A Review on Implementation of Automatic Movement Controlled Using Gesture Recognition

V. B. Katariya, Y. N. Makwana, P. A. Goswami

Abstract- Nowadays, computer interaction is mostly done using dedicated devices. Abundant amount of input devices are used to interact with the computer world or more precisely saying to digital world and very less through gestures made by body movements. Concepts of assistive technology are one of them used for controlling the input from mouse movements, like by detecting the eye, hand, face etc movements of a user with the help of eye tracking system, hand gestures through wearable devices, etc. Our focus is in moving mouse cursor on the screen without using any hardware which is used very often now-a-days i.e. mouse. We use the newly born technology for this purpose. We implement computer mouse movement through finger by image processing using latest Technology which gets processed in MATLAB without and with using gesture recognition.

Index Terms— Color Recognition, camera, Image Processing, Keyboard, MATLAB, Mouse.

I. INTRODUCTION

The term Gesture is defined as "movement to convey meaning" or "the use of motions of the limbs or body as a means of expression; a movement usually of the body or limbs that expresses or emphasizes an idea. Overall aim is to make the computer to understand human body language thereby bridging the gap between machine and human's gesture.

Camera is used to capture the object in sight range and follow the user's hand gestures, sending the data to phone or laptop connected with it. Camera acts as a digital eye connecting the user to the digital world. Colored caps or markers are attached at the finger tips of the user. Marking the user's fingers with different colors helps the webcam to recognize the gestures made by the fingers. The movements and arrangements of these markers are grasped as gestures that act as interaction instructions for the projected application interface device.

Here, in our proposed methodology, first interaction with the physical world is done by camera. Camera takes the video and starts recording the live video and in continuation of recording it sends the live video to MATLAB which is already installed in laptop which is connected with the camera.

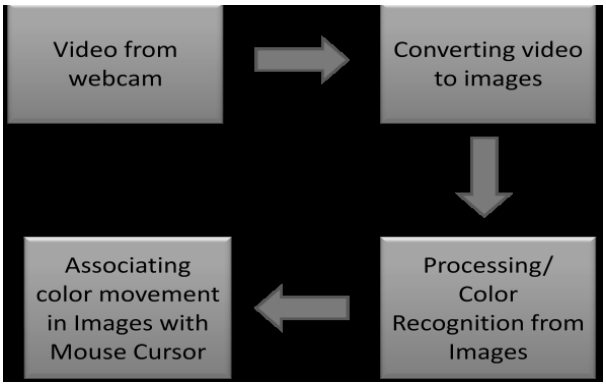


Figure 1: Gesture Recognition process flow

In MATLAB, code is prepared which convert the incoming live video from camera into frames of images or slicing of video is done in the form of images. The output of the color recognition process are the images that contains only those colors of which color caps are present at the finger tips of the user. In this paper we present a specific approach for vision based hand gesture recognition, intended to support natural interaction with autonomously navigating robots that guide visitors in public places such as museums and exhibition centers. Following are the best examples of how to Automatic Movement controlled Using Gesture Recognition.

Huge numbers of videos (e.g. BBC1 and Youtube2) are available online today and the number is rapidly growing. Human actions constitute one of the most important parts in movies, TV shows, and consumer generated videos. Analysis of human actions in videos is considered a very important problem in computer vision because of such applications as human-computer interaction, content-based video retrieval, visual surveillance, analysis of sports events, and more. The term "action" refers to a simple motion pattern as performed by a single subject, and in general lasts only for a short period of time, namely, just a few seconds. Action is often distinguished from activity in the sense that action is an individual atomic unit of activity. In particular, human action refers to physical body motion. Recognizing human actions from video is a very challenging problem due to the fact that physical body motion can look very different depending on the context. For instance, similar actions with different clothes or in different illumination and background can result in a large appearance variation, or the same action performed by two different people may look quite dissimilar in many ways.

Manuscript received on November, 2012

Mr. V.B.Katariya, Electronics and Communication department, Atmiya Institute of Technology and Science /Gujarat Technological University, Rajkot, India.

Prof. Y.N.Makawana, Electronics and Communication department, Atmiya Institute of Technology and Science /Gujarat Technological University, Rajkot, India.

