GESTURE CONTROL ROBOT

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Abstract—. This is Real time monitoring system, by which humans interacts with robots through gestures. This is an immense aid for people for whom mobility is a great challenge. There is need for vision based interface over speech recognition as it failed to mandate the robots because of modulation and varying frequency. The implementation is achieved by navigation of the robot through various gestures. By the impact of this project, life of physically challenged people becomes less challenging. It will benefit various areas including applications in military and high security bases. Gesture control robot consist of two stages: capture image and data extraction. Objects are detected using the webcam. Another moto of this project is to control the Indian economy by regulating the streetlight.

Keywords—Robot, Gesture, Webcam, Street light, Object detection

I. INTRODUCTION

Many parameters of robot are designed according to requirement. There are different ways to control robotic arm like Voice Controlled, Keypad Control, Gesture Control, etc. Implemented system consists of transmitter & receiver. Transmitter is nothing but human hand with flex sensors & receiver is robot manipulator. Motion of transmitter is wirelessly transmitted to receiver through X-bee module. Robotic arm which is receiver is nothing but a mechanical system formed by different joints and end and effectors i.e. gripper movements of these fingers or gripper can be carried out using stepper motor or servo motor when user carry out motion of hand for any application at transmitter side same movement is copied by receiver as on transmitter there are flex sensors mounted on glove at transmitter which change its resistance depending on movement of user. In the research group of intelligent robot, one of the biggest issues is autonomous-driving of robot.

For autonomous-driving, object detection method is very important. It allows robot to avoid obstacles. Human beings mainly use the visual sense to detect the other vehicles in driving. Using this visual information, we can drive safely. Street lights play a vital role in our environment and also plays a critical role in providing light for safety during night-time travel. In this scenario, when the street lights are in working functionality over the whole night that consumes a lot of energy and reduces the lifetime of the electrical equipment such as electric bulb etc. Especially in cities' streetlights, it is a severe power consuming factor and also the most significant energy expenses for a city. In this regard, an intelligent lighting control system can decrease street lighting costs up to 70% and increase the durability of the equipment.

The whole system consist of three modules.

1. Controlling the robot using hand gestures.
2. Object detection using webcam.
3. Regulating the street light electricity.

Fig(1) Gesture control robot (2)Object detection using webcam (3) Regulating the street light electricity.

Applications of the proposed system:

- Wireless controlled robots are very useful in many applications like remote surveillance, military etc.
- Hand gesture controlled robot can be used by physically challenged in wheelchairs.
- Through the use of gesture recognition, remote control with the wave of a hand of various devices is possible.

Benefits of proposed system:

- Developing system will save the electricity and it benefit the Indian economy.
- It will save the life of human beings in the dangerous

zones.

- Far objects can be easily identified through webcam.
- Hand gesture controlled robot can be used by physically challenged in wheelchairs.

II. LITERATURE SURVEY

In this section we have identified and discussed existing work about gesture control robot, electricity regulation and object detection using webcam.

Hand-gesture-based interface for navigating a robot[1]. A robot can be controlled by user using his or her hand gestures. A 3-axis accelerometer is adopted to record a user's hand trajectories. The trajectory data is transmitted wirelessly via an RF module to a computer. The received trajectories are classified into six control commands for navigating a robot. The classifier adopts the dynamic time warping algorithm to classify hand trajectories. The existing work also has limitation that Simulation results shows the classifier could achieve only 92.2% correct rate.

Control strategy[2] allows us to perform the dynamic walking gait of a virtual under-actuated robot even subjected to destabilizing external disturbances. This control strategy is based on two stages. The first one is using a set of pragmatic rules in order to generate a succession of active and passive phases allowing us to perform the dynamic walking of the robot. In the second stage, we use these neural networks to generate the learned trajectories during the first stage. The existing work of this project has the disadvantage while working with obstacles avoidance using neural networking.

Object tracking and detection are two fundamental tasks in multi camera surveillance. This paper proposes a framework [3] for achieving these tasks in a non overlapping multiple camera network. A new object detection algorithm using mean shift segmentation is introduced, and occluded objects are further separated with the help of depth information derived from stereo vision. The present work has complexity while recognizing the performance of non training objects.

Object [4] is the most important components in numerous applications of computer vision. There are many changes in the progress has been made in recent years with efforts on sharing code and datasets, it is of great importance to develop a library and benchmark to gauge the state of the art. After reviewing recent advances of online object tracking, large scale experiments with various evaluation criteria to understand how these algorithms perform can be carried out. The test image sequences are annotated with different attributes for performance evaluation and analysis. By analyzing quantitative results, we identify effective approaches for robust tracking and provide potential future research directions in this field.

