Interfacing Robot ARM using IoT

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***Abstract*—Vision compressive distinguishing, frontal cortex machine reference orders, and adaptable controller have been effectively joined that enable the robot to perform control endeavors as guided by human executive's mind and as shown by its innovative points of view. The way of thinking proposed involves following essential stages: (1) movement affirmation (2) gear interfacing. From the start action affirmation gets video as shown by improvements set up in affirmation structure. A while later, in gear interfacing it passes required requests by a sensor added to microcontroller that identifies the data, perceives where the arm to be moved and gives better exactness to the advancements to be performed. Henceforth this system keeps up solid correspondence that can handle exercises and scholarly sentiments. In IoT, the specialist will move data to client with the help of MQTT show to get to robot from wherever across the world.**

Keywords —Activity acknowledgment; cerebrum PC association; interfacing of human robot; web of Things; tangible insight.

I. INTRODUCTION

The methodology and its innovative skills adapted in neuroscience have created avenues of improving interaction. The involvement of action recognition plays a massive part in controlling the robot in IoT making the client to access it easily and conveniently.

The ideology of robot interaction with human has been significantly improved and thus further coordinated with the system in which the system can manipulate the environment surrounding system in a desired way compatible with his/her views and ideas through brain coordination activities.

The benefit and its purpose of exploiting existing exoskeletons robots when compared to gesture robotsis for rehabilitation purpose [2-3]. One important drawback is that it cannot be controlled through IoT methodology for the user to access whenever it is required to from different places. This limitation can be eliminated by which IoT is preferred for transferring it to client from user anywhere across the world.

In an exoskeleton robot aiming towards rehabilitation, which combines pneumatic muscles and provide accuracy efficiently. For people suffering from spinal cord disability, assistive limb exoskeleton was introduced [1], and an overall estimation algorithm that involves the ideas and thoughts related to the leg swing in forward direction was developed and enhanced [5-8].

The functioning of exoskeleton has particular biological characteristics as per the control of the various multilink segments and its system efficiency [4]. In experimental analysis, many rehabilitation therapies are repeatable techniques, and the inherent system design are commonly subjected to periodic or repeated disturbances and probability of uncertainties [4-6].

This methodology has an advantage by using ESP8266 module to upload data storage to the client rather than using just controller for interfacing. The work stage on this philosophy is ordered into following fundamental stages: (1) Action acknowledgment (2) equipment interfacing In action recognition there is interface between human and machine which captures video of the movements [6-8]. It thus picks the object according to the sensor attached to it and moves it accordingly to coordinated places. The microcontroller will function with the input received from the sensor and later perform the programmed actions [1]. later the action recognition is controlled through Bluetooth which covers small area of 100 meters and later control through IoT so that it can be accessed from anywhere across the world[3].

II.SYSTEM DESIGN

A. Action Recognition System

In the following system design shown in Fig.1, the actions to be interpreted by robot through coordinated software along with hardware that is required to perform tasks according to the actions which is caught by video captured by camera which then later implement in real time according to the movements executed in hardware in loop simulation provided by sensory perception. To permit natural human robot cooperation, in a wide space of interaction ability the utilization of human like motions as informative activities and difference them from ordinary exercises. This is computationally productive too and has high adaptability in speed, and is utilized to perform assortment of undertakings in an enormous space of cycle capacity, particularly in human conditions.

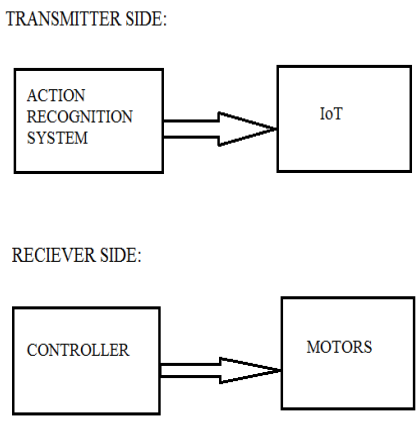


Fig. 1.System Design.

