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Leap Motion Control Using Virtual Automation

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Abstract: Robot is the important part in the industrial electronics and various automation systems. That means the robot is the important part in day to day life of our human beings. In this paper shown that there is one sensor that is Leap motion sensor with help of this sensor, we can control a robotic arm or any automation system. In this system we also use raspberry pi 3 module with the help of this we can control a robotic arm or any automation system from anywhere. With the help of free hands movement, we control any output device. This system is user-friendly it reduces the efforts. It removes the use of the joysticks, remote control. The leap motion sensor is highly accurate and it highly flexible device the bending movement is more in this system. This system is a most useful system in the space technology in research parts. It uses in any emergency system like bomb diffusion.This system is used in the medical surgery detection of internal human organs

Keywords: Raspberry pi 3 Module, Python, Gesture Recognition, Robotic Arm, Leap Motion Sensor.

I. INTRODUCTION

Nowadays, many new technologies are used to reduce the human effort that means man and machine are connected to each other by hand in hand. So it is improving lifestyle. An important use of leap motion sensor is it is also used at the time moving heavy bag like in an airport. Reflexes of this leap motion sensor are highly accurate and quick.It controls the movement of the hand. So using this hand movement we can control a robotic arm. In this type of system, the task is to control the six degrees of freedom, with Leap Motion, a real-time motion tracking sensor. The six degree of freedom concept is very important in engineering world because it allows for more complex and useful design. It includes the movement along the x, y, and z-axis, as well as row yaw and pitch. The six-degree freedom has the ability to be more precise in job specific movements such as spot welding, material placement, or surgical cutting.

In this project, we use raspberry pi 3 module so it overcomes the disadvantage of Arduino module. The raspberry pi 3 module is an arm based credit card sized single board computer created by the raspberry pi foundation. Raspberry pi run Linux operating system. It is open source system. The raspberry pi module has inbuilt 802.11n wireless connectivity and Bluetooth. It sup-port Broadcom BCM2837 processor and CPU core is 64 bit Quad core arm cortex- A53. It has clock speed 1.2GHZ so it is 50% faster than Arduino module.

II. LITERATURE SURVEY

A Tremendous amount of work has been already done on robotic arms and their implementations [1] [2]. Such technologies can be very helpful in day to day lives, doing search and rescue operations, assisting the elderly and differently abled, performing surgeries, etc. From their help, human error can be reduced, as well as the quality of living can be improved. The current project made on this LEAP motion is related to recognizing sign language [4]. In this project, users were able to identify 26 alphabets of the English sign language [4]. The current trend for learning sign language is via an instructor or through typed instructions. But, after this technology, the delay for learning the language can be minimized. There will be no more wait for further instructions. This can reduce the learning time and greatly aid the differently abled. Other areas of interest are also being explored for this, like, military, medical, IT, etc. This project to primarily focuses on IT and search and rescue operations. There are basically 2 ways to use robotics:

1. Contact type
2. Non-contact type

The first type contains data gloves, exoskeleton, and electromagnetic tracking system. Whereas another type contains vision based system, speech recognition, camera based etc [3].For achieving this, LEAP motion sensor, robotic arm, eclipse IDE (For programming), and Arduino Module (For interfacing) are used.

Author Ganesh Choudhary proposes a way to achieve Human Computer Interface entirely in the electronic way (without mechanical sensors). To achieve the preceding idea, the image processing technique is used and for capturing motion, a web camera is used. Which detects the vital features of hand: fingers by computational geometry calculation enabling real-time interaction between hand gestures and Robot [5]?

