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A Review on Gesture Controlled Virtual Mouse

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Abstract: . Researchers around the world are now focused on to make our devices more interactive and trying to make the devices operational with minimal physical contact. In this research, we propose an interactive computer system which can operate without any physical keyboard and mouse. This system can be beneficial to everyone, especially to the paralyzed people who face difficulties to operate physical keyboard and mouse. We used computer vision so that user can type on virtual keyboard using a yellow-colored cap on his fingertip, and can also navigate to mouse controlling system. Once the user is in mouse controlling mode, user can perform all the mouse operations only by showing different number of fingers. We validated both module of our system by a 52 years old paralyzed person and achieved around 80% accuracy on average.

Keywords: Human computer interaction, Colour Detection, Hand gestures, Virtual keyboard, Virtual mouse

I. INTRODUCTION

The uses of computers have become an integral part of our daily life and the human computer interaction are becoming more convenient in everyday. While the majority of the people take these facilities for granted, people with physical impairments face many difficulties in properly using these devices. In particular, people with severe movement disabilities may have physical impairments which significantly limit their ability to control the fine motor. Therefore, they may not be able to type and communicate with a normal keyboard and mouse. In this situation, it is important to use effective assisted technologies to ensure accessibility for such people. A wide range of eye-tracking devices are currently available commercially on the market, offering many functionalities, accuracy level, and price range. Many research studies require eye-tracking devices of high precision to test a range of eye characteristics, but they are expensive such as infrared In this work, we propose a novel multi-modal interactive keyboard and mouse system where we detect and track a color (yellow in this research) to replace the use of traditional keyboard and mouse using the device's camera. This is achieved by taking inputs from a camera using a vision-based color recognition technique and hand gesture recognition technique and without any additional hardware requirements.

II. LITERATURE SURVEY

There are traditional approaches for virtual keyboard and mouse systems which are usually based on eye gestures. Our literature review focuses on the research works on virtual keyboard and virtual mouse which were published in Elsevier, Springer, ACM Digital Library, IEEE Digital Library etc. We discussed about few related works on virtual keyboard and virtual mouse in the following two subsections.

2.1 Virtual Keyboard

In 2010, Y. Adajania et. al developed a Virtual Keyboard Using Shadow Analysis[2]. This system detects keyboard, hands shadow, finger tips using colour segmentation and sobel technique. Ambient lighting conditions required for this system. This system can analyze 3 frames per second. In 2011, S. Hernanto et al. built a method for virtual keyboard using webcam [10]. In this approach, two functions are used for finger detection and location An Interactive Computer System with Gesture-Based Mouse and Keyboard 3 detection. This system used two different webcams which are used to detect skin and location separately. The average time per character of this virtual keyboard is 2.92 milliseconds and the average accuracy of this system is 88.61%. In 2013, M. H. Yousuf et al. introduced a keystroke detection and recognition model using fingertip tracking [25]. They captured real time movements of finger joints and successfully recognised 28 keys. In 2015, I. Patil et al. constructed a virtual keyboard interaction system using eye gaze and eye blinking [16]. Their system first detects face and then detects eye and nose region to recognize an eye blink. The OpenCV java framework is used in this approach. In 160X120 frame size, this approach achieves 48% accuracy and in 1280X960 frame size, 98% accuracy is achieved. In 2016, Hubert Cecotti developed a system for disabled people named a multi-modal gaze-controlled virtual keyboard [6].

2.2 Virtual Mouse

In 2016, S. Shetty et al. constructed a virtual mouse system using color detection [19].They used webcam for detecting mouse cursor movement and click events using OpenCV built-in functions. A mouse driver, written in java, is required as well. This system fails to perform well in rough background. P. C. Shindhe et al. expanded a method for mouse free cursor control where mouse cursor operations are controlled by using hand fingers [21]. They have collected hand gestures via webcam using color detection principles. The built-in function of Image Processing Toolbox in MATLAB and a mouse driver, written in java, used in this approach. The pointer was not too efficient on the air as the cursor was very sensitive to the motion.The virtual keyboard has 8 main commands for menu selection to spell 30 different characters and a delete button to recover from error. They evaluated the performance of the system using the speed and information transfer rate at both the command and application levels.

2.3 Proposed Approach

The aim of this paper is to implement a computer application which uses alternative methods to control keyboard and mouse cursors for rehabilitation of people who are suffered from stroke so that they can recover the side effects. Therefore, we propose a new keyboard and mouse cursor control system based on vision and colour recognition technique, utilizing hand gestures recorded from a webcam.

III. FUTURE SCOPE

Keyboard and mouse actually form an integral part of the computer system. Our system architecture can facilitate the use of computer for the paralyzed people. We have developed a virtual system where people can communicate with the computer without using any physical keyboard and mouse. This could lead to a new age of Human Computer Interaction in which physical contact with the computer would not be necessary at all. The use of object detection and image processing in OpenCV for the implementation of our work has proved to be practically successful and the task of keyboard and mouse is achieved with good precision. This system can be beneficial to certain people who have no control over their limbs

IV. Conclusion

Most of the applications require additional hardware which are often very expensive. The motive of this work is to create this technology as cheaply as possible and to create it under a standardized operating system as well. Though, our system can be used as an alternative for physical keyboard and mouse, it still may perform less accurately in a low light condition. This is a concern for further research. Moreover, the work can be extended for a wide variety of environments and can be tested using the sophisticated existing models.

