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Hands-Free Smartphone For Physically Challenged

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Abstract

Disability is one of the major problems of the contemporary world. There are new technical means, methods of work and education for people with disabilities, making it possible to use a smart phone. The aim of this work is to allow people with disabilities to use android phones by simple eye gestures and speech input. The system combines techniques from image processing, computer vision and pattern recognition to detect gestures in the video recorded using the built in front-facing camera and also speech recognition and processing techniques. The existing gesture recognition system runs entirely on an Android based mobile phone without the need for any additional equipment. The system was implemented using the OpenCV computer vision library. Input to the system is a raw video stream from the device's front-facing camera. Because accurate point of- gaze estimation is not required for gesture recognition, these images are scaled down to reduce processing time and thus increase system performance.

Key terms- OpenCV, image processing, Computer vision, Pattern recognition.

I. Introduction

This paper combines techniques from image processing, computer vision and pattern recognition to detect gestures in the video recorded using the built in front-facing camera and also speech recognition and processing techniques. Blink detection serves as an important work in this paper. This paper combines techniques from image processing, computer vision and pattern recognition to detect facial gestures in the video recorded. It is implemented using the built-in front-facing camera and also speech recognition. Template Matching and Adaptive Boosting is designed and implemented here. Experiments are conducted using android OpenCV which can be installed in low cost smart phones. Experiment results provide smart phone interface for the physically challenged in order to communicate with the environment

This paper was implemented using the OpenCV computer data library. Input to the system is a raw video stream from the device's front-facing camera. Because accurate point of-gaze estimation is not required for gesture recognition, these images are scaled down to reduce processing time and thus increase system performance. The experiment will be done by using an android smart phone which contains a front facing camera with a minimum resolution of 3MP. The front facing camera is opened with a particular application and at first the face location is detected in order to detect the user's face. Then it is made to scan the movement of the face by setting a frame for it. The set up should be done in quiet and stable lightning conditions in order to recognize the facial movement of the user. Here the user can store the face image data in the module and configure it in the ratio of 1:1 or 1:N mode for identifying the person. This module can directly interface with suitable converter required for authentication process. The camera captures the face image of the person which in turn checks with the saved face image data, if the face image matches with the already saved data then the authentication process takes place. Once the face image matched with the images in the data library, then the system will return the matching result. The emergency SMS is the process that takes place when the user says a predefined word, then the system generates emergency SMS or alert SMS for the predefined number. The Contact search is the process which takes place by voice control access, which let the user to search for contacts by calling the name of the person to make call or send SMS. Once the user identifies the contact of the person through voice control access, the user is now ready to call the person by telling the system to call. The gallery processing which in turn uses the voice control access process to make some process like viewing the images. If the user moves the right side of his/her face/by using voice gestures for viewing process, then the image is sliding to next here next is the key word which plays the operation for

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viewing the images. Likewise if the user moves the left side of his/her head/by using voice gestures for viewing process, then the image is sliding to the previous image here previous is the key word which plays the operation for viewing.

II. EYE DETECTION PHASE

By applying a motion analysis technique which operates on consecutive frames, this phase consists on finding the contour of the eyes. The eye pair is identified by the left and right eye contours. While the original algorithm identifies the eye pair with almost no error when running on a desktop computer with a fixed camera . We obtain errors when the algorithm is implemented on the phone due to the quality of the camera compared to the one on the desktop and the unavoidable movement of the phone while in a person's hand. Based on these experimental observations, we modify the original algorithm by: i) reducing the image resolution, which according to the authors in reduces the eye detection error rate, and ii) adding two more criteria to the original heuristics that filter out the false eye contours. In particular, we filter out all the contours for which their width and height in pixels are such that widthmin <= width <= widthmax and heightmin >= height >= heightmax. The widthmin , widthmax, heightmin, and heightmax thresholds, which identify the possible sizes for a true eye contour, are determined under various experimental conditions (e.g., bright, dark, moving, not moving)and with different people. This design approach boosts the eye tracking accuracy considerably.