Mr. P.A.Goswami, Electronics and Communication department, Amrutlal Virlal Parekh Technical Institute , Rajkot, India.

II. METHODOLOGY OF GESTURE RECOGNITION

Here first I would like to take one example (Hand, face, eye.etc) how this system works and what is the method. The methodology used is based on the Latest Technology where user have some devices which together acts as a system. Our aim is to move mouse cursor as the user moves his/her fingers. For this purpose, three components of Sixth Sense are used i.e. Camera, Colored Caps and MATLAB installed in Laptop.

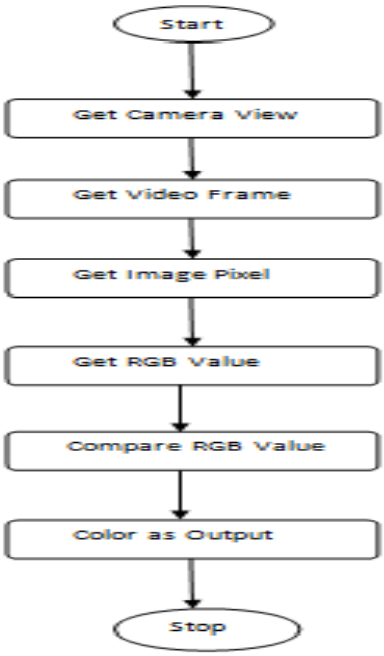
Here we can imaging that hardware devices we have used for experimental purpose .camera into frames of images or slicing of video is done in the form of images. These images that are obtained from the slicing of video are then processed for color recognition process. The output of the color recognition process are the images that contains only those colors of which color caps are present at the finger tips of the user. Neither the fingers of user are shown in the output images nor are any background colors there in the output images from the color recognition process. For this purpose, RGB values of the color caps are set prior in the code so that no other color will be detected in the image after color recognition except the caps colors. The output images are displayed in continuation and at the same speed as the speed at which slicing of video is done, so that it looks like a continuous movie in which the input is physical world and the output is only those colors which are present at the fingertips of the user.

The color is then associated with the mouse cursor in code so that whenever the color moves in the output image from one position to another, the mouse cursor gets attached at the same position where the color is now displayed.

Figure 2: Hand (finger) movement with color

Figure 3: Laptop with digital webcam

III. ALGORITHM FLOW CHARTS



If Following are the Different Stages for Hand movement According to Mouse movement

Step 1: Initialize the Webcam & its profile (resolution setting).

Step 2: Start a while loop with by default true condition. (infinite loop).

Step 3: Query webcam for sending current shot/picture.

Step 4: Convert queried picture from RGB (red, green, blue) space to HSV (hue, saturation, and value) space.

Step 5: From HSV type picture easily pick up Hue value of skin tone & remove all pixels without skin colors. Store only TRUE/FALSE for every pixel which will make another image matrix of boolean values which has our skin color extracted.

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication

Step 6: There can be two objects with skin colors mostly Face & Hand. Remove Face BLOG (Binary Large Object) if there is Face appearing in picture.

Step 7: Get the central point of the Hand BLOB & store the position in variable called <current_hand_pos>

Step 8: Compare it with <previous_had_pos> variable's data. If there is difference then the hand position is assumed to be moved.

Step 9: If hand has moved according to step 8. Then subtract (x, y) of <previous_hand_pos> from <current_hand_pos> variable. By this we will get to know in which direction & how much the hand has moved. Result will be a vector only store it in variable <mouse_movement>

Step 10: According to vector (x, y) type <mouse_movement> variable's data, move system mouse relatively in corresponding amount. (We need to interface with system's mouse calls in this steps.)

Step 11: store <current_mouse_pos> in <previous_mouse_pos> for next step.

Step 12: Go to step-2 & repeat the whole process.

IV. FEATURES OF GESTURE RECOGNITION

Selecting good features is crucial to gesture recognition, since hand gestures are very rich in shape variation, motion and textures. For static hand posture recognition, although it is possible to recognize hand posture by extracting some geometric features such as fingertips, finger directions and hand contours, such features are not always available and reliable due to self-occlusion and lighting conditions. There are also many other non-geometric features such as color silhouette and textures, however, they are inadequate in recognition. Since it is not easy to specify features explicitly, the whole image or transformed image is taken as the input and features are selected implicitly and automatically by the recognizer.

