LITERATURE SURVEY

TOPIC:

A Gesture based tool for Sterile browsing of Radiology Images.

TEAM:

922119106008-ARCHANA ROY A

922119106001-ABITHA DEVADHARSHINI A G

922119106006-AMRITHA M

922119106010-ARUL NANDHINI R

TITLE:

Literature Survey on Hand Gesture Recognition System.

AUTHORS:

Akshatha , Bhavani Patil , Harshitha , Sindhushree

PUBLICATION YEAR:

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ABSTRACT:

For those who are deaf and dumb Sign language is an efficient alternative way for talking, where we can understand them by using the hand gestures. For humans hands are a part of human organs which is used to manipulate physical objects. For this very reason hands are used most frequently by human beings to communicate and interact with machines. In the recent generation, hand gesture recognition system is improving in such a way that the interaction between the human and machine is advancing by using the electronic gadgets such as mobile phones, computers etc. So, there will be advancement not only in representing the speaking skills, also writing skills too. The real-time continuous gesture recognition is based on posture, position, orientation, and motion or by using the embedded systems like microcontrollers or it can be color maker approach, glove-based approach, vision-based approach and depth-based approach. The technique used in this system is that the input to the system will be given from the hand. They detect the image of the hand and pre-process it. Later on, they are going to crop the image how much they require for the analysis. In later stages they are going to extract the feature of the hand and then they are going to classify it. At the last the gesture is converted into the speech. According them hand gesture recognition system provides Human Computer Interaction. The two major applications they have used is Sign Language Recognition and gesture-based control.

INTRODUCTION:

The most critical of all in today’s life is communication- the way to rad and write. The way of communication in which any type of body movement is involved called Gestures.

Gesture recognition is the mathematical interpretation by a computing device. Gestures are expressive, meaningful body motions involving physical movements of the fingers, hands, arms, head, face, or body. There are many kinds of expressions of human movements, the common one is the expression of gestures. In other words, Gesture is non-vocal way of communication which uses hand motion, different postures of body, face expressions. Gesture recognition based on computer vision has gradually become a hot research direction in the field of human-computer interaction. Sign language is the most expressive way for the hearing impaired, recognizer must be able to recognize continuous sign vocabularies in real-time. Gesture recognition based on attitude sensor is an emerging field of pattern recognition research. Experimental investigation proves the performance and high accuracy of any proposed device. Normal way of using hand gesture recognition system is when we give some commands to our system by hand gestures the machine first captures our command as an image then compare this with database and if any image found in database then task assigned to that will be performed. Normal way of using hand gesture recognition system is when we give some commands to our system by hand gestures the machine first captures our command as an image then compare this with database and if any image found in database then task assigned to that will be performed. The most critical of all in today's life is communication- reading and writing. They feel communication medium difficult because they cannot access the computer. In some paper they have used Braille script for reading and writing purpose, which cannot be interpreted by the existing computers. The six fingers represent the six dots in the Braille. Few papers have focused on Human Computer Interaction (HCI). In some times they have used Braille script for reading and writing purpose, which cannot be interpreted by the existing computers. The six fingers represent the six dots in the Braille. A smart camera can be defined as a vision system which produces a high-level understanding of the imaged scene and generate application specific data to be used in system. Mono-vision based skin color segmentation techniques are used for segmenting the hand form a complex image sequence. The standard histogram features along with various geometrical features are extracted. Some papers they have used End-Point problem to determine the end points in a gesture input sequence.