III. OPEN EYE TEMPLATE CREATION

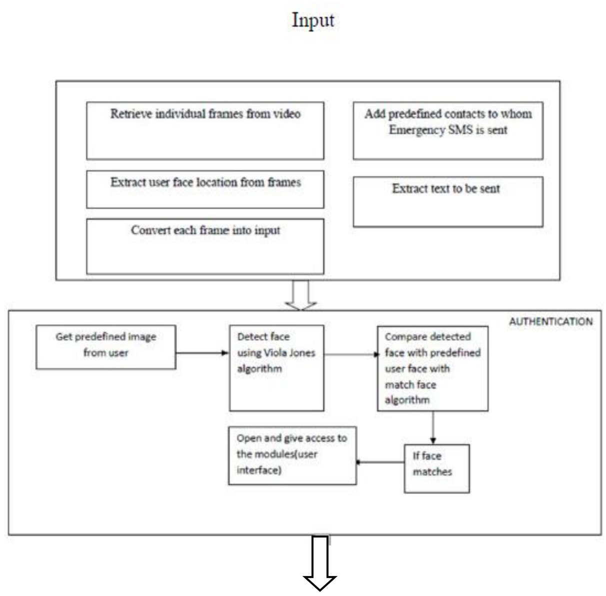
The authors adopt an online open eye template creation by extracting the template every time the eye pair is lost (this could happen because of lighting condition changes or movement in the case of a mobile device), Eye Phone does not rely on the same strategy. The reduced computation speed compared to a desktop machine and the restricted battery requirements imposed by the smartphone dictate a different approach. Eye Phone creates a template of a user's open eye once at the beginning when a person uses the system for the first time using the eye detection algorithm described above. The template is saved in the persistent memory of the device and fetched when Eye Phone is invoked. By taking this simple approach, we drastically reduce the runtime inference delay of Eye Phone, the application memory foot-print, and the battery drain. The downside of this off-line template creation approach is that a template created in certain lighting conditions might not be perfectly suitable for other environments. We intend to address this problem as part of our future work. In the current implementation the system is trained individually, i.e., the eye template is created by each user when the application is used for the first time. In the future, we will investigate eye template training by relying on pre-collected data from multiple individuals. With this supervised learning approach users can readily use Eye Phone without going through the initial eye template creation phase.

IV. EYE TRACKING

The eye tracking algorithm is based on template matching. The template matching function calculates a correlation score between the open eye template, created the first time the application is used, and a search window. In order to reduce the computation time of the template matching function and save resources, the search window is limited to a region which is twice the size of a box enclosing the eye. These regions are shown in where the outer box around the left eye encloses the region where the correlation score is calculated. The correlation co- efficient we rely on, which is often used in template matching problems, is the normalized correlation coefficient defined. This coefficient ranges between -1 and 1. From our experiments this coefficient guarantees better performance than the one used. If the normalized correlation co-efficient equals 0.4 we conclude that there is an eye in the search window. This threshold has been verified accurate by means of multiple experiments under different conditions (e.g., bright, dark, moving, not moving).

V. EXPERIMENT

The experiment will be done by using an android smartphone which contains a front facing camera with a minimum resolution of 3MP.



