

A Gesture Based Tool For Sterile Browsing of Radiology Images

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NO	Source	Year	Name of the paper	About the paper	Advantages	Disadvantages
1	IJHCS	2019	Systematic literature review of hand gestures used in human computer interaction interfaces	hand gestures are defined as gestures performed using one or both hands, including finger gestures when they were performed along with a number of other varied gestures e.g. pointing gesture used for selection of an object and then pinching gesture is used to deform that object, or to move it to a different location.	The former are unobtrusive, and provide opportunity for natural movement, while the latter are generally more accurate and easier to set up and track, but can encumber the wearer. Depth cameras and accelerometers were the most frequently used technologies. However, sensors and cameras are gaining popularity as they provide the ability to implement interfaces requiring no physical contact with the user, which are more intuitive and less invasive.	If accuracy and reliability were improved, these could become the primary technology for gesture interfaces in the future. Finally, observing gestures decoupled from speech may lead to new findings, which might contribute to gesture research, currently focusing on gestures when used simultaneously with speech.

2	Research Square	2022	Introducing a brain-computer interface to facilitate intraoperative medical imaging control – a feasibility study	This study proposes a new medical image control concept based on a Brain Computer Interface (BCI) that allows for hands-free and direct image manipulation without relying on gesture recognition methods or voice commands. A software environment was designed for displaying three-dimensional (3D) patient images onto external monitors, with the functionality of hands-free image manipulation based on the user's brain signals detected by the BCI device (i.e., visually evoked signals)	The use of the developed BCI, that allowed for a purely brain-guided medical image control, yielded promising results, and showed its potential for future intraoperative applications. BCI-based concepts can be investigated for other intraoperative tasks and more complex user interface algorithms such as physical controlling of surgical robots.	The major limitation to overcome was noted as the interaction delay.
3	Springer Nature	2021	Methods, Databases and Recent Advancement of Vision-Based Hand Gesture Recognition for HCI Systems: A Review	This paper is about methods and recent advancements in human computer interactions (HCI) systems. This paper provided	This paper explains both sensor used and facial recognition techniques and distinguishing both the techniques	Dynamic hand gestures vary spatio-temporally with assorted and different implications; The

				BCI-based concepts can be investigated for other intraoperative tasks and more complex user interface algorithms such as physical controlling of surgical robots.. A detailed discussion is provided on feature extraction and major classifiers in current use including deep learning techniques.	.Moreover, as the world adapts to the new changes after the COVID-19 pandemic, touch-less technology can be the 'new normal' in such situations to minimise the risk of a global health crisis.	human hand has a complex non-unbending design making it hard to perceive; and There are as yet numerous difficulties in computer vision itself making it a poorly presented problem.
4	Journal of Imaging	2022	A Structured and Methodological Review on Vision-Based Hand Gesture Recognition System	This article reviews current developments in the field of human–computer interaction (HCI). The emphasis is on the different application areas, where hand gestures are used to create effective engagement. The goal of this article is to give an overview of the current status of static and dynamic hand gesture	In the area of vision-based hand gesture recognition , significant development has been achieved in the recent few years, both in terms of hardware and software. r provides a systematic review and analysis of recent vision-based gesture recognition	The main challenge in egocentric vision gesture detection is the global camera motion created by the device wearer's spontaneous head movement. Apart from lowering the accuracy of the classifier, the inclusion

				recognition in the area of HCI, including gesture taxonomies, representations, and recognition methods, as well as to identify future research objectives in the field.	methods in the design of more efficient and intelligent HCIs.	of several frames increases the computing complexity of the system
5	IEEE	2021	A Review of the Hand Gesture Recognition System: Current Progress and Future Directions	This paper reviewed the sign language research in the vision-based hand gesture recognition system from 2014 to 2020. Its objective is to identify the progress and what needs more attention.	For the signer dependent, the recognition accuracy ranges from 69% to 98%, with an average of 88.8% among the selected studies. On the other hand, the signer independent's recognition accuracy reported in the selected studies ranges from 48% to 97%, with an average recognition accuracy of 78.2%	Due to hand segmentation issues, feature extraction faces restrictions on the signers' environment to achieve higher accuracy. the ideal background for gesture recognition should include only the signer with no background as the background clutter can affect the gesture recognition accuracy.
6	Elsevier	2021	Vision-based hand gesture	In this paper, a deep	The proposed	Comparison has

