MEM BASED HAND GESTURE CONTROLLED WIRELESS ROBOT

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Abstract— The robustness of MEMS based Gesture Controlled Robot is a kind of robot that can be by our hand gestures rather than an ordinary old switches or keypad. In Future there is a chance of making robots that can interact with humans in a natural manner. Hence our target interest is with hand motion-based gesture interfaces. An innovative Formula for gesture recognition is developed for identifying the distinct action signs made through hand movement. A MEMS Sensor was used to carry out this and also an Ultrasonic sensor for convinced operation. In order to full-fill our requirement a program has been written and executed using a micro controller system. Upon noticing the results of experimentation proves that our gesture formula is very competent and it's also enhanced the natural way of intelligence and also assembled in a simple hardware circuit.

Keywords- Mems, Zigbee, Ultrasonic Sensor

Introduction

We have developed a smart dive glove that recognizes 13 static hand gestures used in diving communication. The smart glove employs five dielectric elastomer sensors to capture finger motion and implements a machine learning classifier in the onboard electronics to recognize gestures[1][16]. Five basic classification algorithms are trained and assessed: the decision tree, support vector machine (S VM), logistic regression, Gaussian naive Bayes, and multilayer perceptron. These basic classifiers were selected as they perform well in multiclass classification problems, can be trained using supervised learning, and are model-based algorithms that can be implemented on a microprocessor. The training dataset was collected from 24 participants providing for a range of different hand sizes. After training, the algorithms were evaluated in a dry environment using data collected from ten new participants to test how well they cope with new information. Furthermore, an

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underwater experiment was conducted to assess any impact of the underwater environment on each algorithm's classification. The results show all classifiers performed well in a dry environment[2][15]. The accuracies and Fl -scores range between 0.95 and 0.98, where the logistic regressor and S VM have the highest scores for both the accuracy and Flscore (0.98). The underwater results showed that all algorithms work underwater; however, the performance drops when divers must focus on buoyancy control, breathing, and diver trim[3][11].

LITERATURE SURVEY

.Motion sensors such as MEMS gyroscopes and accelerometers are characterized by a small size, light weight, high sensitivity, and low cost. They are used in an increasing number of applications. However, they are easily influenced by environmental effects such as temperature change, shock, and vibration. Thus, signal processing is essential for minimizing errors and improving signal quality and system stability. The aim of this work is to investigate and present a systematic review of different signal error reduction algorithms that are used for MEMS gyroscope-based motion analysis systems for human motion analysis or have the potential to be used in this area. A systematic search was performed with the search engines/databases of the ACM Digital Library, IEEE Xplore, PubMed, and Scopus [1][17][18]. Sixteen papers that focus on MEMS gyroscope-related signal processing and were published in journals or conference proceedings in the past 10 years were found and fully reviewed. Seventeen algorithms were categorized into four main groups: Kalman-filter-based algorithms, adaptive based algorithms, simple filter algorithms, and compensation based algorithms. The algorithms were analysed and presented along with their characteristics such as advantages, disadvantages, and time limitations. A user guide to the most suitable signal processing algorithms within this area is presented [4].

Leakages from water pipelines cause economic losses and environmental hazards. Despite the damages, it is challenging to avoid leaks throughout the lifetime. However, leak detection and localization, especially in real-time, minimize the damage. Owing to the recent advances, the micro-electromechanical systems (MEMS) based technologies have started to gaining recognition for water network monitoring in real-time, however, a systematic literature review to analyze the existing research trends, technological advances, and future research opportunities are largely missing [2][19][20]. This study has based its investigation on three main MEMS-based technologies for real time monitoring: MEMS sensors wireless networks, MEMS accelerometers, and MEMS hydrophones. Firstly, a scientometric analysis is conducted to 1) retrieve relevant research articles through Scopus, Web of Science, and Google Scholar, 2) visualize the publication trends, and 3) analyze the science mapping of influential authors, countries, organization, and top keywords occurrences [5][13].

Tremendous leaps have been made in the field of wheelchair technology. However, even these significant advances havenet been able to help quadriplegics navigate wheelchair unassisted. It is wheelchair which can be controlled by simple hand gestures. It employs a sensor which controls the wheelchair hand gestures made by the user and interprets the motion intended by user and moves accordingly. In Acceleration we have Acceleration sensor. When we change the direction, the sensor registers values are changed and that values are given to microcontroller. Depending on the direction of the Acceleration, microcontroller controls the wheel chair directions like LEFT, RIGHT, FRONT, and BACK [6][21][23]. The aim of this paper is to implement wheel chair direction control with hand gesture reorganization.

