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Robot Control by Human Head Gesture

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Abstract*: *This paper deals with the specific application for controlled movement of robot head by using head gesture of human. It is considered as the easiest alternative methods of interface with robot and other devices. we precisely targeting the movement of the head of person based on gesture which will decide to move the of robot in the directon of person desires to move it. The robot performs four basic recognised these head gestures are basically :- nodding up, nodding down, bending right and bending left. These are implemented as interaction between human and robot on basis of head gesture and control switch to enable or disable robot . It is controlled using MATLAB programs like Viola Jones algorithm and is segmented with activity based on image processing. The basic purpose of this is to make a controlled head movement of robot which will do copy of human head movement.

Keywords*: *Head gesture, detection, arduino uno, servomotor, webcam

I. INTRODUCTION

Head gesture is also found to be a natural, simple and effective way of interaction and communication with device thus, it has received significant attention in recent research. A robot is a machine usually designed to reduce human efforts and to help them in performing complex tasks. It can be controlled by external device or can be programmable. They can be controlled by humans without moving an inch from their place by their gestures. Gesture recognition involves software and hardware technology which dialect innovation for scientific calculations by using human head gestures . Image processing is emerging and the evolution of this technology is on the peak, and the concept of face detection is a revolutionary idea. Gestures can begin from any movement but in this project we are considering gesture of face or head like nodding up or down or moving the hand left and right. The robot control by gestures can be controlled by using viola jones algorithm which is MATLAB program . when it runs on computer that gives a library of open source code which will detect and sense movement of head and send information to the arduino. The security surveillance is a real-time application of this technology and can be used for that.

II. LITERATURE REVIEW

Image processing is emerging and the evolution of this technology is on the peak, and the concept of face detection is a revolutionary idea. previously robots were controlled through hand operations which was limited the interactions with humans[1], therefore visions based technology was used to overcome this difficulties. In this project we used a visual concept and taken into consideration for the purpose of head movement of robot by using head gesture[4]. For identifying these features a webcam is required for gesture recogination and certain MATLAB algorithm such as viola jones[5]. when we are able to control the robot through gesture instead of human operation which will open the space for evolution of technology and more easier for more people to use. Which will help large number of people to access hand free robot in future.

Usually gesture controlled robot is most useful for disabled people who unable to move. A lot of work studying the head posture and movements of drivers has been done in relation to detection of driver drowsiness. Object detection can also be performed by analyzing the colors of object in the image. Gesture controlled robot has potential to change the life of disabled people ,they donot have to rely for basic things such as moving their wheelchair from one place to another . the gesture based robot work on the the principle of image processing ,for this a camera is attached to the computer, capture image and then compares it with static image to find the position of gesture, and respond to servo motor connected with robot for head movement.

III.COMPONENTS USED

A. Arduino Uno

Arduino is basically an open source platform for both software and hardware used for building electronics devices. It has microcontroller board and having 14 input/output digital pins, from which 6 pins can be used as PWM outputs and 6 pins are used as analog inputs , a quartz crystal of 16 MHz , a USB connection, a power jack, and a button for reset. It contains every thing which are needed to support for proper function of the microcontroller; and it is simply connect to a computer by using a USB cable or power can be given with a AC-to-DC adapter or a battery may used to get start.