			<p>recognition using deep learning for the interpretation of sign language</p>	<p>learning based convolutional neural network (CNN) model is specifically designed for the recognition of gesture-based sign language. This model has a compact representation that achieves better classification accuracy with a fewer number of model parameters over the other existing architectures of CNN.</p>	<p>model finds the key features from the input frame automatically. As a result, this method outperforms the feature extraction based recognition system. Even with less-deepened architecture of G-CNN, this method produces good recognition result with less training time consumption over the state-of art models of deep learning.. The highest accuracy of 99.96% and 100% is obtained by the proposed model for ISL and ASL datasets respectively.</p>	<p>been done based on their achieved accuracy only, as it is the only widely used performance metric in all the state-of-art approaches</p>
7	Researc	2021	Vision based Hand	In this paper a	improved	Security

	hgate		gesture pattern recognition enabled home automation system using Internet of Things	system uses a real time image processing for hand gestures recognition by using a simple android based application and arduino uno.	safety since drivers do not have to take their attention off the road as much as they would with touch controls — and the simple convenience of being able to control vehicle functions with deliberate gestures rather than a potentially complex menu scheme.	Issues: As with all computing devices, security will become a greater issue as more people use smart home devices.
8	ITM web of conferences	2022	Computer Control Using Vision-Based Hand Motion Recognition System	In this study, we created a sophisticated marker-free hand-gesture detection structure that can monitor both dynamic and static hand gesture	Hand gesture recognition is of great importance for human computer interaction (HCI) because its extensive applications in virtual	Recognition in complex background, in dynamic background, in the presence of multiple gestures in the background, under variable lighting conditions, under different

					reality and sign language recognition etc.	view points.
9	Informat ica	2022	Towards a Feasible Hand Gesture Recognition System as Sterile Non-contact Interface in the Operating Room with 3D Convolutional Neural Network	propose a Deep Computer Vision-based Hand Gesture Recognition framework to facilitate the interaction. We trained a 3D Convolutional Neural Network with a very large scale dataset to classify hand gestures robustly. This network became the core component of a prototype application requiring intraoperative navigation of medical images of a patient. Usability evaluation with surgeons demonstrates the application would work and a hand gesture lexicon that is germane to Medical Image Navigation was defined. By completing	Navigation application that is not dependent on the capture device and is positively evaluated by surgeons. General feedback from our local surgeons shows receptiveness and willingness to apply this technology. Furthermore, we defined a set of suitable hand gestures for the application. This set coupled with the framework can serve as a foundation for building and deploying Hand Gesture-co	Due to restrictions on physical meetings brought about by ongoing local policies regarding community quarantines, evaluating the system with multiple surgeons in an OR session has been a roadblock

				one cycle of usability engineering, we prove the feasibility of using the proposed framework inside the Operating Room	ntrolled applications in our operating rooms as well as in other more lenient settings requiring sterility maintenance.	
10	EJMED	2020	Artificial Intelligence: The New Frontier in Surgery	aims to discuss the advances in artificial intelligence (AI) and the role it now plays in surgery. The discussion outlines the many capabilities of AI in improving the way in which surgery is conducted and a critical review of new AI developments.	There will be also be a benefit to humans with this human to machine interaction resulting in augmentation of human intelligence to much higher levels. Nanotechnology has ushered in a new era of surgery that can be performed on a scale order of magnitude hitherto not believed possible even with the most advanced systems available today. Coupled with AI this	It is anticipated that as these AI systems improve, and the data available to them increases, there will be an exponential improvement, which is expected to take the capability of these systems to a point far beyond human ability.

					technology will benefit surgery in the field of diagnosis and treatment of a wide range of surgical diseases.	
11	arXiv	2022	Design of Human Machine Interface through vision-based low-cost Hand Gesture Recognition system based on deep	In this work, a real-time hand gesture recognition system-based human-computer interface (HCI) is presented. The system consists of six stages: (1) hand detection, (2) gesture segmentation, (3) use of six pre-trained CNN models by using the transfer-learning method, (4) building an interactive human-machine interface, (5) development of a gesture-controlled virtual mouse, (6) use of Kalman filter to estimate the hand position, based on that the smoothness of the motion of pointer is improved.	The gestures recognition system is expanded and used to control multimedia applications like VLC media player, audio player, file management.	Sometimes the design of HMI could create confusion between the operator and the machine and this could create major faults, and this confusion is because of HMI design.