Power electronics, machines, grids, and markets via communication technology [6] are various types of energy technologies smart grid link which leads to trans- disciplinary, multi-domain system. Simulation packages for assessing system integration of components typically cover only one sub-domain. Co-simulation overcomes this by coupling sub-domain models that are described and solved within their native environments, using specialized solvers and validated libraries. This article discusses the state of the art and conceptually describes the main challenges for simulating intelligent power systems. Part 1 covers fundamental concepts, part 2 applications.

III. PROPOSED WORK

The aim of this project is to construct a robotic system which can be controlled by human hand gesture activity but not by old buttons. We just need to wear a small transmitting device in your hand which included in accelerometer. This will transmit an appropriate command to the robot so that it can do whatever we want. The robot will detects the objects and name it using webcam and it will regulates the streetlight electricity. To set up a system for automatic segmentation and tracking of moving objects in stationary camera video scenes, which may serve as a foundation for higher level reasoning tasks and applications. To make significant improvements in commonly used algorithms. Finally, the aim is to show how to perform detection and motion-based tracking of moving objects in a video from a stationary camera .

Gap identification of the existing system

Looking back, there were several issues which could be manage differently. First of all the correct chose for the chassis could be done correctly and to eliminated the need of changing it. The major problem that occur during this was not the different implementation, but the waste of time trying to figure why the car do not move in low speed. The other think will be probably picking different language for developing the control station, because the Unity has one big limitation and that is that it does not support a live video stream inside the programme and for the project it has to run in spared window using other programme for playing the video.

In the existing device there is no webcam to detect and name the object with gesture control car robot system. There were several systems which can on and off the streetlight whenever it is dark but there is no regulation in the usage of electricity with respect to the object detection on the road. Radio frequency transmission is used instead of infrared transmission as RF can travel longer distance which improves the range of application, RF can even work in obstruction between remotes and car. The transmission occurs up to 10 Kbps. After studying the literature, it is found that detecting the object from the video sequence and also track the object it is really challenging task. Object tracking can be a time consuming process due to amount of data that is contained in the video

IV. ARCHITECTURE DIAGRAM

The figure 4 shows the Robotic clove houses circuitry which controls the robot. It consists of flex sensor and transfers the data of accelerometer via Bluetooth or Wi-Fi, where the values are combined and processed simultaneously. At the same time the flex sensor is doing its job by sending the degree of movement of the hand to Arduino. The transmitting device includes a Comparator IC for assigning proper levels to the input voltages from the accelerometer and an encoder which is used to encode the data and then it will be transmitted by an RF Transmitter module.

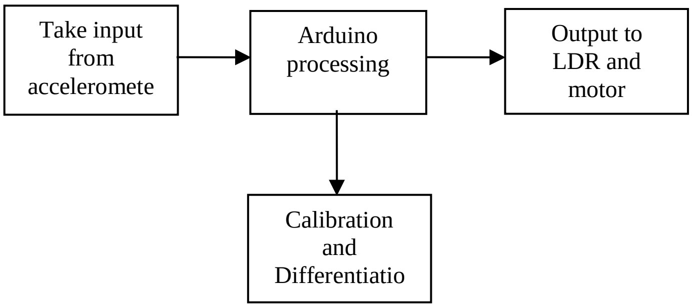

Fig 4. Modeling of Gesture control

At the receiving end an RF module will receive the encoded data and decode it by using a decoder. This data is then processed by a microcontroller and passed onto a motor driver to rotate the motors in a special configuration to make the robot move in the same direction as that of the hand. Webcam is fixed in the robot, where a video object is created in MATLAB and linked to the camera or webcam. It helps in identifying the objects. In the street light regulation motion sensor activates the microcontroller only when vehicle or pedestrian enters into the detection region and activates light sensor. Light sensor gets activated if light illumination is achieved less than fixed threshold to switch the lights ON, else OFF. Sensors (LDR & PIR) senses the data, collect the information and sends to microcontroller. Microcontroller controls the signal and runs the software to analyze the system.

Fig 5. The car-robot used in the experiments.

Figure 5 shows the hand-gesture-based control interface for controlling a car-robot. Based on the interface, a user with a 3-axis accelerometer module attached to his or her wrist can directly use hand gestures to navigate a car-robot. The 3-axis accelerometer module senses the hand trajectories and then wireless transmitted to a PC via a RF module. Then the core hand gesture recognition module adopts the DTW algorithm to recognizes the trajectories. In the following, it sends a control command wirelessly to the car-robot's receiving module. The robot is then navigates according to the received command.