B. Operation on robot

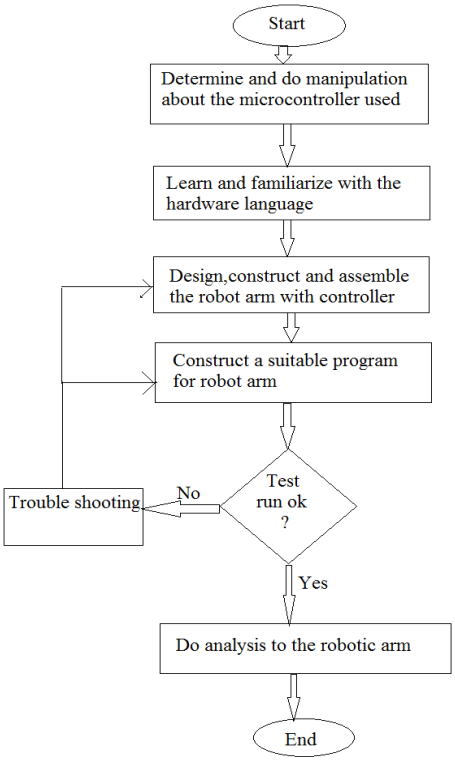


Fig. 2.Flow Chart for overall Robot Operation.

It is capable to pick an object with the sensor attached to it and place object accordingly to defined places with proper orientation. The microcontroller will function to process the input received from the sensory perception and perform the action programmed. It can be a cylindrical or can be conical shaped rigid body that can rotate or provide linear movement in horizontal, vertical and rotational axes. The robotic movement can be using pressurized air and by using valve to cause mechanical motion for positioning of lobes of cam. However the best way is using motors to provide the required actions which cause movements

C.Wi-Fi System

In order to enhance communication with the Robotic arm and its communication over the internet, Wi-Fi system ESP 8266 has been used as shown in Fig. 3. It provides for reliable communication with robot arm by uploading values from client to server communication through internet.

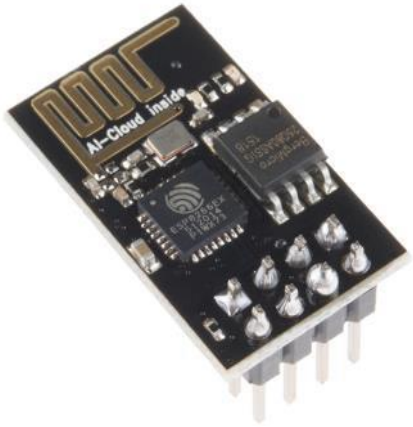


Fig. 3. ESP-8266 Wi-Fi System.

It is cost effective with TCP/IP stack. It has good storage capability and is thus integrated with sensors. It has power down leakage current of less than 10 microamperes.

D. MQTT – Message Queuing Telemetry Transport

MQTT (Message Queuing Telemetry Transport) is a light weight message queueing and transport show. MQTT, as its name proposes, is appropriate for the vehicle of telemetry data (sensor and on-screen character data). MQTT is light weight and thusly proper for M2M, WSN & IoT conditions where sensor and performing specialist focus focuses talk with applications through the MQTT message merchant. Case: Light sensor unendingly sends sensor information to the prepared proficient. Building control application gets sensor information from the merchant and chooses to begin the blinds. Application sends an apparently blocked initiation message to the obviously debilitated performer place through the the agent.

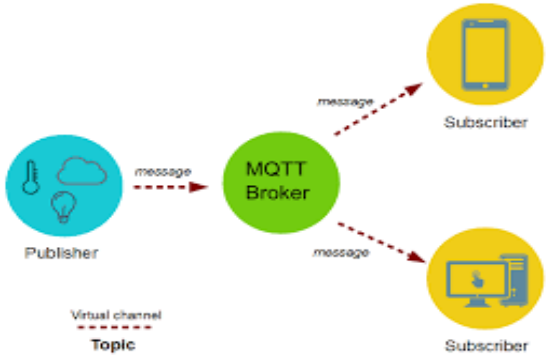


Fig. 4. MQTT publisher/subscriber block diagram

E. IoT(Internet of Things)

Web of Things is recommend the in general thought about things, particularly standard requests, that are discernable, self-evident, locatable, addressable through data distinguishing contraption and besides controllable through the Internet, paying little notice to the correspondence derives (whether or not through RFID, far away LAN, wide space systems, or different techniques). Basic things solidify not just the electronic contraptions we experience or the eventual outcomes of higher mechanical improvement, for example, vehicles and gear in any case things that we don't ordinarily consider as electronic in any capacity whatsoever - , for example, food , apparel ,seat, creature, tree, water, and so on Articles make themselves self-evident and they secure comprehension by settling on or empowering setting related choices in view of the way that they can give data about themselves. They can get to data that has been amassed by different things, or they can be segments of complex associations. This change is going to with the headway of scattered enlisting limits and the progression of the Internet towards IPv6 with a respectably limitless tending to confine. The objective of the Internet of Things is to draw in things to be connected whenever, any spot, with anything and anybody preferably utilizing any way/set up and any association.