TECHNIQUES AND ALGORITHMS USED:

The radar operates on 60GHz and utilized Range Doppler Map algorithm to acquire the velocity and range of different movement and fulfill hand recognition. Also, they have used soundwave technologies like loudspeakers and microphones embedded in the computer to recognize the hand gesture. They have considered Decision based tree algorithm which classifies the original signal they have considered into four set of gestures. This gesture recognition is been described in such a way that for gesture detection we are going use hand pushing, hand pulling, hand lifting and hand shaking. F. In this method they have discussed about the features of radar that are helpful for gesture recognition and perform effective gesture recognition using the features determined through this feature selection analysis. They introduced a method called feature-based gesture recognition in a frequency modulated continuous wave (FMCW) radar. From this method we obtain a raw signal of FMCW radar and generate a variety of features from the RDM. The features are broadly defined so that they can radar-specific characteristics as well as statistical values commonly used in the machine learning. Some of these radar features are highly connected with the Gesture Recognition and are selected by the proposed feature selection algorithm. This selection algorithm which is a wrapper-based feature selection algorithm incorporated with a quantum-inspired evolutionary algorithm (QEA). The algorithm's information factor is based on the minimum Redundancy Maximum Relevance (RMR) criterion and is applied to QEA to get the feature subsets effectively. This introduced algorithm is able to extract all the forms of feature sets from all the feature subsets related to gesture recognition, and it helps in improving the gesture recognition accuracy of the FMCW radar system.

CONCLUSION:

In this paper we have studied the various method of gesture recognition. Hand gesture recognition system is considered as a way for more intuitive and proficient human computer interaction tool. The range of applications includes virtual prototyping, sign language analysis and medical training. Also, we have identified how to classify the non interest images and interested gestures from the taken actions or images, inertial sensor are used to identity the gestures. In this paper we have discussed about the End-Point algorithm and also few techniques of it is Mono-vision technique. Each of them performed all the hand gestures.

TITLE:

Systematic literature review of hand gestures used in human computer interaction interfaces

AUTHORS:

ADEEN, H. S., ATIA, A., AMIN, A., VICTOR, A., ESSAM, A., GHARIB, E. & HUSSIEN

PUBLICATION YEAR:

August 2015

ABSTRACT:

There are three sub-types of iconic gestures: those that describe a shape (Pictographs), those that represent a spatial relation (Spatiographic), and those that describe action of an object (Kinematographs) (Rimé and Schiaratura, 1991). Metaphoric gestures "are iconic gestures which represent abstract content" (Wagner et al., 2014, McNeill, 1992), e.g. a cutting gesture to indicate a decision has been made (Casasanto and Lozano, 2007). They "sketch in space the logical track followed by the speaker's thinking" (Rimé and Schiaratura, 1991). Modalizing symbolic gestures primarily complement speech, but can also complement other means of communication.

INTRODUCTION:

Gestures are a natural form of human expression, and hands a natural mode of interaction with the physical world and objects in it (Zimmerman et al., 1987, Buchmann et al., 2004). Gestures are used for communication and accompany speech in many different forms. They range from gestures that do not convey a specific meaning and simply follow the rhythm of the speech, to those enriching its meaning and symbolising specific concepts (McNeill, 1992, Quek, 2004). Hand gestures in particular, including use of fingers and arms, are widely explored as a natural and intuitive interaction modality for a variety of applications. They are used as a sole, or one of the modes for interaction interfaces. It is believed that gesture based interfaces can reduce the complexity of interaction between humans and computers (New et al., 2003). Motivations behind the decision to use gestures in an interface can be varied. Gesture based interfaces used for computer applications can be more intuitive than established WIMP (Windows Icon Mouse Pointer) based interfaces, and allow inexperienced users to interact with computer applications, without undertaking extensive training (Buchmann et al., 2004, Kim et al., 2005, Beyer and Meier, 2011). In medical applications or industrial environments, they enable touchless operation guaranteeing sterilit or safer interaction. Gesture interfaces for Virtual Reality (VR) or Augmented Reality (AR) environments provide better immersion and do not require conscious attention dedicated to the specific gestures being performed (Deller et al., 2006). Spatial concepts can be expressed using gestures, and they are used in design and engineering, when externalising ideas (Vinayak et al., 2013). Interaction with comfort functions in a car can be achieved without taking the eyes off the road (Riener et al., 2013). Gestures can be used to help older population achieve easier interaction with electronic devices (Bhuiyan and Picking, 2011). These are just some of the examples, and new applications are constantly being developed. Use of gestures for these applications is supported by a variety of technologies. Development of Kinect (Kinect, 2018) and LEAP sensors (LEAP MOTION INC., 2018), which are portable and supported by Software Development Kits (SDKs) enabling simpler implementation, seems to have contributed significantly to the expansion of the field on gesture based interfaces since 2013. While the gesture-based interfaces are being developed for various applications clear standards which could guide their further development are not apparent. For example, while interfaces supporting three-dimensional (3D) object manipulation exploring use of intuitive, affordable and non-intrusive interfaces are ubiquitous, none of the approaches used have been established as the baseline for future development (Vinayak et al., 2013). Investigation of patterns of gesture use, identifying commonalities and differences between different fields would be an initial step towards development of a standard framework for gesture elicitation for interaction interface development. Review by Rautaray and Agrawal (2015), provides a survey of the gesture based research published up to and including 2012, and the content covered is largely that published prior to the uptake of Kinect and LEAP in the gesture research community. Reviews by Hasan and Mishra (2012), Suarez and Murphy (2012), and Pisharady and Saerbeck (2015) focus on recognition approaches. Threesystematic reviews have been identified: one that focuses on usability guidelines for “health serious games” (Milani et al., 2017), one that focuses on data exchange formats (Santos[1] et al., 2015), and one that focuses on vision based gesture systems and algorithms for gesture recognition (Al-Shamayleh et al., 2018). The first one is in Portuguese and reports on only 16 studies. Reviews identified in the literature either cover recognition based research questions, rather than gestures themselves, or are not systematic, and information on patterns of gesture use cannot be extracted from them.Further to this, the underpinning gesture theory found in the literature is heavily based on gestures observed as speech aid, gestures used in parallel with verbal communication. Classifications and definitions present in it may not be capable of fully describing the free-form in-air gesture interaction

TECHNIQUES AND ALGORITHM USED:

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. However, overall there were no clear leaders or prescribed approaches in the technology, gestures or recognition methods used for different applications yet, however a variety of combinations of these show promis

CONCLUSION:

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.

TITLE:

HAND GESTURE RECOGNITION: A LITERATURE REVIEW

AUTHORS:

Rafiqul Zaman Khan and Noor Adnan Ibraheem

PUBLICATION YEAR:

July 2012

ABSTRACT:

Hand gesture recognition system received great attention in the recent few years because of itsmanifoldness applications and the ability to interact with machine efficiently through human computer interaction. In this paper a survey of recent hand gesture recognition systems is presented. Key issues of hand gesture recognition system are presented with challenges of gesture system. Review methods of recent postures and gestures recognition system presented as well. Summary of research results of hand gesture methods, databases, and comparison between main gesture recognition phases are also given. Advantages and drawbacks of the discussed systems are explained finally.

INTRODUCTION:

The essential aim of building hand gesture recognition system is to create a natural interaction between human and computer where the recognized gestures can be used for controlling a robot or conveying meaningful information . How to form the resulted hand gestures to be understood and well interpreted by the computer considered as the problem of gesture interaction.Human computer interaction (HCI) also named Man-Machine Interaction (MMI)refers tothe relation between the human and the computer or more precisely the machine, and since the machine is insignificant without suitable utilize by the human . There are two main characteristics should be deemed when designing a HCI system as mentioned in 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. The system that attains a suitable balance between these concepts considered as influential performance and powerful system.Gestures used for communicating between human and machines as well as between people using sign language.

