Impact Factor (SJIF): 5.301

International Journal of Advance Research in Engineering, Science & Technology

e-ISSN: 2393-9877, p-ISSN: 2394-2444

Volume 7, Issue 5, May-2020

Review on Implementation of Gesture Control Robotic Arm for Automation of Industrial Application

Shriya A. Hande[1], Nitin R. Chopde[2]

[1]*M.Tech Student, Department of Computer Science & Engineering, G.H. Raisoni University Amravati, Maharashtra, India*

[2]*Professor, Department of Computer Science & Engineering, G.H. Raisoni University Amravati, Maharashtra, India*

***Abstract — In this day and age, in practically all areas, the vast majority of the work is finished by robots or mechanical arm having distinctive number of degree of freedoms (DOF's) according to the necessity. This venture manages the Design and Implementation of a "Wireless Gesture Controlled Robotic Arm with Vision". The framework configuration is isolated into 3 sections namely: Accelerometer Part, Robotic Arm and Platform. It is fundamentally an Accelerometer based framework which controls a Robotic Arm remotely utilizing a, little and minimal effort, 3-pivot (DOF's) accelerometer by means of RF signals. The Robotic Arm is mounted over a versatile stage which is likewise controlled remotely by another accelerometer. One accelerometer is mounted/joined on the human hand, catching its conduct (motions and stances) and hence the mechanical arm moves in like manner and the other accelerometer is mounted on any of the leg of the client/administrator, catching its motions and stances and in this way the stage moves as needs be. In a nutshell, the robotic arm and platform is synchronised with the gestures and postures of the hand and leg of the user / operator, respectively. The various movements performed by automated arm are: PICK and PLACE/DROP, RAISING and LOWERING the items. Additionally, the movements performed by the stage are: FORWARD, BACKWARD, RIGHT and LEFT. The framework is outfitted with an IP based camera likewise which can stream ongoing video remotely to any Internet empowered gadget such as Mobile Phone, Laptop, etc*.**

Keywords- DOF, Robotic Arm.

I. INTRODUCTION

An automated arm is a robot controller, which can perform comparative capacities to a human arm. Automated arms are the crucial piece of practically all the enterprises. In businesses, an automated arm perform different various undertakings, for example, welding, cutting, picking and putting and so forth. Besides the greatest favorable position of these arms is that it can work in unsafe regions and furthermore in the territories which can't be gotten to by human. For instance in NASA's strategic Mars, the Spirit and Opportunity ramble. It is additionally used to execute exceptionally exact clinical medications and so on. Numerous variations of these robots/mechanical are accessible or planned according to the prerequisite. Scarcely any variations are Keypad Controlled, Voice Control, Gesture Control, and so on. Notwithstanding, a large portion of the mechanical robots are still modified utilizing the run of the mill showing process which is as yet a monotonous and tedious undertaking that requires specialized mastery. Subsequently, there is a requirement for new and simpler ways for programming the robots. In this venture, the signal based framework (utilizing Accelerometer) has been joined to control the mechanical arm just as its foundation utilizing two, little and minimal effort, 3-pivot accelerometers. The prime point of the plan is that the robot and stage begins the development when the administrator makes a motion or act or any movement. The Robotic arm is synchronized with the motions (hand stances) of the administrator and the stage part is synchronized with the motions (leg stances) of the administrator. The objective of this venture is to create systems that help clients to control and program a robot, with a significant level of deliberation from the robot explicit language for example to disentangle the robot programming. These days, mechanical technology arm getting one of the most progressive in the field of innovation. A Robot is an electro-mechanical framework that is worked by a PC program. Robots can be self-ruling or semi-self-ruling. A self-governing robot isn't constrained by human and follows up on its own choice by detecting its condition. Greater part of the mechanical robots are independent as they are required to work at fast and with extraordinary precision. In any case, a few applications require semi-self-ruling or human controlled robots. The absolute most usually utilized control frameworks are voice acknowledgment, material or contact controlled and movement controlled. A Gesture Controlled robot is a kind of robot which can be controlled by your hand gestures not by old buttons. You just need to wear a small transmitting device in your hand which included an acceleration meter. This will transmit an appropriate command to the robot so that it can do whatever

