JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue

JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)

An International Scholarly Open Access, Peer-reviewed, Refereed Journal

BIONIC ARM BASED ON ARDUINO FLEX SENSOR

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***Abstract*—This project sightsees the robotic hand by which it is possible to do such kind of tasks where human interventions are not possible. In an environment where human interaction cannot be possible to do a particular job where the robots can do. Here we design a robotic hand with the help of flex sensor, Arduino Uno & servo motor. Robotic applications necessitate sensors with high degree of accuracy and consistency. The advantage of using Flex sensor is that, we can achieve the expected results with high degree of exactness. The above structure works on the standard values return by the flex sensor to the controller and by that degree the hand and the fingers must move to grasp an entity. The five servo motors for each finger are also provided to control the activity of finger. Though Flex sensors based bionic arms are existing in the market, at most of them is too costly to be economically accessible or it is overloaded with heavy weight for long time wearing. This proposed work demonstrates the construction and working of a cost effective, robust, and flexible bionic arm controlled through Arduino microcontroller.**

***Keywords*— Disabilities, Bionic Arm, Flex sensors, Arduino Microcontroller, Servo motor**

I. INTRODUCTION

Unfortunately, most of persons met with an accident while working with huge machineries, that results in the loss of their limb. They may also have more of their limbs missing from their birth. But with the advent of technology, there are artificial limbs with that it is possible for those people to do things such as running, walking, holding the things, etc. These tools are called as prosthetics. A robotic hand is a mechanical device, which can perform parallel activities to a human hand. Robotic hands are the significant part of almost all the manufacturing firms. In firms, a robotic hand executes various functions such as welding, pruning, cutting and insertion etc. One of the biggest advantages of this hand is that it can work in dangerous areas and also in the areas where it is difficult to human to reach. The central purpose of this research work is to design and build an artificial part that will be strong enough to execute the assigned task. The hand is the one of the most intricate and weight bearing part of our human body which act as an input and output device to human. These objectives are intended by using flex sensor. A sensor is a device which identifies or measures a physical quantity then record it and after that responds to it. Robotic hand manipulators can have different arrangements. Some of these constrictions can be accurately mimic from the human hand domain to the robot's constrained joint space. In this paper a general method of representing human motions to the robotic hand domain has been verified. The hand moment is replied almost exactly by the robotic hand.

II. PURPOSE

The objective is to develop procedures that assist users to manage and program a robot, with a high-level of intellection from the robot specific language. Presenting a robotic demonstration in terms of high-level behaviours like gestures, communication, manual navigation, visual observation of human performance, etc., the user will determine the mechanism what it must do.

Programming and controlling an industrial robot through the use of machine is a critical and long task that needs technical knowledge. Therefore, new and a lot of intuitive ways are needed for mechanism programming and management.

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III. RELATED WORK

Robots can be used to perform surgeries in a more accurate and precise manner where the surgeon can make decisions and operate the robot as and when needed at the spur of the moment. This ensures that no human error is involved, there is a reduced amount of blood loss, and the area of surgery is comparatively smaller.

In minimally invasive robotic surgery (MIRS), the surgery is performed by the surgeon using tele- operated robotic tools instead of using manual instruments. In this scheme, robots do not replace the surgeon, but instead provide the surgeon with improved abilities to perform the intricate, precise surgical manipulations.

The following are the examples of existing MIRS systems:

Da-Vinci Robot

This system has been approved by the FDA for laparoscopic, non-cardiac thoracoscopic, prostatectomy, cardiotomy, cardiac revascularization, urologic surgical, gynaecologic surgical, paediatric surgical and trans-oral otolaryngology surgical procedures.

Zeus System

The Zeus system has the similar capabilities as the Da Vinci system. It has been approved by the FDA as well. It is composed of a master console and 3 table-mounted robotic arms. Two robotic arms mimic the surgeon's arms and hold the surgical tool and the third arm is a voice-controlled robotic endoscopic system.

The endoscopic instrument mounted on the slave manipulator provides five degrees of freedom to extend the dexterity inside the patient for the surgeon. Robotic systems thus have proven to play a very important role in the medicinal and surgical sector, be it in manufacturing medicines and drugs or carrying out simple tasks in specific surgeries. However, robots do not take over the whole procedure in a surgery, but certainly assist the surgeons to perform the task accurately and avoid large incisions, infections and blood loss.