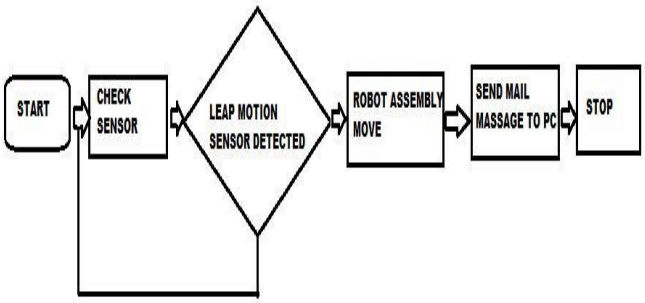
Gyro-Accelerometer based Robotic Arm using AVR Microcontroller by authors Bhuyan and Mallick is a module for improving the stability and to detect the rotational gesture of human arm the combination of gyro-meter and accelerometer are used. The 6DOF arm additionally has the capability to grab the object. For this gyro-meter gives gesture orientation data for determining dynamic gesture behavior. To evaluate the entire gesture data an artificial algorithm is used which helps to train the robotic arm [7].

Authors Biswas and Basu present their experience of using a Kinect® depth camera for recognition of some common gestures. Kinect depth sensor consists of an infrared laser projector combined with a monochrome CMOS sensor, which captures video data in 3D under any ambient light conditions. It generates a depth image of the subject in the plane towards the camera. For a generation of the depth profile of a subject and as a background removal the depth image is used. The difference between subsequent frames gives the motion profile of the subject and is used for recognition of gestures. In this paper, author calculates the result for 8 gestures [6].

American Sign Language Recognition Using Leap Motion Sensor module proposed by Chuan and Regina. classifies the 26 letters of the English alphabet in American Sign Language using the derived features from the sensory data the support vector machine is used. Using movement of fingers they assign individual gesture for each alphabet. Also, they addition-ally introduced the parameter setting in machine learning methods and accurateness of the specific alphabet letter [4].

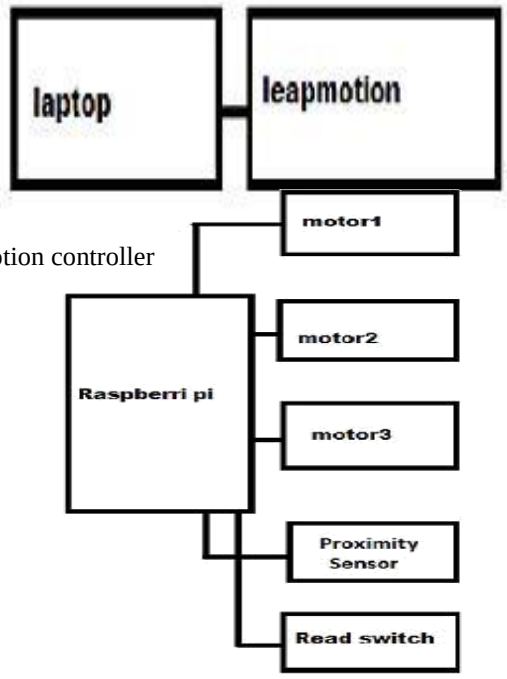
III. BLOCK DIAGRAM

Dataflow:



In this data flow to show when leap sensor goes to initial condition to start condition, it checks the human gesture and to mimic the movements of user hand and robot take accurate action in real time.

Transmitter section of leap motion controller



The receiver section of leap motion controller.

Fig.1 Block Diagram of leap motion controller using virtual automation

IV. HARDWARE DESCRIPTION

Leap motion controller

It is more accurate than a mouse, as reliable as a keyboard and more sensitive than a touchscreen. For the first time, you can control a computer in three dimensions with your natural hand and finger movements. It can also be mounted onto a virtual reality headset. Using three infrared LEDs and two monochromatic IR cameras, the device observes a roughly hemispherical area, to a distance of about 1 meter. The cameras generate almost 200 frames per second of reflected data and the LEDs generate pattern-less IR light. Then sent through a USB cable to the host computer.

Raspberry pi 3

The Raspberry Pi 3 is the third generation Raspberry Pi. It has inbuilt Bluetooth and Wi-fi.

Proximity sensor

A proximity sensor is a sensor able to detect the presence of nearby objects without any physical contact. A proximity sensor often emits an electromagnetic field or a beam of electromagnetic radiation (infrared, for instance), and looks for changes in the field or return signal.