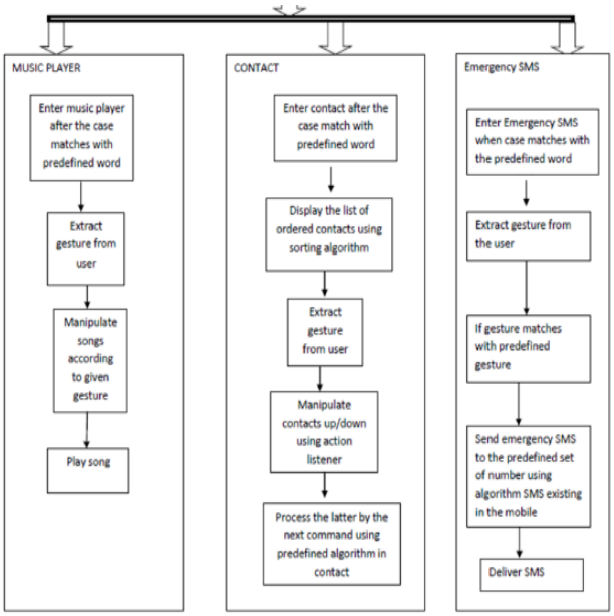


Fig 1. System Architecture

A.Authentication

Get the input from the user as a predefined images and detect the face using Viola Jones algorithm. Once the face is detected, compare the detected face with the predefined user face using match face algorithm. If the face matches then it opens and gives access to the module user interface.The first phase of the project is authentication process. By using this module we can create our own face authentication process using camera, here the user can store the face image data in the module and configure it in the ratio of 1:1 or 1:N mode for identifying the person. This module can directly interface with suitable converter required for authentication process. The camera captures the face image of the person which in turn checks with the saved face image data, if the face image matches with the already saved data then the authentication process takes place.

B. Emergency SMS

Once the face image matched with the images in the data library ,then the system will return the matching result. The emergency SMS module is the process that takes place when the user says a predefined word, then the system generates emergency SMS or alert SMS for the predefined number.

C.Contact search

The Contact search module is the process which takes place by voice control access, which let the user to search for contacts by calling the name of the person to make call or send SMS. Once the user identifies the contact of the person through voice control access, the user is now ready to call the person by telling the system to call.

D.Music Player

The music player module is the process which takes place by some simple gestures, which let the user to search for music in the music player by doing the gestures. Once the predefined word matches with the user gesture, then the music is played

VI. CONCLUSION AND FUTURE WORK

In this work we presented the eye gesture recognition system that runs entirely on a mobile phone and that does not require any additional equipment. Our prototype combines several image processing, computer vision and pattern recognition techniques.This work helps the physically challenged people to use some basic mobile applications and interact with outside world without the help of others.This work includes only few mobile applications,in future more applications can be added according to the need of the user. In this work no IR illuminators are used which will not provide best results under poor lighting conditions. In future, extraction of features from face with IR illuminators can be addressed.

REFERENCES

[1] Iqbal, N. H. Lee and S.Y.Lee, Smart user interface for mobile consumer devices using model-based eye-gaze estimation, Consumer Electronics, IEEE Transactions on (Volume:59 , Issue: 1), February 2013, Page(s): 161-166
[2] V. Vaitukaitis and A.Bulling, Eye gesture recognition on portable devices , Proceeding UbiComp '12 Proceedings of
the 2012 ACM Conference on Ubiquitous Computing, Pages 711-714
[3] E. Miluzzo, T. Wang, A. T. Campbell, Eye Phone: Activating Mobile Phones With Your Eyes, MobiHeld '10 Proceedings of the second ACM SIGCOMM workshop on Networking, systems, and applications on mobile handhelds, 2010, Pages 15-20
[4] E.Wood and A. Bulling, EyeTab: Model-based gaze estimation on unmodified tablet computers, Proceeding ETRA '14 Proceedings of the Symposium on Eye Tracking Research and Applications, 2014, Pages 207-210
[5] C. Pino and I. Kavasidis, Improving mobile device interaction by eye tracking analysis, Computer Science and Information Systems (FedCSIS), 2012 Federated Conference on, 2012, pages: 1199 1202

[6] DiakoMardanbegi,Dan Witzner Hansen ,Thomas Pederson,"Eye-based head gestures",ETRA'12 Proceedings of the Symposium on Eye Tracking Research and Applications,Pages 139-146,ACM New York,NY,USA 2012.
[7].TomaszLewandowski,PiotrAugustyniak,."The System of a touchfree personal computer navigation by using the information on the human eye movements",3rd International IEEE Conference on Human System Interaction, pages 674-677,2010.
[8].HaneneElleuch,AliWali,adel M.Alimi,"Smart Tablet Monitoring by a Real-Time Head Movement and Eye Gestures Recognition System",Future Internet of Things and Cloud(FiCloud), International IEEE Conference on 2014.
[9].RaineKajastilan ,TapioLokki," Eyes-free interaction with free-hand gestures and auditory menus", International journal of Human-Computer studies, pages 627-640,2013.

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