require.

In addition to this, they also test end-to-end features and user scenarios.

7. CONCLUSION

The project "Eye Ball Cursor Movement using OPENCV" is developed. The results show that we can effectively control cursor functions without using a mouse. This system is a possible solution to all the problems we face with the existing mouse cursor control manual, which is not possible for people with disabilities. In this research, the experimental results provide objective eye-tracking evidence that confirms the hypotheses made based on the findings of existing research. Most students recognize beacons and pay more attention to these areas when debugging. Only significant statistical results have been reported in the conclusions, guaranteeing the conclusion validity. Previous research has revealed a relationship between working memory capacity and the cognitive activities related to debugging with regard to mental arithmetic, short-term memory, logical thinking, and problem solving. Thus, the eye ball movement tracking is applied to physically challenged peoples to obtain various results.

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