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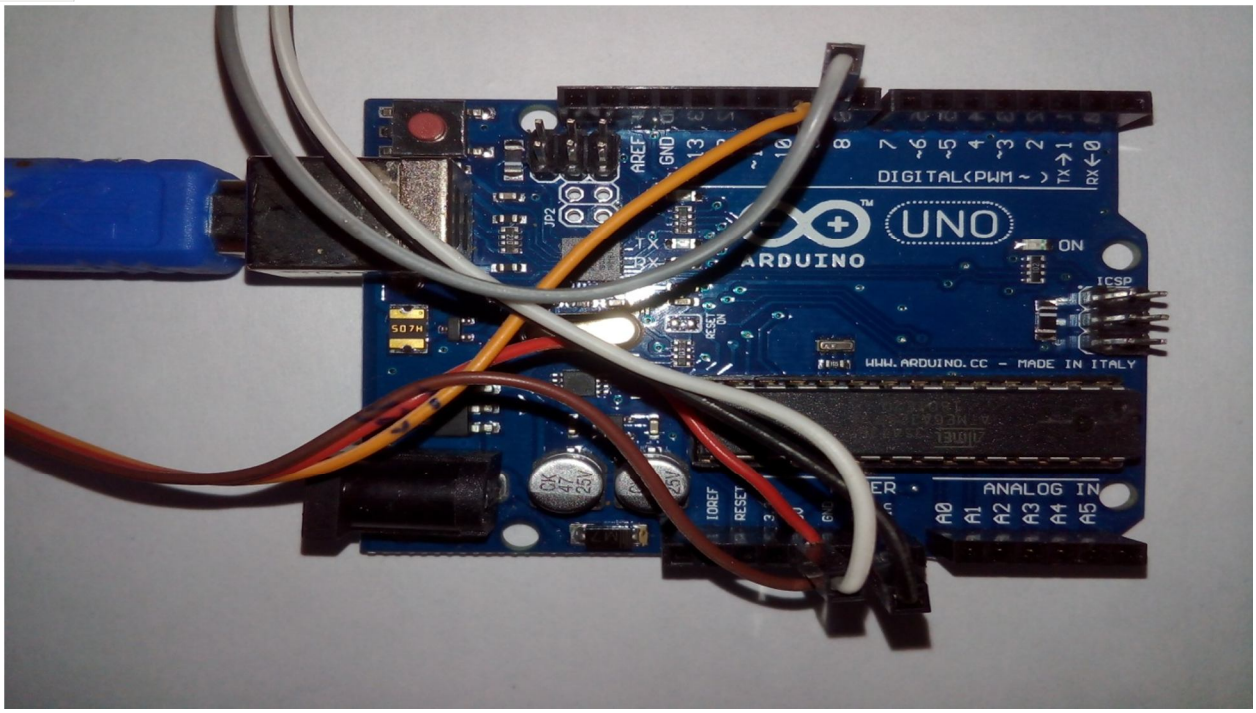

Figure 1. Arduino Uno Setup

B. Servo Motor

A servomotor is basically a rotary and linear actuator which is used for precise control of angular and linear position, controlled velocity and acceleration. It has a motor coupled suitably with a sensor for position feedback which makes it controlled. It also often requires a relatively sophisticated controller and a dedicated module designed specifically for use servomotors.

