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Hand Gesture Controlled Robot Using Arduino

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***Abstract:** This paper presents a Hand Gesture Controlled Robot using Arduino, which can be controlled by simple hand gesture. According to the movement of the person hand, the accelerometer start moves. It is based on 3axis of accelerometer and robot move in four direction forward, backward, left and right. For sensing Human motion, we use infrared sensor, it's range is 790nm wavelength from human body. This type of robot widely used in military application, industrial robotic, construction field. In such a field, it is very risky and complicated to handle the machines through switches or remote, sometimes operator may be confused so this new concept introduce to control the machine with the movement of hand which will simultaneously control the robot.*

***Keywords:** Arduino Technology, gesture, Accelerometer, Infrared sensor.*

I. INTRODUCTION

Robotics is the system which deals with construction, design and operation. This system is related to robot and their design, manufacturer, application. Robotics research today is focused on developing systems that modularity, flexibility, redundancy, fault-tolerance and some other researchers are on completely automating a manufacturing process or a task, by providing sensor based to the robot arm. In this highly developing industry and man power are critical constraints for completion of task. To save human efforts the automation playing important role in system. This system is useful for regular and frequently carried works. One of the major and most commonly performed works is picking and placing of jobs from source to destination.

In the earlier system, the motion of the human hand are sensed by the robot through sensors and it follow the same. As the person moves their hand , the accelerometer also start moving accordingly motion of the hand sensor displaces and this sensor senses object or parameter according to motion of hand.

In this system, a gesture driven robotic vehicle is developed, in which how the vehicle is moving i.e,
control and handling is depend on user gesture. This type of control is mostly used in virtual world compute games. This control make switching system is more real and give more freedom to user.

II. WHY PICK & PLACE ROBOT

We have selected the pick and place robots for this particular process due to the following reasons:-Flexibility is one of the main advantage of robotics system . Pick and place robots are easily programmable using computer software. In robotic system pick and place is a application which is related to physically demanding. In industries the demanding work for human labour is moving machines from one place to another. To reduce human labour efforts pick and place robots are used. Pick and place robots are unaffected by the stresses of the application. They are able to work without taking breaks or making mistakes.

It is a mechatronic system that picks object from source location and places at desired location. For detection of object, infrared sensors are used which detect presence of object as the transmitter to receiver path for infrared sensor is interrupted by placed object. As soon as robot senses presence of objects, it moves towards objects, pick it and finally place it on destination.

III. RELATED WORK

The paper[7][8] focuses on the development of the robotic Arm by using Flex Sensor, and DC motor which are connected to the Arduino Uno. It is controlled by processing software. These robotic Arm are cheap and easily available which makes it free from unnecessary wire connection, reducing its complexity. But still there is a requirement of adding new ideas and functionality. The central goal of the paper[6] is to implement a system through which the user can give commands to wireless Robot using gesture. By using this gestures command signals are generated by using image processing and then signal pass to specified direction.

The paper[9] explain about the implementation and design of gesture controlled robot by using Flex Sensor, Ultra sonic Sensor, and accelerometer connected to Microcontroller. The research paper[10] describes the Robot, which is controlled by a hand Glove Wirelessly via Bluetooth. The Robot is developed by using the input section consisting of sensor, LCD, Display and a Bluetooth Device and the output section which is consisting of NXT Microcontroller, Motor and Camera. The programming is developed in MATLAB.

IV. PROPOSED WORK

The whole project is divided into 2 sections one is transmitter section and another is receiver section.
The transmitter section consists of one Arduino Uno, one 3-axis accelerometer and one RF transmitter module. The receiver section includes RF receiver module, one motor drives IC. Here two separate 5 volt power supply is applied to the both sections.
The central goal of the paper[6] is to implement a system through which the user can give commands to wireless Robot using gesture. Finally, the Arduino Uno takes the analog output values and convert analog value to the respective digital value. The digital values are processed by Arduino Uno and send to the RF transmitter which is received by the Receiver and is processed at the receiver end which drives the motor to a particular direction. The robot moves forward, backward, right and left.