All Rights Reserved, @IJAREST-2020

we want. The transmitting device included a ADC for analog to digital conversion and an encoder IC(HT12E) which is use to encode the four bit data and then it will transmit by an RF Transmitter module. At the receiving end an RF Receiver module receives the encoded data and decode it by and decoder IC (HT12D).

This data is then processed by a microcontroller and finally our motor driver to control the motor's. Now its time to break the task in different module's to make the task easy and simple any project become easy or error free if it is done in different modules. As our project is already divided into two different part transmitter and receiver. The applications of robotics mainly involve in automobiles, medical, construction, defense and also used as a fire fighting robot to help the people from the fire accident. But, controlling the robot with a remote or a switch is quite complicated. So, a new project is developed that is, an accelerometer based gesture control robot. The main goal of this project is to control the movement of the robot with hand gesture using accelerometer. The robot is usually an electro-mechanical machine that can perform tasks automatically. Some robots require some degree of guidance, which may be done using a remote control or with a computer interface. Robots can be autonomous, semi-autonomous or remotely controlled. Robots have evolved so much and are capable of mimicking humans that they seem to have a mind of their own.

II. LITERATURE REVIEW

The presented method provides a solution in which a paralyzed individual can control a computer, a wheelchair and an assistive robotic arm with the same tongue interface without the need of calibration, long-term training or the need of intervention from a helper. Thus, the presented system may possibly challenge the current need for 24 h personal assistance of individuals with tetraplegia and significantly improve their quality of life through their empowerment. Future studies should evaluate the suggested method in relation to activities of daily living and through more standardized assessment methods including e.g. assessment of throughput and the path efficiency[5].

Service robotics is currently a highly active research area in robotics, with enormous societal potential. Since service robots directly interact with people, finding "natural" and easy-to-use user interfaces is of fundamental importance. While past work has predominately focused on issues such as navigation and manipulation, relatively few robotic systems are equipped with flexible user interfaces that permit controlling the robot by "natural" means. This paper describes a gesture interface for the control of a mobile robot equipped with a manipulator. The interface uses a camera to track a person and recognize gestures involving arm motion. A fast, adaptive tracking algorithm enables the robot to track and follow a person reliably through office environments with changing lighting conditions. Two alternative methods for gesture recognition are compared: a template based approach and a neural network approach. Both are combined with the Viterbi algorithm for the recognition of gestures defined through arm motion (in addition to static arm poses). Results are reported in the context of an interactive clean-up task, where a person guides the robot to specific locations that need to be cleaned and instructs the robot to pick up trash [10].

Most of industrial robots are still programmed using the typical teaching process, through the use of the robot teach pendant. In this paper is proposed an accelerometer-based system to control an industrial robot using two low-cost and small 3-axis wireless accelerometers. These accelerometers are attached to the human arms, capturing its behavior (gestures and postures). An Artificial Neural Network (ANN) trained with a back-propagation algorithm was used to recognize arm gestures and postures, which then will be used as input in the control of the robot. The aim is that the robot starts the movement almost at the same time as the user starts to perform a gesture or posture (low response time). The results show that the system allows the control of an industrial robot in an intuitive way. However, the achieved recognition rate of gestures and postures (92%) should be improved in future, keeping the compromise with the system response time (160 milliseconds). Finally, the results of some tests performed with an industrial robot are presented and discussed. Most of industrial robots are still programmed using the typical teaching process, through the use of the robot teach pendant. In this paper is proposed an accelerometer-based system to control an industrial robot using two low-cost and small 3-axis wireless accelerometers. These accelerometers are attached to the human arms, capturing its behavior (gestures and postures). An Artificial Neural Network (ANN) trained with a back-propagation algorithm was used to recognize arm gestures and postures, which then will be used as input in the control of the robot. The aim is that the robot starts the movement almost at the same time as the user starts to perform a gesture or posture (low response time). The results show that the system allows the control of an industrial robot in an intuitive way. However, the achieved recognition rate of gestures and postures (92%) should be improved in future, keeping the compromise with the system response time (160 milliseconds). Finally, the results of some tests performed with an industrial robot are presented and discussed[8].