A. The recognition procedure involves 5 steps as follows:

Step 1. Calibration: The way how a tri-axes accelerometer module is attached to a user's wrist varies from person to person. Even more, it may vary from time to time during the control procedure for the same user. For example, a user may wear the module with a certain tilting angle. Without any hand movement, the accelerator already has some g values on the sensor. Therefore, the module has to be calibrated for each user at the beginning of the control procedure. To calibrate the accelerator module, we first measure the tilting and rotation angles.

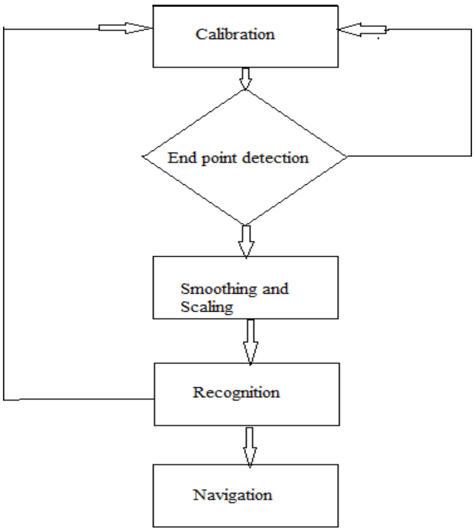

Fig 5. Block diagram for Gesture sensor robot

Step 2. End Points Detection: Before we can use the DTW algorithm to classify the recorded trajectories, the end points of the received trajectories have been detected first. The end points mark the beginning and the ending of the trajectory sampling data. The acceleration signal changes accordingly as the acceleration module moves. Therefore, the amount of acceleration changes (AAC) can be used to detect the end points. When the AAC exceeded a certain pre-specified threshold, it represents that a starting point of motion is detected. The end point is detected when the AAC falls below the threshold for 0.5 seconds. The performance of the end points detection depends on the value of the pre-specified threshold. If the threshold is set too low, a small shaking movement would be detected as a new trajectory. On the contrary, if the threshold is set too high, a slow moving trajectory would not be detected. From our many experiment, the 0.1g would be a good threshold.

Step 3. Smoothing and Scaling: After detecting the end points, we smooth the data to reduce the impact of noise. In our system, we use the second-order Handling filter to smooth the data. After smoothing, we need to scale the smoothed data to lie in the interval [0, 1]. Without the scaling process, trajectories resulted from the same hand gesture may be different.

Step 4. Recognition: The DTW algorithm is a time-warping algorithm for recognizing spatial- temporal sequences. It works as follows. First, for each class, one or more than one sequences are stored as template sequences. Then the test sequence is compared with the pre-stored template sequences, and the corresponding similarity score (or distance) for each template is computed. An important step in these comparisons is the alignment of the test sequence in time with each template sequence due to the variations in the sequence lengths. In our recognition module, for each hand gesture, we randomly select one trajectory as the corresponding template trajectory for the gesture. The resulting test trajectory is then compared to the template sequence for each hand gesture. The two trajectories to be compared are dynamically time aligned and the resultant alignment path of maximum similarity is computed. Finally, the test trajectory is claimed to be the class with the largest similarity.

Step 5. Navigation: After the trajectories have been classified, the corresponding command is then transmitted to the robot. Generated signal is stored in the file at the control station Wi-Fi shield on the robot accesses this file to transmit the signals from the control station to the robot. As soon as the Wi-Fi shield gets command from the control station, it is passed to the Arduino microcontroller. Arduino takes this signal as input from the Wi-Fi shield and generates some output signals that are passed to the motor driver. This output signal generation depends on the gesture input, for every four possible gesture input, different output signal is generated. The motor driver is used to drive the DC motors of the robot. It takes digital signals as the input from the Arduino and gives these signals as an output to the DC motors. Once a command signal is given to the robot, it continues to move in that direction till the next command is given or any obstacle comes in the path.

EXPECTED OUTCOME

The outcomes of this proposed system are as followed.

The proposed system, in which the user can navigate the wireless robot in the environment using various gestures commands. The main objective is to provide reliable and a more natural technique for the user to navigate a wireless robot in the environment using gestures. The proposed system will give the intelligent system which can controlled by the hand gestures, it works on the device accelerometer which has transmitter and receiver.

The developing robot will detects the objects and name it using the webcam. Object detection and tracking can be used to wirelessly control a robot's movement. Object detection was achieved by means of color detection and image segmentation.

The robot will detect the object and it automatically regulates the streetlight electricity. Each sensor controls the turning ON or OFF the lighting column. The street lights have been successfully controlled by Arduino microcontroller. With commands from the controller the lights will be ON in the places of the movement when it's dark.

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