V. HAND GESTURE TECHNIQUES

For a wide range of applications dynamic, non-contact hand gestures are used. From a selective literature review the following applications have been found: remote crane control; aircraft traffic control; human computer Interaction; virtual environments; remote robot manipulation; wearable human computer interfaces [18]; home appliance control [17]; TV control [16]; music; room lighting [15]; hearing aids [13]; weather forecasting [14]; presentations [3]; mobile phone [36]; translation [4]; jukebox [5] and 3D Kiosk [11]. The two common factors in all of the above applications are the use of dynamic and non-contact hand gestures.

A. Contact and Non-Contact Hand Gestures

It is recognized that contact-based hand gestures using a touch pad and expansion of existing handwriting recognition techniques is a possible gesture-based interface for in-vehicle secondary controls which are providing safety benefits[12]. The contact based hand gestures allows a more in-depth analysis of non-contact gesture recognition technologies and possible automotive applications. The three different factors are offers by non-contact gesture recognition. firstly, no working in-vehicle non-contact dynamic hand gesture based system could be found maximum research efforts. Secondly, non-contact gestures meant there was no physical interface at all, and thirdly, dynamic noncontact gestures could possibly be used outside the vehicle, although this does not offer any safety benefits, it does offer the opportunity for further experimentation with new ideas and concepts.

B. Dynamic and Static Hand Gestures

According to the research, it was understood that for replace existing secondary controls by using static hand gestures, the driver would have to recall potentially hundreds of individual hand gestures each of which would map to a particular in-vehicle secondary control. This static hand gestures create too many problems because drivers are unlikely to work all these gestures and if they did the additional mental workload that providing safety benefit. Finally, use of dynamic hand gestures appears to be much clearer than static gestures with less ambiguity, only when observing human-to-human communications are present. For these basic common sense reasons, to concentrate on researching dynamic hand gestures only was initially decided.

C. Gesture Driver Interaction

When reviewing previous research it is interesting and instructive that when gestures are used the differences in different approach with driver interaction is present. In particular visual reminders, gesture location and system feedback, these are now briefly described.

D. Gesture Location

It is possible to perform a hand gesture practically anywhere within the drivers reach zone, there are three zones like dynamic, non-contact hand gestures can be performed for in-vehicle controls. The first is directly in contact with driver in the windscreen area as used by Alpern and Minardo [2], this would allow hand to be used. The second is in the central windscreen area in the middle of the car, this would just available for use by one of the hands, and the third zone is in the height of the windscreen above the centre stack area used by Althoff [1].
If a specific gesture zone is not to be used and gestures are to be used as a supplementary input method, then it could be argued there is a fourth potential location, namely at or adjacent to the relevant tactile control, this may help users with mental modeling of the gesture and aid recall.
No research has been identified on the best location of hand gestures that would provide maximum safety for in-vehicle applications, ease of use and user acceptability. This lack of research probably explains why there appears to be no agreed standard location. Based on ease of use and the ability to use either hand the first zone immediately in front of the driver is probably the best, however, this may momentarily compromise forward visibility and attract unwanted attention from other motorists or pedestrians.

The user acceptability is affected by this two disadvantages, so the user acceptability may improve by zone 3. Since the gesture is hidden from view and there is no obstruction of forward visibility, however, the use of one hand only may be restrictive to some users, perhaps reinforcing the need for the gesture to be a supplementary input modality. The optimum zone to carry out hand gestures is clearly an area of further research.

VI. CONCLUSION

In this paper robot has been developed which is according to human hand gesture. The robot is showing proper responses whenever we move our hand. Different Hand gestures to make the robot in specific directions are left, right, forward, backward. In this project our robot senses any obstacle comes in it's path, avoids it and resumes it's running. As we are using pick and place which is a system that picks object from source location and places at desired location.

VII. FUTURE SCOPE

In the receiver section a wireless camera is placed to monitor the performance of robot arm along with patient side (Robot arm side) 5 vital parameters (ECG, Respiration rate, Pulse rate, Temperature, Heart beat) of patient is monitored. This is a preventive measure for any imbalance in victim's metabolism (temperature, pressure, heart rate), ALARM in transmitter's section (physician side) will be ringing, which in turn brings into notice of physician that patient is in some critical situation, so that the physician immediately going to stops the action of robotic arm and he will inform the nearby doctors to take care of patient. This robotic arm developed is to reduce man power in medical field, take care of patient in absence of specialist/surgeon and to impart the robotic in medical areas.