12	Remote Sens	2022	Hand Gestures Recognition Using Radar Sensors for Human-Computer-Interaction: A Review	Use of Radar and other RF sensors to develop HCI based on hand gesture recognition	The use of Radar and other RF sensors to develop HCI based on HGR helps in building devices for recognising and categorising hand movements.	Although radar sensors offer several advantages over the other HGR sensors (i.e., wearable sensors and cameras), the adoption of radar-based HGR in our daily lives is still lagging behind these competing technologies.
13	Taylor and Francis	2021	An Augmented Reality Platform with Hand Gestures-based Navigation for Applications in Image-Guided Surgery: Prospective Concept Evaluation by Surgeons	In this paper, we present the development of a generic AR-based and wireless gestures platform for image-guided surgery planning. The system was assessed with two minimally invasive surgery scenarios: heart mitral valve repair and endovascular	Augmented reality (AR) technologies provide new scenarios for analysis and medical data representation, by combining the standard image-based analysis using 2D-slices with 3D	It has a wider field of vision, needed for surgery visual augmentation using standard patient-specific datasets and 3D anatomies, mapped in the visual space of the operating room or

				<p>brain aneurysm repair using CT Angiography (CTA) images. Twenty-one experiments with heart surgeons and neurosurgeons were carried out, testing the clinical pathology, anatomy exploration, interaction, and perceived usability. The tasks and scenarios, perceived illusion related to the realism of the 3D virtual models and hand manipulation, and the navigation experience were all well evaluated</p>	<p>virtual models of patient-specific structures of the body overlapped in the view of the real world in real-time.</p>	<p>even superimposed over the patient. Additionally, the system implements a ubiquitous and ergonomic human-computer interaction scheme, without the need for the surgeons to manipulate any extra tools with their hands beyond the standard surgical instruments, and consequently losing visuomotor perception with the real view of the operating room scene</p>
14	Researchgate	2021	A Novel Art Gesture Recognition Model	In this paper, we propose a novel gesture	The two-channel	(1) try to introduce more

			<p>Based on Two Channel Region-Based Convolution Neural Network for Explainable Human-computer Interaction Understanding</p>	<p>recognition based on two channel region-based convolution neural network for explainable human-computer interaction understanding. The input gesture image is extracted through two mutually independent channels. The two channels have convolution kernel with different scales, which can extract the features of different scales in the input image, and then carry out feature fusion at the fully connection layer. Finally, it is classified by the softmax classifier. The two-channel convolutional neural network model is proposed to solve the problem of insufficient feature extraction by the convolution</p>	<p>convolutional neural network model is proposed to solve the problem of insufficient feature extraction by the convolution kernel. Experimental results of gesture recognition on public datasets NTU and VIVA show that the proposed algorithm can effectively avoid the over-fitting problem of training models, and has higher recognition accuracy and stronger robustness than traditional algorithms.</p>	<p>hierarchical and scale features to further improve the adaptability of the model to complex background. (2) At present, the accuracy of dynamic gesture recognition still has a lot of room for improvement, and the model can be applied to the field of dynamic gesture recognition. (3) The convolutional neural network model for gesture recognition needs a large number of labelled image data for training.</p>
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				kernel.		
15	Researchgate	2022	Generations of human-computer interactions: evolution, tendencies and perspectives	In this paper, we present the usability evolution of human-computer interactions. In addition, we group the various user interfaces of human-computer interaction into two generations with three classes each. The most user interfaces for human-computer interaction are assigned into a class depending on objective criteria scores, such as technical literacy level, level of natural interactions, user learning curve and UI's ability to adapt.	In this paper, we have presented a way to create a classification of all existing HCI interfaces by dividing them into two generations, with three classes each. The factors for this classification are not arbitrary, nor historical. By using criteria, such as user interaction space, the level of natural interactions, the software technical complexity and the ability to adapt, we are able to define the class of existing and new user interface.	The notion of a software interface is even wider. The modern term interface defines an interaction space not only between a human and a machine, but also between a computer system and a physical object or even between two computer systems.

16	Elseiver	2021	Human-Computer Interaction to Support Work and Wellbeing in Mobile Environments	Designing human-computer interaction for work and wellbeing tasks in mobile environments is a multi-dimensional problem. Key dimensions of this field will be the basis for the research questions that we plan to address:	This research paper tells us how in near future we can make and advancement on building mobile devices with the help of HCI to ease our day to day life	One of its challenges include Algorithmic bias on how tools are designed for the future of work
17	Elseiver	2021	Hand gesture recognition via enhanced densely connected convolutional neural network	Hand gesture recognition (HGR) serves as a fundamental way of communication and interaction for human being. While HGR can be applied in human computer interaction (HCI) to facilitate user interaction, it can also be utilized for bridging the language barrier. For instance, HGR can be utilized to recognize sign language, which is a visual language represented by hand gestures and used by the deaf and mute	a deep learning approach such as convolutional neural network (CNN), adapts to varied challenges via supervised learning. , a customized network architecture dubbed as enhanced densely connected convolutional neural network (EDenseNet) is proposed for vision-based hand gesture recognition .The	Experiments have been carried out on multiple datasets, namely one NUS hand gesture dataset and two American Sign Language (ASL) datasets. Numerous challenges concerning vision-based gesture recognition are variation in skin tones, hand sizes, and view