Human-robot voice interface has a key role in many application fields. Hand gesture is a very natural form of human interaction and can be used effectively in human computer interaction (HCI). In this paper, we propose a "Human Machine Interfacing Device" utilizing hand gestures to communicate with computers and other embedded systems acting as an intermediary to an appliance. Developments in field of communication have enabled computer commands being executed using hand gestures. This paper discusses hand glove-based techniques that use sensors to measure the positions of the fingers and the position of the hand in real-time. Interaction using gesture technology for effective communication

All Rights Reserved, @IJAREST-2020

empowering physically challenged to interact with machines and computing devices including 3-D graphic interactions and simulations. This paper focuses on wireless data gloves that are proposed to be used for gesture recognition and accordingly robot movement will take place [9].

III. METHODOLOGY

1. Software Architecture

Usability is the main gauge of a control system's successfulness. In addition to low-power, convenience and flexibility concerns that has prevailed in the hardware architecture design phase, ease of use, intuitiveness and efficiency are among the key elements that were considered when designing the architecture and processing units of this BoMI.

1.1 Sensor Nodes Firmware Architecture: Sensor nodes must minimize power consumption while guaranteeing adequate motion sampling rate for supporting robust and precise control schemes.

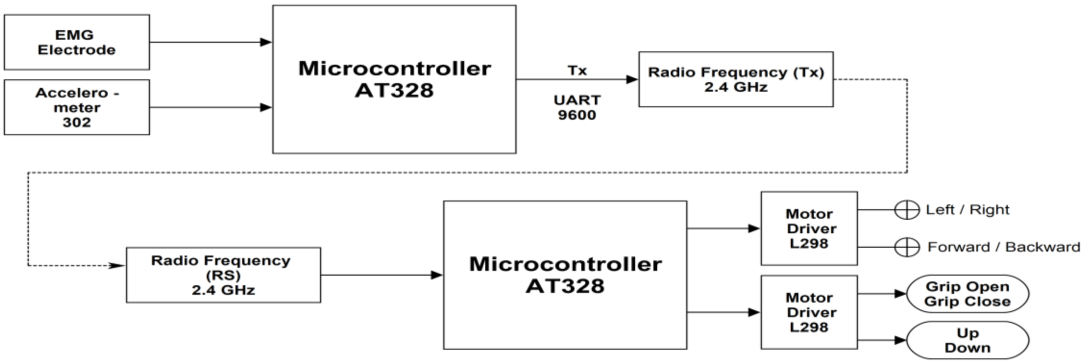

Fig 1. WBSN Based Controller: Power Management and Control Safety Schemes.

1.2 Wireless Sensor Network & Power Management: As mentioned in Section III-A, the nRF24L01+ is used for the wireless data link of the proposed controller. A star topology is used and the base-station receives the stream of measurement data sent by all the network's peripheral nodes (sensors + *Safety-key*).

1.3 Data Processing: All the data processing is done on the host platform. Voluntary muscle contractions are read from raw muscle activity signals when sEMG features are used whereas motion is sensed from IMU data.

2. Robotic Arm

This is the vital part of the system as it is this part which does the Pick and Drop task of the project. Both the Arm and Gripper are equipped with Servo Motor to control the movement. These movements are synchronised with the hand gestures of the user, operating the Robotic Arm.

