ARTIFICIAL INTELLIGENCE

A GESTURE BASED TOOL FOR STERILE BROWSING OF RADIOLOGY IMAGES

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ABSTRACT

The use of doctor-computer interaction devices in the operation room (OR) requires new modalities that support medical imaging manipulation while allowing doctors' hands to remain sterile, supporting their focus of attention, and providing fast response times. This paper presents "Gestix," a vision-based hand gesture capture and recognition system that interprets in real-time the user's gestures for navigation and manipulation of images in an electronic medical record (EMR) database. Navigation and other gestures are translated to commands based on their temporal trajectories, through video capture. "Gestix" was tested during a brain biopsy procedure. In the in vivo experiment, this interface prevented the surgeon's focus shift and change of location while achieving a rapid intuitive reaction and easy interaction. Data from two usability tests provide insights and implications regarding human-computer interaction based on nonverbal conversational modalities.

LITERATURE SURVEY

Existing method 1:

SURVEY: REAL-TIME HAND GESTURE INTERFACE FOR BROWSING MEDICAL IMAGES. WACHS JP, STERN HI, EDAN Y, ET AL. INT. J INTEL. COMP. MED. SCI. IMAGE PROC. 2007

A gesture interface is developed for users, such as doctor or surgeons, to browse medical images in a sterile medical environment. The system was proposed to avoid spreading bacterial infection from one person to another by computer keyboards and mice in intensive care units (ICUs) used by doctors and nurses. It does not require the surgeon to attach a microphone, use head-mounted sensing devices or use foot pedals. A vision-based system that can interpret user's gestures in real-time to manipulate windows and objects. Hand segmentation and tracking algorithm are used. A sterile non-contact interface is a major advantage for use in operating rooms. Dynamic navigation gestures along with zoom, rotate, and system sleep gestures are recognized. The major advantages of the hand gesture interface for use by surgeons and doctors

easy to use hands naturally and the reaction of nonverbal instructions by hand gesture commands are intuitive and fast.

Limitations

The rotation of gesture can be done automatically. The hand gestures can't be recognized to more than 5 meters from the camera. The hand must always be in the neutral area to analyse gesture.

Existing method 2:

SURVEY : INTERNATIONAL JOURNAL OF ARTIFICIAL INTELLIGENCE AND APPLICATIONS(IJAIA),Vol.3,No.4,July 2012

The essential aim of building hand gesture recognition system is to create a natural interaction between human and computer where the recognised gestures can be used for controlling a robot or conveying meaningful information.There are two main characteristics should be deemed when designing a Human computer interaction (HCI) system are functionality and usability.System functionality referred to the set of functions or services that the system equips to the users,while system usability referred to the level and scope that the system can operate and perform specific user purposes efficiently. Gestures can be static (posture or certain pose) which require less computational complexity or dynamic(sequence of postures) which are more complex but suitable for real time environments.Different methods have been proposed for acquiring information necessary for recognition gestures system. Some methods used additional hardware devices such as data glove devices and color markers to easily extract comprehensive description of gesture features.Other methods based on the appearance of the hand using the skin color to segment the hand and extract necessary features,these methods considered easy,natural and less cost comparing with methods mentioned before. Three steps to recognise hand gesture are Extraction Method, features estimation and extraction, and classification or recognition.Segmentation process is the first process for recognizing hand gestures. It is the process of dividing the input image (in this case hand gesture image) into regions separated by boundaries.The segmentation process depends on the type of gesture,if it is dynamic gesture then the hand gesture need to be located and tracked, if it is static gesture (posture) the input image have to be segmented only.The hand should be located

firstly,generally a bounding box is used to specify the depending on the skin color and secondly,the hand have to be tracked,for tracking the hand there are two main approaches;either the video is divided into frames and each frame have to be processed alone,in this case the hand frame is treated as a posture and segmented.Good segmentation process leads to perfect features extraction process.Various methods have been applied for representing the features can be extracted. Some methods used the shape of the hand such as hand contour and silhouette while others utilized fingertips position, palm center, etc. created 13 parameters as a feature vector, the first parameters represents the ratio aspect of the bounding box of the hand and the rest 12 parameters are mean values of brightness pixels in the image.Used Self-Growing and Self-Organized Neural Gas (SGONG) neural algorithm to capture the shape of the hand, then three features are obtained; Palm region, Palm center, and Hand slope.After modeling and analysis of the input hand image, gesture classification method is used Recognize the gestures..

Limitations

The performance of recognition algorithm decreases when the distance greater than 1.5meters between the user and the camera.Besides that,its variation to lighting condition changes and unwanted objects might overlap with the hand gesture.System limitations restrict the application such as gestures are made with the right hand only, the arm must be vertical, the palm is facing the camera, background is uniform. In the system could recognize numbers only form 0 to 9.