HAND gesture recognition provides an intelligent, natural, and convenient way of human—computer interaction (HCI). Sign language recognition (SLR) and gesture-based control are

two major applications for hand gesture recognition technologies. SLR aims to interpret sign languages automatically by a computer in order to help the deaf communicate with hearing society conveniently. Since sign language is a kind of highly structured and largely symbolic human gesture set, SLR also serves as a good basic for the development of general gesture-based HCI[7][12][24]. It provides us the means to create a communication between human and computer to operate a mouse cursor on the screen of a PC.
MEMS based Robot which is a kind of robot that can be controlled by our handmovements rather than ordinary old switches and keypad. Already, conventional system performs its task with the help of lithium battery but in this concept, battery backup is made with optimal concept. The charging concept in the existing systemis overcome with help of solar cells in this project. Micro-Electro-Mechanical Systems consists of mechanical elements, sensors, actuators, and electrical and electronics devices on a common silicon substrate [8][13][22]. The sensors in MEMS gather information from the environment through measuring mechanical, thermal, biological, chemical, optical, and magnetic Substance. [25]
Hand gesture recognition is an emerging field of technology in robotics and human computer interaction. It has tremendous applications in daily life activities and intelligent workplaces. In this study, a system which could help people to work and operate without directly using hands or contacting by hands, is proposed and demonstrated. This system composed of a glove with flexible force sensors and a 3D printed robotic forearm. The user wearing the glove could control the action of the 3D printed robotic forearm. The 3D printed forearm simultaneously acted following the motion of the glove. The 3D printed forearm was composed of 46 individual parts that were printed with white biodegradable polylactic acid (PLA) [4][11]. Electronic components in the system are five flex sensors, a master Arduino Nano, a slave Arduino Nano, a wireless NRF24L01 transmitter module banding on the glove, a second wireless NRF24L01 receiver module in the forearm and five motors. The five flex sensors on the fingers of the glove detected and collected the signals reflecting the movements of the hands. The Arduino Nano processed the signals from the flex sensors and sent them through the wireless transmitter module to the slave Arduino Nano. In order to control the action of the robotic forearm, it was embedded with a slave Arduino Nano as a control kernel, a wireless NRF24L01 receiver module and five actuators. The slave Arduino Nano received and processed the signals through the wireless receiver module. After that, the signals were sent to the actuators- servo motors. The fingers' action in the robotics arm was executed with the actuators. After carefully testing the system, the robotic arm followed the action correctly with a maximum 0.133 ms time delay all the time. This system could be really useful for the users who work in dangerous conditions, hazardous environment or require remote operation for safety reasons [8].
Robots are playing a vital role in today's industrial automation and monitoring system. As technology developed these robots have increased their applications and functionality. Working robots will cooperate to the people makes the work more Effortless and uncomplicated. This paper cutting weeds a gripper concept using buttons is anticipated. These movements are given by the user using MEMS Sensor. The MEMS Sensor will be set to the hand[9]. Whenever the hand moves in some direction, the mechanical movement of the hand will be recognized by MEMS. MEMS translate this mechanical hand movement into equivalent electrical signals and send it to the Raspberry Pi. The Raspberry Pi at the transmitter side sends control signals to the receiver side through IOT (Internet of Things). The controller (ARM7) at the receiver area receives these signals and gives direction to the robot through IOT ie through cloud.
Real time swing angle measurement can be used to improve the efficiency and quality for crane control system. This paper presents a wireless microelectromechanical system (MEMS) based swing angle measurement system[10]. The system consists of two MEMS-based attitude heading reference system (AHRS) sensing units with wireless communication, which are mounted on the hook (or payload) and the jib (or base) of the

crane, respectively. The orientation of the payload and the base can be measured by the mounted MEMS-based AHRS sensors. Wireless Zigbee communication is employed to transmit the orientation of the payload to the sensor unit mounted on the base which measures the orientation of the base. Therefore, the swing angles of the payload can be calculated based on the two measured orientation parameters. Preliminary experiments were performed to show the feasibility and effectiveness of the proposed swing angle measurement system. user/operator, respectively. The different motions performed by robotic arm are: PICK and PLACE/DROP, RAISING and LOWERING the objects. Also, the motions performed by the platform are: FORWARD, BACKWARD, RIGHT and LEFT. The system is equipped with an IP based camera also which can stream real time video wirelessly to any Internet.