3. Communication System

This part is the heart of the entire project. Without an effective and reliable communication system, no system / project can work. Similar is the case with this project also. Different parts of Robotic Arm Arm and Gripper in action.

IV. CONCLUSION

The venture presents a Gesture Control Robotic Arm Using Flex Sensor with seven degrees of opportunity. The mechanical arm was made of minimal effort materials that were promptly accessible. The model of the automated arm was developed and the usefulness was tried. The mechanical arm can be controlled over the web by utilizing Ethernet availability and a camera for visual input. Gesture based interfaces allow human computer interaction to be in a natural as well as intuitive manner. This project discussed hardware and software co-design of robotic arm controller using DC motors employing microcontroller ATMEGA16. The mechanical hand has been intended to meet the entirety of the first particulars of the task. The fingers are taking into consideration full movement of the hand. Perceptions show that the venture creates the necessary movement of the fingers. Such sort of hand motion controlled automated arm is generally helpful for Industrial, Medical and Military applications. This kind of the hand motion innovation can be utilized where the people can't support in the troublesome or brutal situations. This may diminish a portion of the work that is utilized in industry and furthermore the existence hazard factor.

All Rights Reserved, @IJAREST-2020

REFERENCES

[1] M. A. Jose and R. de Deus Lopes, "Human–computer interface controlled by the lip," *IEEE J. Biomed. Health Inf.*, vol. 19, no. 1, pp. 302–308, Jan. 2015.

[2] C. L. Fall *et al.*, "Wireless sEMG-based body–machine interface for assistive technology devices," *IEEE J. Biomed. Health Informat.*, vol. 21, no. 4, pp. 967–977, Jul. 2017.

[3] U. Cˆot´e-Allard, C. L. Fall, A. Campeau-Lecours, C. Gosselin, F. Laviolette, and B. Gosselin, "Transfer learning for sEMG hand gestures recognition using convolutional neural networks," in *Proc. 2017 IEEE Int. Conf. Syst., Man,Cybern.*, 2017, pp. 1663–1668.

[4] H. Park *et al.*, "A wireless magnetoresistive sensing system for an intraoral tongue-computer interface," *IEEE Trans. Biomed. Circuits Syst.*, vol. 6, no. 6, pp. 571–585, Dec. 2012.

[5] L. N. A. Struijk, L. L. Egsgaard, R. Lontis, M. Gaihede, and B. Bentsen, "Wireless intraoral tongue control of an assistive robotic arm for individuals with tetraplegia," *J. NeuroEng. Rehab.*, vol. 14, no. 1, p. 110, 2017

[6] M. N. Sahadat, A. Alreja, and M. Ghovanloo, "Simultaneous multimodal PC access for people with disabilities by integrating head tracking, speech recognition, and tongue motion," *IEEE Trans. Biomed. Circuits Syst.*, vol. 12, no. 1, pp.192–201, Feb. 2018.

[7] B. Hudgins, P. Parker, and R. N. Scott, "A new strategy for multifunction myoelectric control," *IEEE Trans. Biomed. Eng.*, vol. 40, no. 1, pp. 82–94, Jan. 1993.

[8] Pedro Neto, J. Norberto Pires, A. Paulo Moreira, "Accelerometer-Based Control of an Industrial Robotic Arm" Available at: http://arxiv.org/ftp/arxiv/projects/1309/1309.2090.pdf

[9] Dr. R. V. Dharaskar, S. A. Chhabria, Sandeep Ganorkar, "Robotic Arm Control Using Gesture and Voice", In International Journal of Computer, Information Technology & Bioinformatics (IJCITB), Vol. 1, Issue 1, pp. 41-46 Available at: http://www.ijcitb.com/issues/project_9.pdf

[10] S. Waldherr, R. Romero and S. Thrun, 2000, "A gesture based interface for human-robot interaction", In Autonomous Robots in Springer, vol. 9, Issue 2, pp. 151-173.

All Rights Reserved, @IJAREST-2020