Leap Motion Controlled Wheel Chair

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Abstract-Hand gesture recognition is a crucial and challenging task in recognition and computer vision communities. In this paper we propose a method suitable for the recognition of the hand gesture by PC through which wheel chair can be controlled. Leap motion technology allows users to control their computers with hand gestures alone. The proposed prototype also contains the capability of operating any required home appliance by the user. The status of the wheel chair can also be tracked with the help of tilt sensor continuously and can be communicated to the appropriate person. The wheel chair can also be controlled by the person with in 100mts operating range. The system is also equipped with the facility of operating any required appliance (fan or light) by the user.

Index term- Leap Motion Technology(LMT), tilt sensor, RF-TX, RF-RX.

I. INTRODUCTION

Human being Gestures provide the most important means for non-verbal interaction among people. They range from simple manipulative gestures that are used to point at and move objects around to more complex communicative ones that express our feelings and allow us to communicate with others.

Hand gesture recognition based man-machine interface is being developed vigorously in recent years. Due to the effect of lighting and complex background, most visual hand gesture recognition systems work only under restricted environment. Gestures are expressive, meaningful body motions-i.e., physical movements of the fingers, hands, arms, head, face, or body with the intent to convey information or interact with environment.

With the advancements in the human computer interaction like touch screens users are enjoying high level of comfort. Here is the prototype next to the touch screens, in which PC can be operated through hand gestures with the help of Leap motion. In general the operation of wheel chair can be controlled by the hands of the disabled person movements of the wheel chair any other person must be constantly there to take care about the Here wheel chair is controlled with the help of hand gestures and can also control required fan or light. In past few days we have seen wheel chairs operated by the person in the wheel chair.

Here the person with in 100mts operating range can also control the wheel chair. The status of the wheel chair (about tilting) can be tracked and can be sent to the appropriate person by detecting with the help of tilt sensor. The proposed system consists of two main steps in which one is tracing the hand gesture placed by the person and the other is the recognition of the hand gesture and pass appropriate signal for the movement of wheel chair. These two steps can also be called as Gesture extraction and recognition.

Gesture recognition is the process by which gestures made by the user are made to known to the system. Gesture recognition is important for developing alternative human-computer interaction modalities. It enables human to interface with machine in a more natural way.

Gesture recognition is a technique which is used to make computers ‘see’ and interpret intelligently is becoming increasingly popular. Hummels and Stappers describe four aspects of a gesture which may be important to its meaning: Spatial information, Pathic information, Symbolic information

II. BLOCK DIAGRAM

![Block diagram of the proposed system.](image-url)
acquiring the image and is connected to PC and the signal is passed to the Motor of the wheel chair through Bluetooth, Microcontroller and a series of components. Third part consists of the RF-RX to control a bulb according to the information transmitted by the RF-TX in the second part.

III. FLOWCHART

start

Camera gets activated

Camera takes video input

Acquires an image

Image is sent as input to MATLAB

Processes the image

All the required properties are calculated

If any condition satisfies

Tilt sensor is activated and communicated to person

Control signal is sent to wheel chair

If obstacle is present

Stop

no

yes

yes

no

Fig.2. Flow chart

As shown in the Fig.2, In the developed system, first the camera gets activated and checks for taking the video input. It is arranged in the form of frames and is sent as input to the MATLAB. The image inputs are processed and the corresponding signal is sent from the PC through Bluetooth to the Motor driver which controls the wheel chair. If any obstacle occurs, then the information is sent to the appropriate person with the help of Bluetooth, which is detected with the help of Tilt Sensor.

IV. ALGORITHMS FOR HAND GESTURE RECOGNITION

MATLAB is a high-performance language for technical computing. It integrates computation, visualization, and programming in an easy-to-use environment where problems and solutions are expressed in familiar mathematical notation. MATLAB provides the Toolboxes that allows us to learn and apply specialized technology.

The recognition of hand gesture using MATLAB is described as follows.

1. Image capturing using the camera connected to the PC.
2. Converting the captured image into frames.
3. Image pre-processing.
4. Enlargement of the edges of regions of foreground pixels by using Dilation to get a continuous edge.
5. Filling of the object enclosed by the edge.
6. Storing the boundary of the object.
7. Calculating various properties of Identification of gesture based on motion.

V. APPLICATIONS OF LEAP MOTION

1. For operating various devices.
2. Game designing.
3. App development.

VI. HARDWARE RESULTS

Using the LEAP MOTION GESTURE dataset wheel chair is operating perfectly with in the operating distance of 100mts.

The system also provided with the facility of operating a bulb by the LEAP MOTION using RF-TX and RF-RX.

Care should be taken regarding the dataset of the gestures such that the gestures should not be coincided with one other. The best dataset is to be selected that which gives more appropriate results.

The proposed system hardware kit is presented in this paper with the help of the following picture:
VII. SOFTWARE RESULTS

MATLAB programming has been used for the GESTURE RECOGNITION purpose. Median Filtering is used to denoise the image and image subtraction is used to separate the background from the image for recognition.

TRAINING SET

Fig.3. Proposed system

VIII. CONCLUSION

Leap motion (Hand Gesture recognition) based man-machine interface is being developed vigorously in recent years. Gesture recognition is also important for developing alternative human-computer interaction modalities. It enables human to interface with machine in a more natural way.

MATLAB provides the better solution for the hand gesture recognition.

Further detail research is focused on providing security mechanism through gesture. We use body motion for authentication purpose or provide security to access the information or data with CCTV camera.

References