The invention in this paper aims to depict an adaptable, cost-cogent and conveyable MEMS positioned subjection ideology, for the physically disabled people with practicability and high accuracy[3][14]. People do not compass time to look after their old and needy ones because of their hassle work hours. This invention helps them be absolute and recede a frontage of unessential laceration. The transmitter and receiver modules data can be cogent to keep track of instant action that can be taken. The features embedded in designing a scalable, reliable, cost-effective, and portable wireless MEMS-based device module for the physically disabled with high precision and in better functionality. The venture centers on finger movement recognition acknowledgment through displacement in various ways. Numerous methodologies utilizing camera modules and artificial intelligence to interpret sign language were in existence. Gesture recognition with sensor modules is a way for machines in depth in understanding human body language, thus building a high interface bridge and connectivity between humans and machines[6]. Roughly 6 million people in the world face the issue of disability due to paralysis of various degrees and our aim to conquer the problems faced by them in their daily routine life.

METHODOLOGY

In this system we are ARDUINO UNO microcontroller as the brain of this proposed system so that all program coding are stored in it. MEMS Sensor is used to give directions to the robot. The zigbee transmitter will send the data to the receiving side. On the other hand the receiving side has a robotic chase and zigbee receiver. The zigbee receiver will get the signal and send it to the controller and the controller will send the data to the motor driver. The ultrasonic sensor are used to detect the object in front of the robotic chase. Recreational scuba divers, who dive in buddy pairs for improved safety, generally exchange information through hand gestures that can include signals for boat direction, general well-being, air supply, interesting or hazardous marine life, swimming direction, and dive planning. For gesture-based communication to work well, several criteria must be met: a clear line of sight, attention of both divers, and a good understanding of the dive plan. Communication can be compromised when gesture sighting is inhibited, such as in murky water, with environmental obstacles, or simply loss of buddy attention. The abovementioned factors often lead to the complete breakdown of the buddy system through diver separation that can, on its own, substantially increase the likelihood of an emergency.

SYSTEM ANALYSIS

EXISTING SYSTEM

There is no hand gesture used to operate robot in existing model. In existing model Here its fully depends on man power source. It will eventually take a toll on a human body.

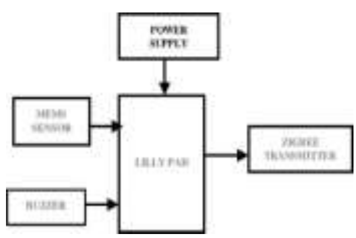
DRAWBACKS

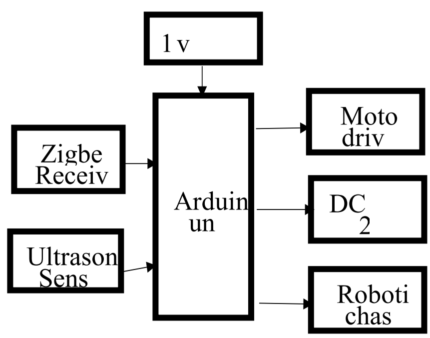
- The existing system is only designed either hand gesture or robot individually.
- There is no physically exhausting work. There is no sensor to control the robot.

PROPOSED SYSTEM

MEMS based Gesture Controlled Robot is a kind of robot that can be by our hand gestures rather than an ordinary old switches or keypad. In Future there is a chance of making robots that can interact with humans in a natural manner. Hence our target interest is with hand motion-based gesture interfaces. An innovative Formula for gesture recognition is developed for identifying the distinct action signs made through hand movement. A MEMS Sensor was used to carry out this and also an Ultrasonic sensor for convinced operation. In order to full-fill our requirement a program has been written and executed using amicrocontroller system. Upon noticing the results of experimentation proves that our gesture formula is very competent and it's also enhanced the natural way of intelligence and also assembled in a simple hardware circuit.

PROPOSED





RESULT AND DISCUSSION

In many application of controlling robots, it is quite difficult and complicated when there comes a part of controlling robot with remote or many different switches. In industrial robotics, medical application for surgery, military application in this field it is quite complicated to control the robot or machine with switches or remote. Therefore a new concept is introduced to control a machine with the movement of hand which will simultaneously control the position and movement of robot. In many application of controlling robots, it is quite difficult and complicated when there comes a part of controlling robot with remote or many different switches. In industrial robotics, medical application for surgery, military application in this field it is quite complicated to control the robot or machine with switches or remote. Therefore a new concept is introduced to control a machine with the movement of hand which will simultaneously control the position and movement of robot.

CONCLUSION

In this study, we developed a smart dive glove capable of recognizing 13 static hand gestures used in underwater diver This article has been accepted for inclusion in a future issue of this journal. Content is final as presented, with the exception of pagination.12 IEEE TRANSACTIONS ON NEURAL NETWORKS AND LEARNING SYSTEMS communication. Our smart glove uses five waterproofed DE sensors and an onboard machine learning algorithm to recognize performed gestures. The glove is a standalone wearable device, which provides user feedback through haptics and an LED, and works underwater since the electronics are enclosed, waterproofed in a 3 -D enclosure, and communicates using acoustics. The aim of our project is a mems-based hand gesture controlled wireless robot.

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