A feature for temporally invariant gesture recognition is hard to specify since it depends on the temporal representation of gestures. However, it can be handled implicitly in some recognition approaches such as finite state machine. Human gesture recognition from vision input is challenging due to human variations in doing the same gesture e.g., differences in appearance, viewpoint, and execution as well as the overlap between gesture classes . Two main components of an action recognition system are choosing an action representation (feature) space and then action classification. It is very important to select a good representation space which should generalize over variations within each gesture class but still is rich enough to distinguish between different classes. Some examples of action representation space include space-time shape, motion history volume, cylindrical voxel histogram, and distance transform of body contour. Since external parts (i.e., head and hands in case of upper body) can be extracted more reliably with less occlusion compared to other inner parts, there are also several methods using features based on extremities dynamics, e.g., analyzing hand trajectories and posture , or using variable star skeleton representation. The proposed system is also based on extremities (head and hands) movements for gesture recognition. However, instead of using raw head and hands trajectories, we incorporate knowledge of the underlying upper body model which could help improve gesture recognition. An intuitive and clear way to do so is to implement upper body pose estimation and tracking. The output of body pose tracking such as joint angle dynamics are mentioned as rich, view-invariant representations for gesture recognition but challenging to derive.

V. GESTURE TYPES

In computer interfaces, two types of gestures are distinguished: We consider online gestures, which can also be regarded as direct manipulations like scaling and rotating. In contrast, offline gestures are usually processed after the interaction is finished; e. g. a circle is drawn to activate a context menu.

1) Offline gestures: Those gestures that are processed after the user interaction with the object. An example is the gesture to activate a menu.
2) Online gestures: Direct manipulation gestures. They are used to scale or rotate a tangible object.

VI. GESTURE USES

Gesture recognition is useful for processing information from humans which is not conveyed through speech or type. As well, there are various types of gestures which can be identified by computers.

- Sign language recognition: Just as speech recognition can transcribe speech to text, certain types of gesture recognition software can transcribe the symbols represented through sign language into text.
- For socially assistive robotic:. By using proper sensors (accelerometers and gyros) worn on the body of a patient and by reading the values from those sensors, robots can assist in patient rehabilitation. The best example can be stroke rehabilitation.
- Directional indication through pointing: Pointing has a very specific purpose in our society, to reference an object or location based on its position relative to ourselves. The use of gesture recognition to determine where a person is pointing is useful for identifying the context of statements or instructions. This application is of particular interest in the field of robotics.
- Control through facial gestures: Controlling a computer through facial gestures is a useful application of gesture recognition for users who may not physically be able to use a mouse or keyboard. Eye track in particular may be of use for controlling cursor motion or focusing on elements of a display.
- Alternative computer interfaces: Foregoing the traditional keyboard and mouse setup to interact with a computer, strong gesture recognition could allow users to accomplish frequent or common tasks using hand or face gestures to a camera.
- Immersive game technology: Gestures can be used to control interactions within video games to try and make the game player's experience more interactive or immersive.
- Virtual controllers: For systems where the act of finding or acquiring a physical controller could require too much time, gestures can be used as an alternative control mechanism. Controlling secondary devices in a car or controlling a television set are examples of such usage.

- Affective computing: gesture recognition is used in the process of identifying emotional expression through computer systems.
- Remote control: Through the use of gesture recognition, Remote control with the wave of a hand" of various devices is possible. The signal must not only indicate the desired response, but also which device to be controlled.

VII. CONCLUSION

This paper focused on the analysis of the development of hands-free PC control - Controlling mouse cursor movements using human eyes, application in all aspects**.** Moreover, not all facial expressions can be completely classified into the six defined categories. There should exist possibility of learning new categories for clustering, and then interpreting each and every encountered facial expression. Similarity-based matching of the retrieved images may be performed on these clusters, using concepts from approximate reasoning, searching, and learning. This paper presented a novel gesture spotting algorithm that is accurate and efficient, is purely vision-based, and can robustly recognize gestures, even when the user gestures without any aiding devices in front of a complex background.

