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Visual Interpretation Of Hand Gestures For Human Computer Interaction

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ABSTRACT
The use of hand gestures provides an attractive alternative to cumbersome interface devices for human-computer interaction (HCI). In particular, visual interpretation of hand gestures can help in achieving the ease and naturalness desired for HCI. This discussion is organized on the basis of the method used for modeling, analyzing, and recognizing gestures. We propose pointing gesture-based large display interaction using a depth camera. A user interacts with applications for large display by using pointing gestures with the barehand. The calibration between large display and depth camera can be automatically performed by using RGB-D camera.. We also discuss implemented gestural systems as well as other potential applications of vision-based gesture recognition. We discuss directions of future research in gesture recognition, including its integration with other natural modes of human computer interaction.
Keywords – Visual interpretation,Human computer interaction,Gesture recognition.

I. INTRODUCTION

With the massive influx of computers in society, human computer interaction,or HCI, has become an increasingly important part of our daily lives. It is widely believed that as the computing, communication, and display technologies progress even further, the existing HCI techniques may become a bottleneck in the effective utilization of the available information flow. For example, the most popular mode of HCI is based on simple mechanical devices keyboards and mice. These devices have grown to be familiar but inherently limit the speed and naturalness with which we can interact with the computer. This limitation has become even more apparent with the emergence of novel display technology such as virtual reality [2]. Thus in recent years there has been a tremendous push in research toward novel devices and techniques that will address this HCI bottleneck. To exploit the use of gestures in HCI it is necessary to provide the means by which they can be interpreted by computers. The HCI interpretation of gestures requires that dynamic and/or static configurations of the human hand,arm, and even other parts of the human body, be measurable by the machine.

II. LITERATURE SURVEY

Gesture recognition is a topic in computer science and language technology with the goal of interpreting human gestures via mathematical algorithms. Gestures can originate from any bodily motion or state but commonly originate from the face or hand[2].Current focuses in the field include emotion recognition from the face and hand gesture recognition. Many approaches have been made using cameras and computer vision algorithms to interpret sign language. Gesture recognition can be seen as a way for computers to begin to understand human body language,thus building a richer bridge between machines and humans than primitive text user interfaces or even GUIs, which still limit the majority of input to keyboard and mouse.Gestures can be static or dynamic Some gestures also have both static and dynamic elements, as in sign languages. Again, the automatic recognition of natural continuous gestures requires their temporal segmentation .Often one needs to specify the start and end points of a gesture in terms of the frames of movement, both in time and in space. Sometimes a gesture is also affected by the context of preceding as well as following gestures. Moreover, gestures are often language- and culture-specific. To extract and recognize gestures, researches have used various techniques ranging from hidden Markov modeling (HMM), dynamic timing warping (DTW) and others techniques reviewed in [2][3][4][5]. However, these approaches require the signer to wear color tape or when the background color is restricted. It reveals that these systems do not provide excellent means of human-computer interaction.

III. GESTURE TECHNOLOGY

A movement of a limb or the body as an expression of thought of feeling.The gesture has the following technologies.

3.1 GESTURE ANALYSIS

In the previous section, we discussed different approaches for modeling gestures for HCI. In this section we consider the analysis phase where the goal is to estimate the parameters of the gesture model using measurements from the video images of a human operator engaged in HCI.Two generally sequential tasks are involved in the analysis (see Fig.3.1).The first task involves “detecting” or extracting relevant image features from the raw image or image sequence.The second task uses these image features for computing the model parameters. We discuss the different approaches used in this analysis.

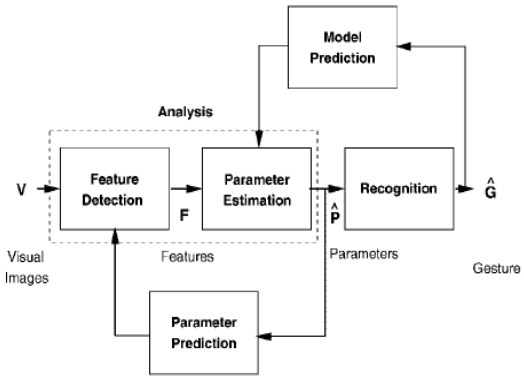

Fig. 3.1. Analysis and recognition of gestures

3.2 GESTURE RECOGNITION

Gesture recognition is the phase in which the data analyzed from the visual images of gestures is recognized as a specific gesture. Analogously, using the notation we established the trajectory in the model parameter space is classified as a member of some meaningful subset of that parameter space.Two tasks are commonly associated with the recognition process:

- Optimal partitioning of the parameter space and
- Implementation of the recognition procedure.