Existing method 3:

SURVEY : A SURVEY ON HAND GESTURE RECOGNITION

U.K. JALIYA1, DR. DARSHAK THAKORE2, DEEPALI KAWDIYA3:(2013)

In this paper recognition of dynamic hand gesture is proposed. MATLAB algorithms pre-process the image and detect the skin region and count the number of active fingers. Hand gesture recognition based on Gabor filters. The different approaches, like vision-based hand gesture algorithm has three stages: preprocessing, feature extraction and classification. In preprocessing stage segmentation of hand region is done using histogram algorithm .Rotation that rotates segments utilize sensors to measure the joint angles. Filtering is effectively used to removes background noise and object noise from binary image by morphological using this technique. Pixel Count Algorithm:This RGB image is converted to Binary image (BW) using MATLAB function im2bw. The binary image is obtained, the skin region- represented by the white (1) pixels and the background- represented by black (0) pixels. Detection Circle Algorithm:In this Algorithm the fingers are to be marked with black circles prior to placing them before camera.This algorithm concentrates on the number of circles alone, independent of both size and rotation of the hand. Morphological Operation The binary image is filtered using a median filter of dimension 3 and future the image is converted 3 to 5 dimension. This image is further dilated by using another structural element of dimension 10 to 12.

Limitations:

The pixel count algorithm count only the white pixel(skin region) due to this rotation of gesture is not possible. The accuracy of the image is not more than 83%.

Existing method 4:

SURVEY: HAND-GESTURE-BASED STERILE INTERFACE FOR THE OPERATING ROOM USING CONTEXTUAL CUES FOR THE NAVIGATION OF RADIOLOGICAL IMAGES.

This paper presents a method to improve the navigation and manipulation of radiological images through a sterile hand gesture recognition interface based on attentional contextual cues.Experimental results show that gesture interaction and surgeon behavior analysis can be used to accurately navigate, manipulate and access MRI images, and therefore this modality could replace the use of keyboard and mice-based interfaces. The 10 gestures selected for the MRI image browser are displayed in table 1: ‘clockwise’ and ‘counterclockwise’ rotate the image; ‘browse left’ and ‘browse right’ browse between images in a sequence; ‘zoom in’ and ‘zoom out’ toggle between magnified and normal view, respectively; ‘browse up’ and ‘browse down’ switch between sequences; ‘increase brightness’ and ‘decrease brightness’ alter brightness. Skeletal joints were tracked using a software library using the Kinect sensor, which fits a skeleton model to the user The results of the first study showed a mean recognition accuracy of 97.9% with 1.36% false positive rate (FPR) through twofold cross-validation at the peak operating point.

Limitations

Adding more environmental cues such as the position of a surgical instrument within the patient's body requiring further data collection, training, and
validation.

It is quite diificult for the machine to detect the intentional and unintentional moves of the surgeon.

Existing method 5:

SURVEY: SYSTEMATIC LITERATURE REVIEW OF HAND GESTURES USED IN HUMAN COMPUTER INTERACTION INTERFACES BY (ZIMMERMAN ET AL., 1987, BUCHMANN ET AL., 2004)

Hand gestures were used extensively in interfaces for a variety of applications, facilitated by a large number of technologies. The applications fall under larger groupings of 3D modelling, assistive applications, data input, manipulation or navigation, and touchless interaction and control. Technologies can roughly be divided into visual based sensors and cameras, and physical wearables This paper reports findings from a systematic review aiming to answer the following research question: What are the patterns of touchless hand gesture use during gesture based interface.to answer this research question, the field of touchless gesture based interfaces is first mapped, and then patterns and commonalities between different approaches are explored. If accuracy and reliability were improved, these could become the primary technology for gesture interfaces in the future. HMM algorithm and gesture libraries and SDKs were used across majority of applications and facilitating technologies. DTM, FSM and SVM algorithms were used only in applications supported by visual based technologies. Then the types of gestures used are Temporal classification and Contextual classification in Temporal classification Based on their temporal characteristics, gestures can be classified as static or dynamic. Static gestures are those where only static position of a hand ("a snapshot") is observed. These types of gestures are also called postures and in contextual classification Based on what they are used for, and the context they are used in, gestures can be classified as communicative or manipulative. Free-form gestures were often correlated with 3D application, and deictic gestures with interaction with different display types and robot control.In 3D modelling definition of 3D modelling activities, shape creation, modification and manipulation.They stated that creation is use of hand gestures to create a new shape in an empty working space, modification is the interaction with that shape intending to change its geometric characteristics, and manipulation is an activity that does not modify the shape itself but shifts it in space, translates, rotates or scales it.

Limitations

Since it is Systematic approach the cost of the machines are expensive.
camera setup also the expensive one.