IV. METHODOLOGY

In this design we have used flex sensors for each finger to sense the movement of individual finger. These 5 sensors are organized on a hand glove, which will make the sensors easy to wear. The Other part i.e., mechanical hand consists of 5 fingers which are controlled with the help of five servo motors, one motor for each finger. All together it will be one hand consists of 5 flex sensors one in each finger. Movement like bending of fingers is analysed using ATMega328 microcontroller and the resultant data will be sent to one of the ports via serial communication. The microcontroller will generate appropriate PWM signals for controlling servo motors. The complexity of the project is reduced by properly categorising the whole project into sub design. It makes it to make a better design and work effectively. The readings of each finger were measured in the form of voltage, while the movement of each finger will be given with respect to angle. Thus, to relate voltage with respect to angle we plot the graph of each finger and then we get a linear graph. By calculating equation of each line, we can relate each other easily.

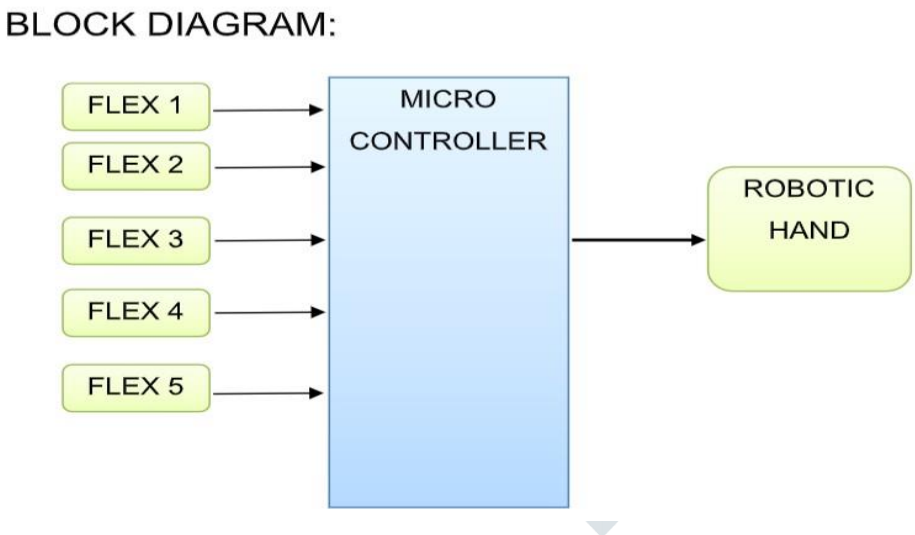

Fig. 1 Block Diagram of Bionic arm

V. CONCLUSION

Our model could be used for small scale surgical procedures in case of an emergency but currently, the major limiting factor that was stunting the development of our model was "latency" which is the time delay between the instructions issued by the surgeon and the movement of the robot which responds to the instructions. With the current level of technology, the surgeon must be in close proximity. Robot control refers to the way in which the sensing and action of a robot are coordinated. There are infinitely many possible robot programs, but they all fall along a well-defined spectrum of control. No single approach is & quot; the best and for control of robots; each has its strengths and weaknesses. The accuracy and efficiency of surgeries have improved greatly because of the application of robotics in the field. However, there are still some problems that need to be addressed. Research is still being carried out to improve the wireless transmission of signal and reduce the delay and for the simultaneous movement of five servos. Thus, the control of a robotic arm was achieved wirelessly.

VI. REFERENCES

[1] R. Slyper and J. Hodgins, "Action Capture with Accelerometers," Euro Graphics/A CMSIG GRAPHS Symposium on Computer Animation, 2008.

[2] E. Foxl and L. Naimark, "Vis-Tracker: A Wearable Vision-Inertial Self-Tracker," IEEE Virtual Reality Conference, 22-26 March 2003, Los Angeles.

[3] M. Gross and D. James, "Eurographics/ACM SIGGRAPH Symposium on Computer Animation," Smart Objects Conference SOC '03, Grenoble, 2003.

[4] L. Bio and S. Intille, "Activity Recognition from User-Annotated Acceleration Data," Pervasive Computing, Vol. 3001, 2004, pp. 1-17. doi:10.1007/978-3-540-24646-6_1

[5] D. Fontaine, D. David and Y. Caritu, "Sourceless Human Body Motion Capture," Smart Objects Conference (SOC 2003), Grenoble, 2003.

[6] J. Bernstein, H. R. Everett, L. Feng, and D. Wehe, "Mobile Robot Positioning Sensors &

[7] U. D. Meshram and R. Harkare, "FPGA Based Five Axis Robot Arm Controller," International Journal of Electronics Engineering, Vol. 2, No. 1, 2010, pp. 209-211.