IV. SYSTEM ARCHITECTURE

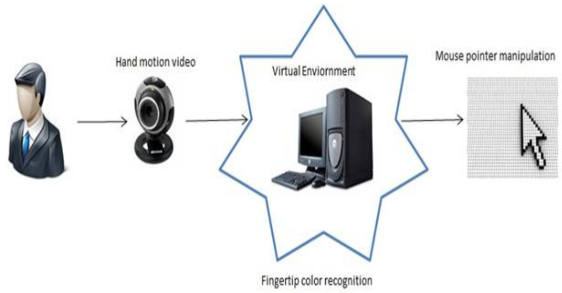

Fig.4: System architecture

4.1 NEW APPROACH TO FINGERTIP RECOGNITION

We propose in this paper a new algorithm that can play a core role in those systems aiming to recognize fine hand movements ,considering the specific problem of tracking fingertips. The algorithm was developed using the software development kits (SDKs) provided by Prime Sense, Open NI and, in particular, the Natural Interaction Middleware (NiTE) [2], [44]. Such SDKs are able to provide both skeleton and hand tracking, in addition to several other features.

4.1.1 SAMPLING AND SEGMENTATION OF THE HAND

The main object used for our purposes is the “hand-point” control returned by NiTE. It is an object fed with points that relate to one specific hand that is currently defined as the active hand.Unfortunately, pixels of the hand-point mostly lie on the hand contour but its shape is often defined roughly So,introduce in the algorithm a preliminary segmentation of the hand image detected

4.1.2 APPLICATIONS AND SYSTEMS

Recent interest in gestural interface for HCI has been driven by a vast number of potential applications.Hand gestures as a mode of HCI can simply enhance the interaction in “classical” desktop computer applications by replacing the computer mouse or similar hand-held devices.They can also replace joysticks and buttons in the control of computerized machinery or be used to help the physically impaired to communicate more easily with others. Nevertheless,the major impulse to the development of gestural interfaces has come from the growth of applications situated in virtual environments (VEs) [2], [53].

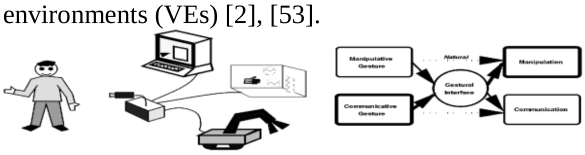

Fig.4.1.2 : Applications of gestural interface for HCI.

V. METHODOLOGY USED FOR THE MANIPULATION OF THE MOVING OBJECT IN A VIRTUAL ENVIRONMENT USING A HAND GESTURE

The methodology applied for this second application is described in following figure.

Fig.5: Methodology for moving virtual object

The movement of the virtual object is supposed to be the same as the movement of the hand. Thus the 3D translation and rotation applied to the moving object are obtained from the hand segment. Regarding the translation, the coordinates of the centre of the moving object are the same as the ones of the centre of gravity of the hand segment. The rotation angles ω, ϕ and □ are taken from three orthogonal vectors computed after fitting a plane to the hand points. The first vector joins the centre of gravity of the hand segment to the farthest point in the computed plane. The second vector is the normal to the plane and the third one is the cross product of the first two. After

making them unit, the new coordinates mij are used to define a rotation matrix M (4) from which, the angles ω (5), ϕ (6) and □ (7) are derived.This rotation angles are applied to the moving object.

VI. CONCLUSION

The goal of this project is to use color segregation, mouse pointer is controlled by tracking a color tape It tracks the color tape of optical mouse. A webcam is used to take the video. we are using color segregation technique on grayscale format. Different color formats can also be tried. We will determine the co-ordinates of the centroid of the region of the tape. It will cover all actions of traditional mouse pointers. And there is no need of mouse.

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