The use of image processing and color recognition in MATLAB for the implementation of our proposed approach proved to be practically successful and the movement of mouse cursor is achieved with a good precision. The approach has huge potential once it gets further optimized, as its time complexity is higher, with the help of hardware having better specifications. This approach has much high potential for future advanced applications which can have the ability to change the mobile world also.

VIII. ACKNOWLEDGMENT

Mr.V.B.Katariya would like to thank Prof. Y. N. Makwana, Mr. P. A. Goswami & Mr.Rajdeep Bosrsaniya for their guidelines in making this paper.

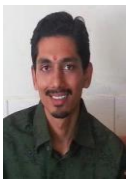
REFERENCES

1. Sushmita Mitra and Tinku Acharya, "Gesture Recognition: A Survey", *IEEE Transactions on Systems, Man and Cybernetics-Part C*: Applications and Reviews, Vol. 37(3), pp. 56-68, May 2007.
2. Akhil Gupta, Akash Rathi, Dr. Y. Radhika, **"**Hands-free pc control, controlling of mouse cursor using eye movement", *International Journal of Scientific and Research Publications*, vol. 2, issue 4, ISSN 2250-3153. pp. 1-5, April 2012.
3. Prof. R. W. Jasutkar, Ms. Shubhangi J. Moon, " A Real Time Hand Gesture Recognition Technique by using Embedded device". *International Journal Of Advanced Engineering Sciences And Technologies*, vol. 2, issue no.1, pp. 043–046 may 2005.
4. Zhi-gang XuHong-lei Zhu,"Vision-based Detection of Dynamic Gesture", *International Conference on Test and Measurement*, vol. no. 6 issue no.8 pp. 89-90, may 2010.
5. Michal Lech, Bozena Kostek,"Gesture-based Computer Control System applied to the Interactive Whiteboard" Proceedings of the 2nd *International Conference on Information Technology*, vol. no.06 pp. 28-30, June 2010.
6. Prateek Agrawal, Kunal Gupta. "Mouse Movement Through Finger By Image Grabbing Using Sixth Sense Technology", *International Journal Of Engineering Science & Advanced Technology* vol-2, Issue-2, pp.245 – 249, march-april 2012.
7. Hae Jong Seo, Peyman Milanfar "A Review on Action Recognition from One Example*", IEEE Transactions on Pattern Analysis And Machine Intelligence*, vol. 33(5), may 2011.
8. M. A. MONI and A B M Shawkat Ali., "HMM based Hand Gesture Recognition: A Review on Techniques and Approaches".
9. S.B. Wang et al. "Hidden Conditional Random Fields for Gesture Recognition". *IEEE Computer Society Conference on Computer Vision and Pattern Recognition*, volume 2, 2006.
10. Denis Amelynck, Maarten Grachten, Leon Van Noorden, and Marc Leman. "Toward E-Motion-Based Music Retrieval a Study of Affective Gesture Recognition", *IEEE transactions on affective computing*, vol. 3, no. 2, april-june 2012.
11. http://www.youtube.com/watch?v=k-rSWM6h3Aw
12. http://www.youtube.com/watch?v=1GhNXHCQGsM
13. https://github.com/zk00006/OpenTLD
14. http://touchless.codeplex.com/releases/view/17986
15. http:// Wikipedia, the free encyclopedia gesture recognition based on matlab simulation

AUTHOR PROFILE

Mr. V.B.Katariya received B.E.(Electronics and Communication) degree from V.V.P Engineering college, saurasatra university,Rajkot,currently persuing M.E(Electronics and Communication) from A.I.T.S GTU, Rajkot and has 2years Telecommunication experience as Project Coordinator.

Mr. Y.N.Makwana received B.E degree from A.I.T.S college rajkot and M.E degree from C.U.Shah engineering college Wadhwan and currently persuing Ph.D from Dr.K.N.Modi university.He is the author of four international journals and has presented paper in four international conferences.He is currently working as Assistant Professor in A.I.T.S college Rajkot.



Mr. P.A.Goswami received B.E. degree from V.V.P Engineering college,Rajkot and MTech degree from DAICT has published Lecture Notes in Computer Science Volume 7143, 2012, pp 329-337
Novel Interleaving Schemes for Speaker Recognition over Lossy Networks. He is currently working as lecturer in A.V.P.T.I college Rajkot.