ALGORITHM AND TECHNIQUES:

The common helpful cue used for segmenting the hand is the skin color ,since it is easy and invariant to scale, translation, and rotation changes .Different tools and methods used skin and non-skin pixels to model the hand. These methods are parametric and non-parametric techniques, Gaussian Model (GM) and Gaussian Mixture Model (GMM) are parametrictechniques, and histogram based techniques are non- parametric. However it is affected withillumination condition changes abs different races . Some researches overcome this problem using data glove and colored markers which provide exact information about the orientation and position of palm and fingers. Others used infrared camera ,and range informationgenerated by special camera Time-of-Flight (ToF) camera ,although these systems can detect different skin colors under cluttered background but it is affected with changing in temperature degrees besides their expensive cost [6]. The segmentation considered as an open issue problem itself . The color space used in a specific application plays an essential role in the success ofsegmentation process, however color spaces are sensitive to lighting changes, for this reason,researches tend to use chrominance components only and neglect the luminance components such as r-g, and HS colors.

CONCLUSIONS:

In this paper various methods are discussed for gesture recognition, these methods include from Neural Network, HMM, fuzzy c-means clustering, besides using orientation histogram forfeatures representation. For dynamic gestures HMM tools are perfect and have shown its efficiency especially for robot control . NNs are used as classifier and for capturing hand shape in. For features extraction, some methods and algorithms are required even to capture the shape of the hand as in applied Gaussian bivariate function for fitting the segmented hand which used to minimize the rotation affection The selection of specific algorithm for recognition depends on the application needed. In this work application areas for the gestures system are presented. Explanation of gesture recognition issues,detail discussion of recent recognition systems are given as well. Summary of some selected systems are listed as well.

TITLE:

Real-Time Hand Gesture Interface for Browsing Medical Images

AUTHOR:

Juan Wachs,Helman Stern,Yael Edan,Craig Feied,Mark Smith and Jon

PUBLICATION YEAR:

March 2007

ABSTRACT:

A gesture interface is developed for users, such as doctors/surgeons, to browse medical images in a sterile medical environment. A vision-based gesture capture system interprets user's gestures in real-time to manipulate objects in an image visualization environment. A color distribution model of the gamut of colors of the users hand or glove is built at the start of each session resulting in an independent system. The gesture system relies on real-time robust tracking of the user's hand based on a color-motion fusion model, in which the relative weight applied to the motion and color cues are adaptively determined according to the state of the system. Dynamic navigation gestures are translated to commands based on their relative positions on the screen. A state machine switches between other gestures such as zoom and rotate, as well as a sleep state. Performance evaluation included gesture recognition accuracy, task learning, and rotation accuracy. Fast task learning rates were found with convergence after ten trials. A beta test of a system prototype was conducted during a live brain biopsy operation, where neurosurgeons were able to browse through MRI images of the patient's brain using the sterile hand gesture interface. The surgeons indicated the system was easy to use and fast with high overall satisfaction.

INTRODUCTION:

Computer information technology is increasingly penetrating into the hospital domain. It is important that such technology be used in a safe manner to avoid serious mistakes leading to possible fatal incidents.The Gesture Pendant is a wearable gesture recognition system that can be used to control home devices and provides additional functionality as a medical diagnostic toolthis paper we explore only the use of hand gestures, which can in the future be further enhanced by other modalities. We propose a doctor-computer interaction system based on effective methods for analyzing and recognizing gestures in sterile dynamic environments such as operation rooms. Much of the research on real-time gesture recognition has focused exclusively on dynamic or static gestures. In our work, we consider hand motion and posture simultaneously. This allows for much richer and realistic gesture representations. Our system is user independent without the need of a large multi-user training set. We develop a vision based (unencumbered) hand gesture capture system that can be used to manipulate windows and objects, especially images, within a graphical user interface (GUI). Performance of the gesture interface was tested in real-time in a hospital environment. In this domain the non-contact aspect of the gesture interface avoids the problem of possible transfer of contagious diseases through traditional keyboard/mice user interfaces. The system specifications and description appear in abstract.In image processing operations using adaptive color-motion fusion for hand segmentation and tracking is described. It provides details of the gesture operational mode, with state machine switching between directional navigation, rotate, zoom and sleep modes. It provides performance evaluation results. It reports on the test of the system during a live brain biopsy operation. Final conclusions are provided .