III. IMPLEMENTATION

A. System Architecture

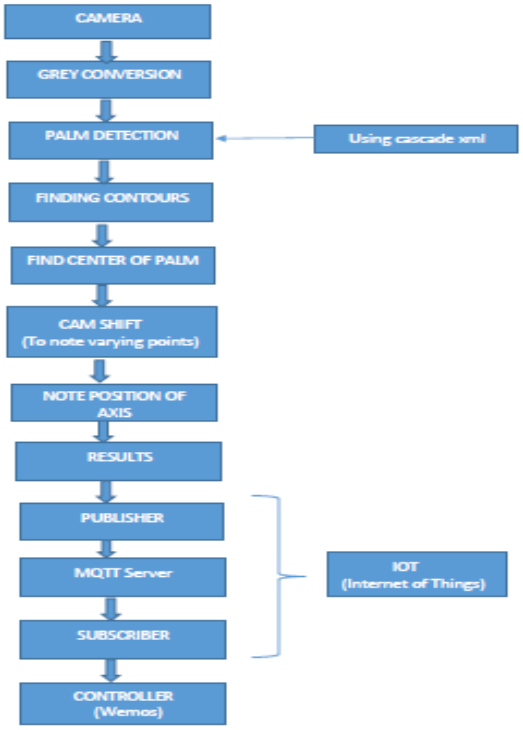
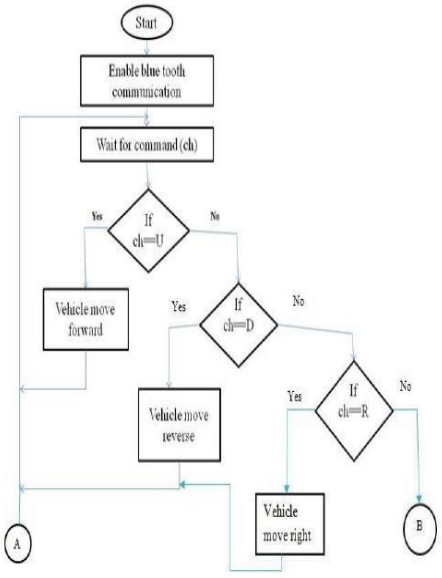


Fig. 5.System Architecture.

In system architecture as observed in Fig. 5,there is interface between human palm by which it takes movements of palm in PC at transmitter side and adjusts the robot accordingly to coordinated places at receiver side. The system consists of wemos controller that has wifi set up built in, fourDC motors with motor driver L293Dand voltage regulator. The maximum upward and downward movement of arm and closing and opening of jaw is provided by interfacing of hand palm in PC with hardware by which as it moves towards north, arm moves up and towards waving south, the arm moves down. On waving palm towards east vehicle moves toward front and towards west for backward. South east and South west are to stop vehicle. It proceeds by waving palm towards North West for capture motion of arm and North east for release motion of arm. There is action recognition at input and communication between master and slave of Bluetooth where master is connected to PC and slave to pick and place robot which works for approximately 100 meters with arduino mega microcontroller which control the motors and then later replace with IoT instead of Bluetooth so that it can move robot according to movements of palm from distant places.

IV. EXPERIMENTAL RESULTS

In the overall experimental view the movements of palm is detected by action recognition and implemented on pick and place robot. The overall working of the system both at transmitter and receiver is as shown in Fig.6.Further directions are detected and marked on palm. As on moving palm towards north the arm moves up and on moving towards south it moves down and also operation on vehicle (forward, backward etc). As shown in Fig.7, it indicates south direction on palm and performs respective operation on robot. The hardware analysis on proposed system is as shown in Fig.8,by which robot receives commands as per the controller used with regulated power supply which is then further integrated with dc motors for movement of wheel and robot arm by using bluetooth communication between two or more devices which is later replaced by IoT. The robot is portable and also has high accuracy in getting results of operation. This robot can thus be beneficial in most of the industrial applications and for medical purpose.