V. SOFTWARE DESCRIPTION

Linux operating system

The Linux open source operating system, or Linux OS, is a freely distributable, cross-platform operating system based on UNIX that can be installed on PCs, laptops, netbooks, mobile and tablet devices, video game consoles, servers, Supercomputers.

Python coding technique

Python is a widely used high-level, general-purpose, interpreted, dynamic programming language. Its design philosophy emphasizes code readability, and its syntax allows programmers to express concepts in fewer lines of code than possible in languages such as C++ or Java.

API

In computer programming, an application programming interface (API) is a set of subroutine definitions, protocols, and tools for building software and applications. An API specification can take many forms, but often include specifications for routines, data structures, object classes, variables, or remote calls.

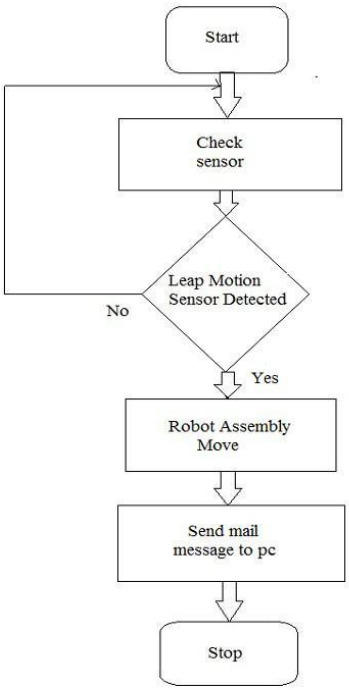
VI. ALGORITHM

Input: Freehand movements over sensor

Output: control automation system through raspberry pi 3

1. Start.
2. Check sensor.
3. Leap motion sensor is not detected then go to check the sensor.
4. If leap sensor detected, according to hand movement's robot will be move.
5. Then send a message through the mail to the PC.
6. Stop.

VII. FLOW CHART



CONCLUSION

Leap motion control is useful in any kind of the automation system in this system we can control the device from anywhere. leap motion sensor is easily compatible with the laptop or PC with USB 3.0 hence it is highly flexible & it is more accurate than another system we perform hand movement in more degree of freedom so the most important part of this system is the connection is wireless when controlling robot so hence this system is less complex from another system hence this system is most useful system mainly in this system the human efforts is less required as compare to another system.

REFERENCES

[1] Lengare, P.S.; Rane, M.E., "Human hand tracking using MATLAB to control Arduino based robotic arm," in Pervasive Computing (ICPC), 2015 International Conference on, vol., no., pp.1-4, 8-10 Jan. 2015

[2] Allen, P.K.; Timcenko, A.; Yoshimi, B.; Michelman, P., "Automated tracking and grasping of a moving object with a robotic hand-eye system," in Robotics and
Automation, IEEE Transactions on, vol.9, no.2, pp.152-165, Apr 1993

[3] Marin, G.; Dominio, F.; Zanuttigh, P., "Hand gesture recognition with leap motion and Kinect devices," in Image Processing (ICIP), 2014 IEEE International Conference on, vol., no., pp.1565-1569, 27-30 Oct. 2014

[4] Ching-Hua Chuan; Regina, E.; Guardino, C. "American Sign Language Recognition Using Leap Motion Sensor" Machine Learning and Applications (ICMLA), 2014 13th International Conference on Year: 2014

[5] Ganesh Choudhary, B.; Chethan Ram, B.V., "Real-time robotic arm control using hand gestures," in High-Performance Computing and Applications (ICHPCA), 2014 International Conference on, vol., no., pp.1-3, 22-24 Dec. 2014

[6] Biswas, K.K.; Basu, S.K., "Gesture recognition using Microsoft Kinect®," in Automation, Robotics, and Applications (ICARA), 2011 5th International Conference on, vol., no., pp.100-103, 6-8 Dec. 2011

[7] Bhuyan, A.I.; Mallick, T.C., "Gyro-accelerometer based control of a robotic Arm using AVR microcontroller," in Strategic Technology (IFOST), 2014 9th International Forum on, vol., no., pp.409-413, 21-2