ALGORITHM AND TECHNIQUES:

The CAMSHIFT algorithm is used to track the hand. CAMSHIFT, as described by Bradski uses a probability distribution image comprised of pixels representing hand colors. This hand image is created from a 2D hue-saturation skin color histogram .A histogram is used as a look-up-table to convert the acquired camera images of the hand into corresponding pixel intensities, a process known as back projection. In the original CAMSHIFT algorithm the probability of a pixel belonging to the hand is determined by the grayscale value of the pixel only. In lieu of using color probability alone, we modify it with motion information accordingly,it represent a hand pixel probability. The relative weights between color and motion are shifted according to the amount of motion in the scene resulting in an adaptive fusion system. Using the centroid and size of the hand blob of pixels an iterative procedure based on a generalization of the mean shift algorithm is used to update the tracking window at each frame. Thresholding to black and white followed by morphological operations is used to obtain a single component for further processing to classify the gestures the main surgeon who conducted the task of browsing MRI images, filled in a questionnaire with questions on task experience, ease of task, time of task completion, and overall task satisfaction. The surgeon's response indicated that the Gestix system was easy to use, fast, with high over all satisfaction.

CONCLUSION:

A vision-based system that can interpret user's gestures in real-time to manipulate windows and objects within a medical data visualization environment is presented. The system is user independent due to the fact that the gamut of colors of the users hand or glove is built at the start of each session. Hand segmentation and tracking uses a new adaptive color-motion fusion function. Dynamic navigation gestures along with zoom, rotate, and system sleep gestures are recognized. Three types of system performance evaluations were conducted; (a) gesture recognition accuracy, (b) task learning, and (c) rotation accuracy. Subjects were also queried on the ergonomic aspects of the system such as comfort and intuitiveness. In addition, the system was tested by surgeons during a neural operation in a real hospital setting. A test of the system was conducted in an OR at Washington Hospital Center, Washington, DC, during a live biopsy operation where neurosurgeons browsed through MRI images of the patient's brain using the Gestix hand gesture interface. Surgeons were given a post operation satisfaction questionnaire which revealed high scores for ease of use, task completion time and overall satisfaction. The following are some of the major advantages of the hand gesture interface for use by surgeons and doctors: (i) Easy to use: - the system allows the use of hands, which is the natural work tool for the surgeons, (ii) Rapid reaction: - nonverbal instructions by hand gesture commands are intuitive and fast. In practice, the Gestix system can process images and track hands in real-time, (iii) Unencumbered: - the proposed system does not require the surgeon to attach a microphone, use head-mounted (body-contact) sensing devices or use foot pedals, (iv) Sterile interface: - a sterile non contact interface is a major advantage for use in operating rooms, and (v) Controlled from afar: - the hand gestures can be performed up to 5 meters from the camera and still be recognized accurately.Future work includes replacement of the rotation gesture to operate with the hand palm only, and the development of two handed gestures to achieve increased accuracy for the zoom and rotation gestures. It is also planned to assess the use of stereo and/or infrared cameras.

TITLE:

Gesture-controlled image system positioning for minimally invasive interventions

AUTHORS:

Hatscher B, Mewes A,Pannicke E,Kagebein U,Wacker F, Hansen C, Hensel.

PUBLICATION YEAR:

December 2020

ABSTRACT:

This work examines how a touchless interaction concept contributes to an efficient, direct, and sterile interaction workflow during CT-guided interventions. Twohand gesture sets were designed specifically under consideration of the clinical workflow and the hardware capabilities. These were used to change the position of an X-Ray tube and detector of a CT scanner without breakingsterility and are compared regarding usability and performance in a user study with 10 users. The user study revealed that it ispossible to change the angle of the gantry within 10 secondsaverage in an experimental setup. A straight hand gesture showed higher acceptance than a pistol motivated gesture. Furthermore, the sequences were not optimal and confused the users. It turned out that it feels more natural to activate and confirm the system with the same gesture.