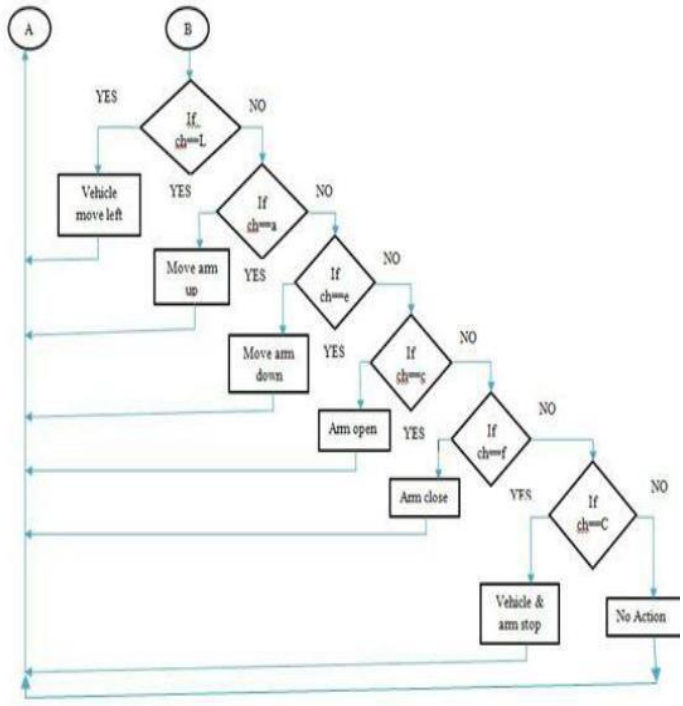


Fig. 6.Flow Chart depicting system design.

Fig. 7. Action Recognition System.

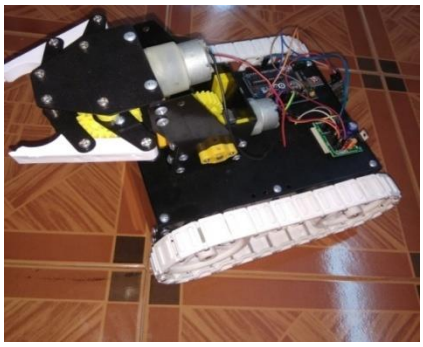


Fig. 8. Experimental Analysis.

V. CONCLUSION

The involvement of IoT is used in accessing the system with high efficiency and accuracy. In action recognition there is interface between human and machine which captures video of the movements being performed with the help of IoT. It thus picks the object according to the sensor attached to it and moves it accordingly to coordinated places. Themicrocontroller will function from the sensor by input received and later perform the programmed actions. The advancement of the correspondence interface between the interface of human and machines has expanded the odds of coordinating back significant human resources and furthermore to collaborate viably. The joining of human stringing into machines and robot correspondence frameworks will improve the productivity and execution of machines and robots in a human facilitated climate. The association among robot and human has given effective correspondence between human psyche, robots and machines.

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REFERENCES

[1] ShiyuanQiu, Zhijun Li, Senior Member, IEEE, Wei He, Senior Member, IEEE, LongbinZhang,Chenguang Yang, Senior Member, IEEE, and Chun-Yi Su, Senior Member, IEEE "Brain–Machine Interface and Visual Compressive Sensing-Based Teleoperation Control of an Exoskeleton Robot" IEEE transactions on fuzzy systems, vol. 25, no. 1, february 2017.

[2] R. Lu, Z. Li, C.-Y. Su, and A. Xue, "Development and learning control of a human limbwith a rehabilitation exoskeleton," IEEE Trans. Ind. Electron., vol. 61, no. 7, pp. 3776–3785, Jul. 2014.

[3] Reza Abiri, GriffinHeise, Xiaopeng Zhao, Yang Jiang " Brain Computer Interface for Gesture Control of a 1) Social Robot: an Offline Study".

[4] K. Kiguchi, S. Kariya, K. Watanabe, K. Izumi, and T. Fukuda, "An exoskeletal robot for human elbowmotion support-sensor fusion, adaptation, and control," IEEE Trans. Syst. ManCybern. B, vol. 31, no. 3, pp. 353–361,Jun. 2001.

[5] K. Kiguchi, T. Tanaka, and T. Fukuda, "Neuro-fuzzy control of a robotic exoskeleton with EMG signals," IEEE Trans. Fuzzy Syst., vol. 12, no. 4, pp. 481–490, Aug. 2004.

[6] J. Huang, X. Tu, and J. He, "Design and evaluation of the RUPERT wearable upper extremity exoskeleton robot for clinical and in-home therapies," IEEE Trans. Syst., Man, Cybern. Syst., to be published, doi: 10.1109/TSMC.2015.2497205.

[7] W. He. Y. Zhao, H. Tang, C. Sun, and W. Fu, "A wireless BCI and BMI system for wearable robots," IEEE Trans. Syst. Man Cybern. Syst., to be published, doi: 10.1109/TSMC.2015.2506618.

[8] M. A. L. Nicolelis, "Actions from thoughts," Nature, vol. 409, no. 6818,1) pp. 403–407, 2001.