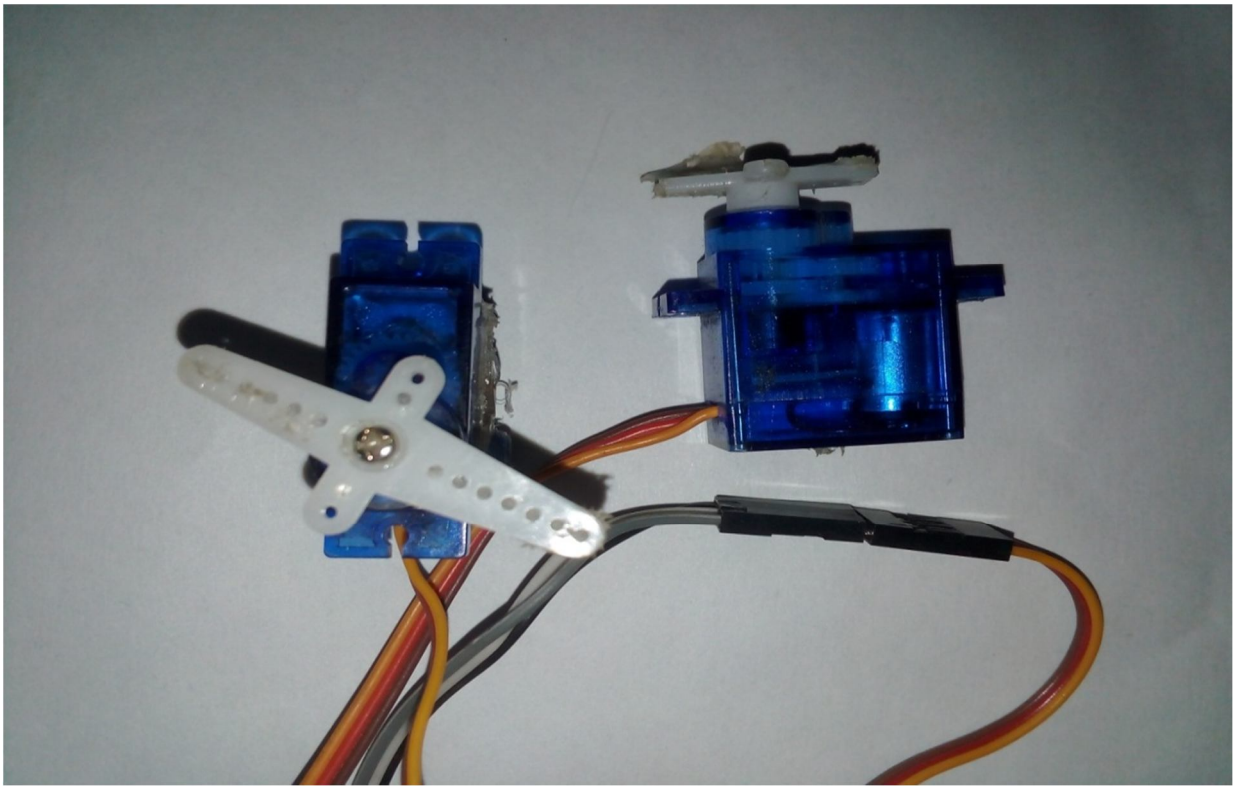

Figure 2. Servo Motor Setup

C. USB Webcam

A webcam is a camera which is used for feeds capture video and image or streams its image at a real time when connected with a computer . When video streams captured by the webcam then its communicate with the computer.The image video stream may be viewed or saved and further sent to other networks by using internet connected device, it can be used as live streaming video calling or also emailed it as an attachment and sent to a remote location. A webcam is generally connected by a USB cable, or by using bluetooth or it may built computer hardware like laptops.

IV. METHODOLOGY

A. Detection

Detection of face or head is the first step towards the gesture based controlled robot ,the human face is detected by the webcam connected to the computer or any other live video acquisition device continuously for input video stream. The video is then divided by into frames and for each frame there is a face detection. It will spot the face and once it get detected, a bounding box is drawn around the face/head and coordinates of the box is obtained to determine the position of head[7].

The first operation is executed on computer by using Viola Jones algorithm for face detection MATLAB software. MATLAB is a computing programming language which is multi-archetype numerical , that uses Viola Jones algorithm for face detection. It will obtain a information of coordinates as a output when it detect the face/head in a frame which will be send to the Arduino microcontroller for future operations. Viola Jones algorithm technique is used only to detect frontal faces operations.

B. Tracking

The concept of face tracking emerges when face is moving continuously then, there is a need to track a face. An Arduino uno microcontroller is used to track the moving face. Arduino is an open source platform for both hardware and software applications.

Two servo motors is connected with the microcontroller which will move as per movement of head. Before tracking begins both servo motors are centered as like initial position. The bounding box is used to track the face by using the coordinates obtained from subsequent frames. The motor start tilting and panning in a controlled manner[7]. The webcam mounted on it and its starts changing position as per the movement of the person or object.

Since Viola Jones algorithm restricts the operation to frontal faces. The Kanade-Lucas-Tomasi (KLT) algorithm is used for continuously tracking human faces in the live video stream..