Iv. Reference

1. Abedin, M.Z., Nath, A.C., Dhar, P., Deb, K., Hossain, M.S.: License plate recognition system based on contour properties and deep learning model. In: 2017 IEEE Region 10 Humanitarian Technology Conference (R10-HTC). pp. 590–593. IEEE (2017)

2. Adajania, Y., Gosalia, J., Kanade, A., Mehta, H., Shekokar, N.: Virtual keyboard using shadow analysis. In: 2010 3rd International Conference on Emerging Trends in Engineering and Technology. pp. 163–165. IEEE (2010)

3. Ahmed, T.U., Hossain, S., Hossain, M.S., ul Islam, R., Andersson, K.: Facial expression recognition using convolutional neural network with data augmentation. In: 2019 Joint 8th International Conference on Informatics, Electronics & Vision (ICIEV) and 2019 3rd International Conference on Imaging, Vision & Pattern Recognition (icIVPR). pp. 336–341. IEEE (2019)

4. Asad, M.U., Mustafa, R., Hossain, M.S.: An efficient strategy for face clustering use in video surveillance system. In: 2019 Joint 8th International Conference on Informatics, Electronics & Vision (ICIEV) and 2019 3rd International Conference on Imaging, Vision & Pattern Recognition (icIVPR). pp. 12–17. IEEE (2019)

5. Bhuvana, S., Ashwin, E., Boopathi, R., Victor, A.D.: Virtual keyboard interaction with system based on webcam (2017)

6. Cecotti, H.: A multimodal gaze-controlled virtual keyboard. IEEE Transactions on Human-Machine Systems 46(4), 601–606 (2016)

7. Chowdhury, R.R., Hossain, M.S., ul Islam, R., Andersson, K., Hossain, S.: Bangla handwritten character recognition using convolutional neural network with data augmentation. In: 2019 Joint 8th International Conference on Informatics, Electronics & Vision (ICIEV) and 2019 3rd International Conference on Imaging, Vision & Pattern Recognition (icIVPR). pp. 318–323. IEEE (2019)

8. Gupta, D., Hossain, E., Hossain, M.S., Andersson, K., Hossain, S.: A digital personal assistant using bangla voice command recognition and face detection. In: 2019 IEEE International Conference on Robotics, Automation, Artificial-intelligence and Internet-of-Things (RAAICON). pp. 116–121. IEEE (2019) An Interactive Computer System with Gesture-Based Mouse and Keyboard 13

9. Haria, A., Subramanian, A., Asokkumar, N., Poddar, S., Nayak, J.S.: Hand gesture recognition for human computer interaction. Procedia computer science 115, 367– 374 (2017)

10. Hernanto, S., Suwardi, I.S.: Webcam virtual keyboard. In: Proceedings of the 2011 International Conference on Electrical Engineering and Informatics. pp. 1–5. IEEE (2011)

11. Islam, M.Z., Hossain, M.S., ul Islam, R., Andersson, K.: Static hand gesture recognition using convolutional neural network with data augmentation. In: 2019 Joint 8th International Conference on Informatics, Electronics & Vision (ICIEV) and 2019 3rd International Conference on Imaging, Vision & Pattern Recognition (icIVPR). pp. 324–329. IEEE (2019)

12. Islam, R.U., Hossain, M.S., Andersson, K.: A novel anomaly detection algorithm for sensor data under uncertainty. Soft Computing 22(5), 1623–1639 (2018)

13. Jagannathan, M., Surya, M., BT, A.M., Poovaraghavan, R.: Finger recognition and gesture based augmented keyboard (2018)

14. Keil, A., Albuquerque, G., Berger, K., Magnor, M.A.: Real-time gaze tracking with a consumer-grade video camera (2010)

15. Noor, K., Siddiquee, E.A., Sarma, D., Nandi, A., Akhter, S., Hossain, S., Andersson, K., Hossain, M.S.: Performance analysis of a surveillance system to detect and track vehicles

using haar cascaded classifiers and optical flow method. In: 2017 12th IEEE Conference on Industrial Electronics and Applications (ICIEA). pp. 258–263. IEEE (2017)
16. Patil, I.D., Lambhate, P.: Virtual keyboard interaction using eye gaze and eye blink. International Journal on Recent and Innovation Trends in Computing and Communication (IJRITCC) 3(7), 4849–4852
17. Sahu, G., Mittal, S.: Controlling mouse pointer using web cam (2016)
18. Saraswati, V.I., Sigit, R., Harsono, T.: Eye gaze system to operate virtual keyboard. In: 2016 International Electronics Symposium (IES). pp. 175–179. IEEE (2016)