INTRODUCTION:

The number of percutaneous interventions is increasing due to the demographic change. Patients are older and more people get cancer. Especially older and multi-morbid patients often cannot be cured with invasive surgery, i.e. by resection of the lesion. With the help of imaging devices, such as CT scanners, the radiologist brings energy applicators into the tumour region with high precision percutaneously. However, most CT systems were developed as diagnostic devices and thus lack assistance and interaction concepts essential for the interventional workflow. Especially for flat panel CT's toacquire images to visualize the instrument and risk structurelocations, the radiologist must position the X-Ray tube and the detector to the dedicated angle for the radiography. Observations revealed that the current workflow is not optimal, due to sterility issues that arise with the use of haptic buttons or touchscreens covered with a sterile drape . A lot of research effort has been done in interaction with visualization and controlling of medical image viewers or registration of images .Wachs et al. developed a vision-based hand gesture system to control medical image viewer. Shen et al. developed a hand gesture interaction and visualization for CT volume dataset using a Leap Motion Controller (LMC, San Francisco, California, United States).However, during interventions, controlling imaging devices is a frequent task that still shows a need for application specific sterile interaction concepts.In this work a gesture interaction concept that translates touchless hand gestures into commands for special-purpose radiography imaging and a graphical user interface (GUI) for visualization purposes is presented. With the help of this system, the interventionalist is capable to position X-Ray tube and detector to a dedicated angle without leaving the sterile area and without breaking sterility. This should improve the workflow of image-guided interventions and, consequently, save time and costs and improve the outcome of treated patients. The proposed interaction concepts were evaluated in a user study with 10 participants regarding error rate, task completion time, and usability.

ALGORITHM AND TECHNIQUES:

To tackle the challenges of image-guided interventions listed above a hand gesture interaction concept was designed. Additionally, a GUI was developed to get live feedback of the current and the configured angle. The gestures were detected with a stereo infrared optical tracking system, the LMC .Gesture DesignThe proposed interaction concept consists of two gesture sets. Each set includes three phases: Activation, Continuation and GUI start screen . The application visualizes the current gantry position by showing the position of the X-Ray tube (grey). The user can change the target position of the X-Ray tube by using gestures to move the X-Ray tube (dark blue). On the right-hand side the gesture can be selected shows four predefined angles. Gantr specific parameter and control elements can also be found in the GUI.To evaluate the subjective workload of each gesture concept an additional questionnaire was developed. The study was performed without weighting of the subscales. For each thesis the scale rank ranged from 0 (“disagree vehemently”) to (“agree completely”).

CONCLUSION:

In this work a touchless, direct, and sterile gesture interaction control for the manipulation of the CT scanner rotation angle was developed and evaluated. With the usage of an LMC handor finger movements were tracked and used to control the rotation angle of an X-Ray tube. Within this work a gesture set was designed to evaluate the suitability of gesture interaction in C-Arm CT or gantry CT applications to position the imaging system. Furthermore, to increase the usability of such a system, a simple GUI was developed to visualize the gantry movement in real time, but offered potential for improvements.In a user study with 10 non-medical users the usability and the susceptibility to errors were evaluated. The study showedthat the first gesture interaction set performed by a straight hand is more acceptable than the symbolic pistol gesture set.In the future, different interaction concepts need to beoptimized and evaluated to be suited for other controllable devices in the intervention room, e.g. the patent table. A possible additional modality can be speech recognition. Applications for such systems could be to scroll through slices in diagnostic scans or to apply image processing tools, like e.g. windowing, contrast and brightness level during minimally-invasive image-guided interventions without delays in the workflow. To use the full range of human senses, ideally a combination of multimodal interactions concepts, as presented in have to be further investigated.