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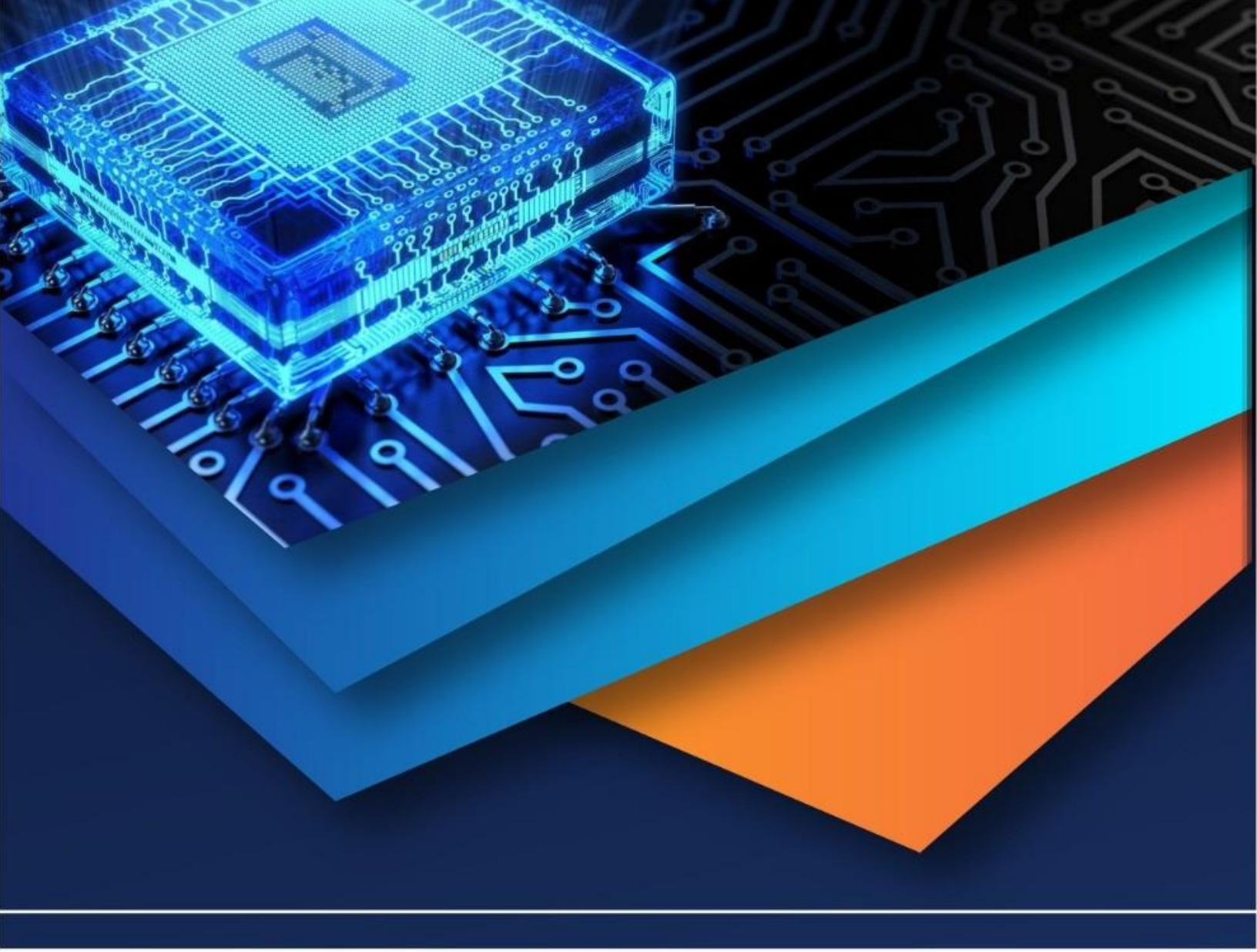

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