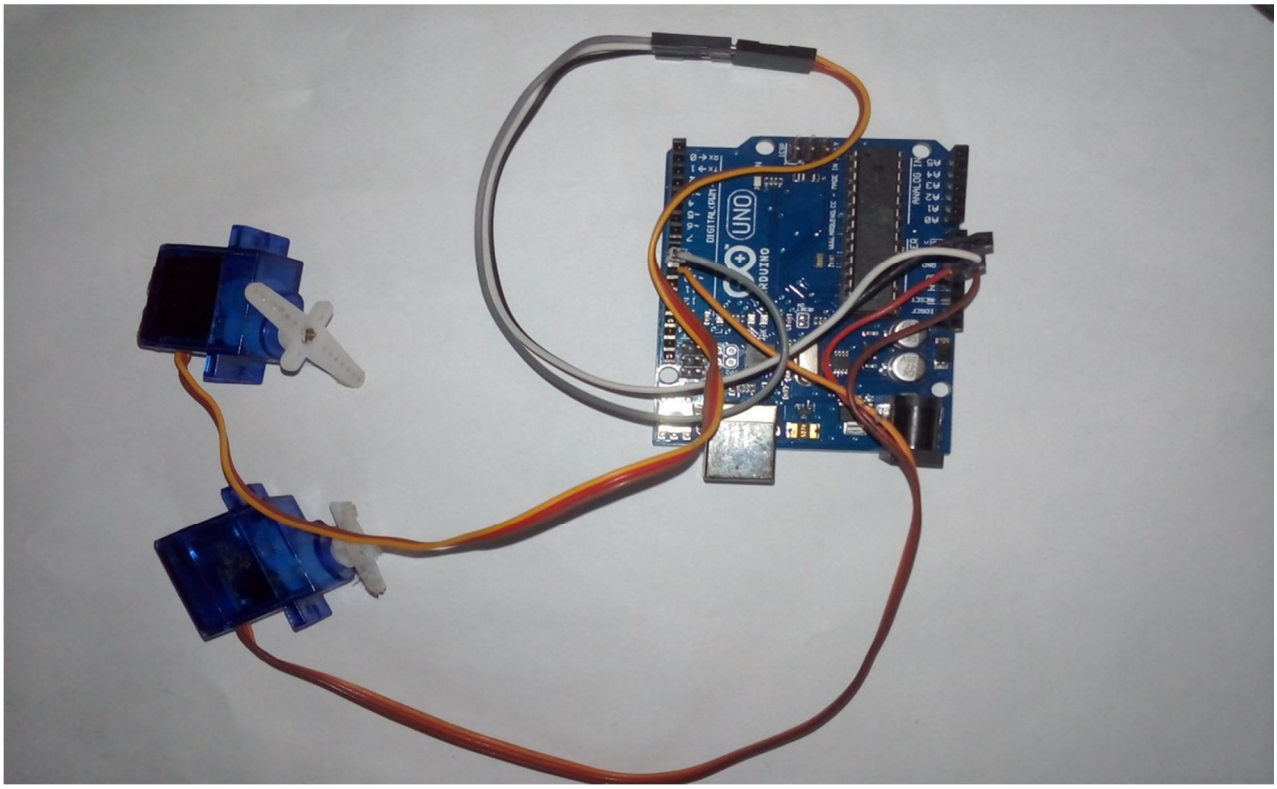

Figure 3. Experimental Setup

V. RESULT AND ANALYSIS

Some sort of sequence of event should trigger short of detection. After many hit and trials over the hardware and the programming, the robot was not able to function properly. We then stated to make some changes in the program in MATLAB and connections of servo motor and arduino. As the MATLAB code runs servo motor takes it initial position and finally the robot was able to move with the movement of the head. The details of few trials are given as follows:

Trail l: The servo motor could not move with the movement of the head.

Trial 2: It could move only horizontally and vertically.

Trial 3: Some success. The servo motor moved horizontally, vertically, up and down with the movement of the head.

VI. CONCLUSIONS

In this project, an innovative technique of gesture based control robot has been introduced which provide accessibility and assertive technology of interaction. Though our prototype performance is satisfactory and the components used are cost effective and compact. With the help of this technique, the human effort would be reduced to large extent especially for industrial use such as surveillance systems. We can move wheelchair by using head gesture because a physically disabled person do not want to move chair every time manually or by taking help of others. Motion analysis of cells and particles in real time is going to be one of the major scopes in the field of tracking.