				<p>all over the world as a primary way of communication. Hand-crafted approach for vision-based HGR typically involves multiple stages of specialised processing, such as hand-crafted feature extraction methods, which are usually designed to deal with particular challenges specifically.</p>	<p>modified transition layer in EDenseNet further strengthens feature propagation, by utilizing bottleneck layer to propagate the features being reused to all the feature maps in a bottleneck manner, and the following Conv layer smooths out the unwanted features</p>	<p>points. Other challenges include gestures similarity, varied illuminations and background noises presented in the images. In essence, varied conditions presented in the images constitute to the numerous challenges faced in recognizing hand gesture from images</p>
18	SAGE	2012	<p>You Can't Touch This: Touch-free Navigation Through Radiological Images</p>	<p>Keyboards, mice, and touch screens are a potential source of infection or contamination in operating rooms, intensive care units, and autopsy suites. A low-cost prototype of a system, which allows for</p>	<p>In this feasibility study, the authors introduced 10 medical professionals to the system and asked them to re-create 12 images from a CT data set. They evaluated response</p>	<p>the elimination of voice commands, and the extension of the system to allow for more complicated image manipulation.</p>

				<p>touch-free control of a medical image viewer is presented. This touch-free navigation system consists of a computer system with a medical image viewer and a depth camera. They implemented software that translates the data delivered by the camera and a voice recognition software into keyboard and mouse commands, which are then passed to OsiriX.</p>	<p>times and usability of the system compared with standard mouse/keyboard control. Users felt comfortable with the system after approximately 10 minutes. Response time was 120 ms. Users required 1.4 times more time to re-create an image with gesture control. Users with OsiriX experience were significantly faster using the mouse/keyboard and faster than users without prior experience. The touch-free, gesture-co</p>	
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					<p>ntrolled</p> <p>system performs favourably and removes a potential vector for infection, protecting both patients and staff. Because the camera can be quickly and easily integrated into existing systems, requires no calibration, and is low cost, the barriers to using this technology are low.</p>	
19	Health Informatics	2018	Touchless computer interfaces in hospitals: A review	<p>touchless interaction with computer equipment in the hospital environment. Gestures have been implemented for input, system and content control. Most of the studies found</p>	<p>Advancements in technology provide emerging opportunities in terms of potential accuracy of both depth and colour inputs. Developments such</p>	<p>While there is an understandable focus on the OR and interventional radiology as the most frequently examined use</p>

				<p>have small sample sizes and focus on feasibility, acceptability or gesture-recognition accuracy. three databases: ACM: 'gesture recognition', 'voice recognition', 'speech recognition', 'gaze tracking', touchless, contactless, hands-free and touch-free. PubMed:to filter out those papers concerned with touchless interaction in other environments Web of Science:restrict the corpus to those papers in the medical devices/technology field.</p>	<p>as the second generation of Microsoft Kinect, which was not used in any of the papers investigated, are a sufficiently significant improvement when compared to the first generation of such technologies that one can reasonably anticipate a noticeable improvement in possible applications.</p>	<p>cases, the use of touchless systems in other areas of the hospital environment should also be explored.</p>
20	ITM web of conferences	2022	Hand gesture based X-ray image controlling using Convolutional Neural Network	<p>a novel computer vision based system that allows doctors, surgeons and other physicians to control X-Ray images just by using simple gestures thus</p>	<p>we performed each gesture 100 times under ideal lighting conditions with the Trackbar settings set to their default</p>	<p>In the future, more hand gestures can be added and applied as input to the computer. These</p>

				<p>eliminating the need of traditional devices like mouse and keyboard. This will help reduce the risk of contamination in sterile environments like those found in the hospitals and it will also help in preventing the spread of covid by not allowing contact with contaminated surfaces. It is implemented using CNN model. CNN is specially used for image recognition as well as processing. The system detects gestures through in-built webcam and converts it into corresponding computer commands to perform its associated tasks.</p>	<p>values and we noted the number of times each gesture was recognised successfully to perform the assigned action. The success rate and failure rate for each gesture helps a lot of doctors to perform their tasks more effectively while keeping them free from the risk of contamination especially in the light of the current Covid situation</p>	<p>hand gestures can then be converted into computer commands to perform tasks in real time. Since our code will be flexible, it can be adapted so that it can be used in any application and it is not just limited to X-Ray image viewing. The gestures can be mapped to various keyboard commands and these commands can then be used to implement various operations within different apps.</p>