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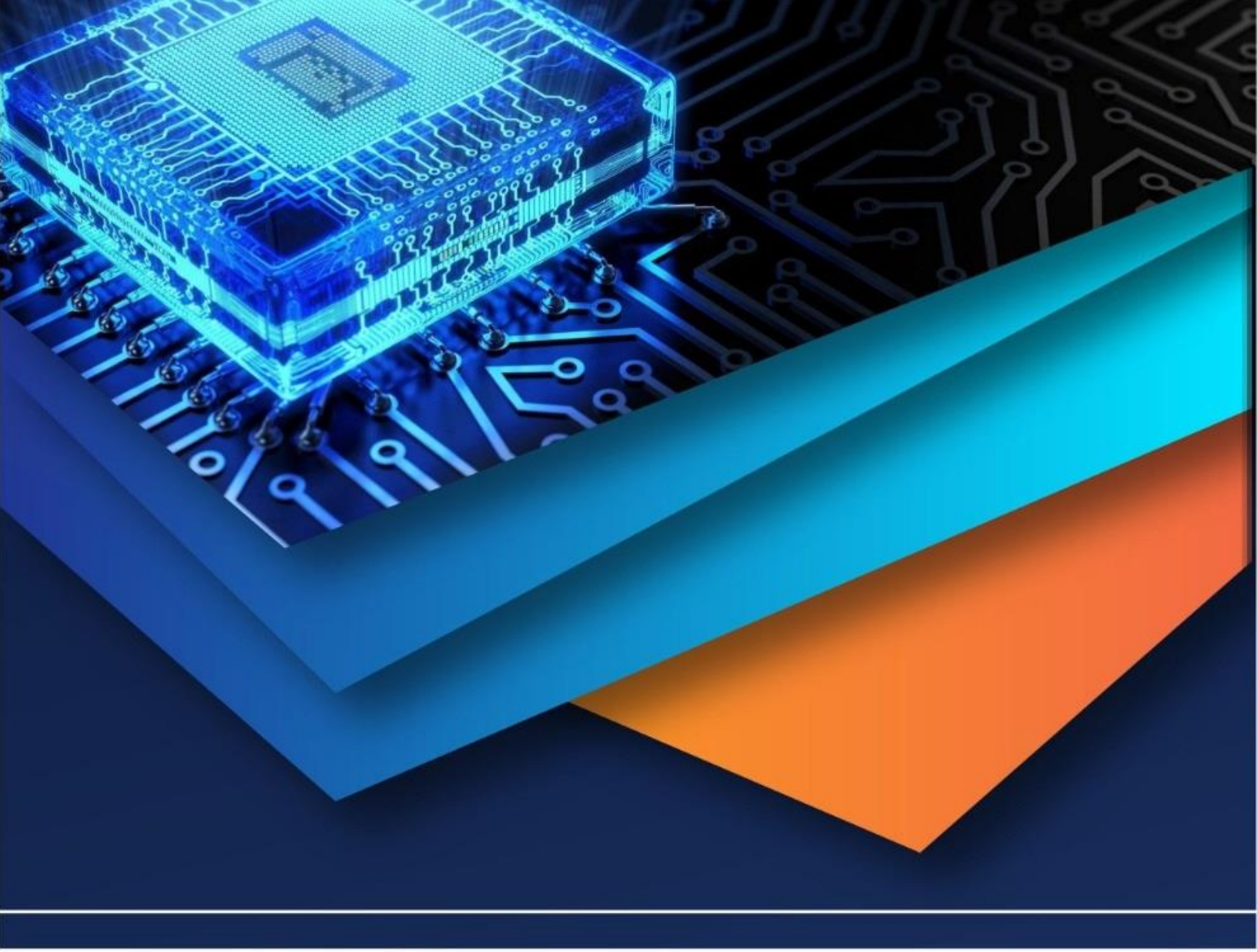

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