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Review On An Iot Based Gesture Recognition Using Ultrasonic Sensor.

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Abstract

Gesture is a symbol of physical behavior or emotional expression. Gestures can originate from any bodily motion or state but commonly originate from the face or hand. Gesture recognition is very significant for human-computer interaction. It is a language technologyin computer science which interpreting human gestures via mathematical algorithms.Internet of Things or IoT is nothing but an evolved version of Internet, which includes sensors, consumer electronic devices and other embedded systems connected to it besides computers, smart phones and tablets to collect and exchange data with one another.With the rapid development of Internet of Things, hand gesture recognition has drawn wide attention in the eld of ubiquitous computing because it provides us with simple and natural human-computer interaction mode.The aim of this paper is to survey a system that detects the hand gesture motions using ultrasonic sensor based on IOT.

Index Terms: *Gesture Recognition, Sign Language Interpretation, Ultrasonic Waves, Computer Interface, Presence Detection, Leap Motion Devices*

1. INTRODUCTION

Gesture recognition is a type of perceptual computing user interface that allows computers to capture and interpret human gestures as commands. The general definition of gesture recognition is the ability of a computer to understand gestures and execute commands based on those gestures. Most consumers are familiar with the concept through Wii Fit, X-box and PlayStation games such as “Just Dance” and “Kinect Sports.”
In the world of gesture recognition, a gesture is defined as any physical movement, large or small, that can be interpreted by a motion sensor. It may include anything from the pointing of a finger to a roundhouse kick or a nod of the head to a pinch or wave of the hand. Gestures can be broad and sweeping or small and contained. In some cases, the definition of “gesture” may also include voice or verbal commands. Gesture recognition is an alternative user interface for providing real-time data to a computer. Instead of typing with keys or tapping on a touch screen, a motion sensor perceives and interprets movements as the primary source of data input. [1][2]

1. A camera feeds image data into a sensing device that is connected to a computer. The sensing device typically uses an infrared sensor or projector for the purpose of calculating depth.
2. Specially designed software identifies meaningful gestures from a predetermined gesture library where each gesture is matched to a computer command [3]
3. The software then correlates each registered real-time gesture, interprets the gesture and uses the library to identify meaningful gestures that match the library.
4. Once the gesture has been interpreted, the computer executes the command correlated to that specific gesture.[4]

What is the Internet of Things?
The Internet of Things, or IoT, refers to the billions of physical devices around the world that are now connected to
the internet, all collecting and sharing data. The IoT depends on a whole host of technologies – such as application programming interfaces (APIs) that connect devices to the Internet. Other key IoT technologies are Big Datamanagement tools, predictive analytics, AI and machine learning, the cloud, and radio-frequency identification (RFID).

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Literature Survey is covered in **Section-2**. **Section-3** discusses in brief about the work. Conclusion & Future scope is discussed in **Section-4.**

2. RELATED WORK

2.1 Literature review on Gesture recognition:

Cloud-based IoT platforms and architecture connect the real and virtual worlds. They help companies manage IoT device connectivity and security – as well as collect device data, link devices to backend systems, ensure IoT interoperability, and build and run IoT applications.

Gesture recognition refers to the process of understanding and classifying meaningful movements by human's body parts such as hands, arms, face, and sometimes head. The proliferation in technology, and in microelectronics more specifically, has inspired research in the field of IMU-based gesture recognition. Three-axis accelerometers are increasingly embedded into many personal electronic devices such as smartphones, Wiimote, etc.

The researchers built a small sensor that can be placed on an electronic device such as a smartphone. The sensor uses an ultra-low-power receiver to extract and classify gesture information from wireless transmissions around us. When a person gestures with the hand, it changes the amplitude of the wireless signals in the air. The AllSee sensors then recognize unique amplitude changes created by specific gestures.[8]

Sensors use three to four times less power than existing gesture recognition systems by harvesting power from wireless transmissions. This allows for mobile devices to always have the gesture technology on and enabled.[9]

2.2 Literature review on IOT used in Gesture recognition:

Gesture recognition already is possible on some mobile devices, including the Samsung Galaxy S4 smartphone. But users have to first manually enable the feature and be able to see the device for the gesture technology to work, and if left on, the gesture system quickly drains the phone's battery. In contrast, AllSee consumes only tens of microwatts of power and can always be left on. The user could gesture at the phone in a pocket or handbag to change the volume or mute the phone without having to touch or see the phone.

This technology could allow sensors to be attached to household electronics, making it possible to interact with everyday objects using gestures and connect them to the Internet and to each other in an "Internet of Things" world.[10]

2.3 PROS & CONS:

Gesture recognition is very useful for automation. Gestures, a natural language of humans, provide an intuitive and effortless interface for communication with the computers. They will reduce our need for devices like mouse, keys, remote control or keys for interaction with the electronic devices. When combined with other advanced user interface technologies such as voice commands and face recognition,

gestures can create a richer user experience that strives to understand the human "language," thereby fueling the next wave of electronic innovation.

This technology is limited in the sense that all whole of human signs or gestures are not recognizable using this technology. The ultrasonic waves spread out and cannot be used to detect gestures like victory sign, where the gesture is made by two fingers.

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3. DISCUSSION

An increasingly large number of devices can capture gestures. A few examples of such devices include Nintendo Wiimote, joystick, trackball, touch tablet, smart phone, data

Gesture recognition is useful in processing information from human beings that is not conveyed through speech or other methods. This technology is useful in following areas:

a. Immersive gaming technology: Gestures may be used to control interactions with the gaming console and give a more interactive and immersive experience.

   Sign Language interpretation: Gesture recognition can be used to transcribe signs into text, just like speech recognition. This would be greatly helpful for the speech impaired.

c. Control through facial gestures: This technology can be used for applications with even more precision like recognizing face gestures. This will be helpful in situations when users cannot use other
d. input interfaces like mouse or keyboard or even hand gestures. This would be additionally helpful in applications like mood sensing.

e. Alternative computer interfaces: Strong gesture recognition can be used to accomplish common tasks performed traditionally with the current input

f. Remote control: By using gesture recognition, it is possible to use hand alone as a remote control for various devices. The signal must not only indicate the desired response, but also which device to be controlled.

g. Home Appliances control: It is possible to extend the gesture recognition technology to control the household appliances.

glove, TI eZ430-Chronos watch, etc. The two most popular algorithms found in gesture recognition literature are hidden markov models (HMMs) and dynamic time warping (DTW). Another limitation of HMMbased methods is that they often require knowledge of the vocabulary in order to configure the models properly, e.g., the number of states in the model. Therefore, HMM-based methods may suffer when users are allowed to choose gestures freely, or for personalized gesture recognition [Liu et al., 2009]. Naïve template-based techniques such as nearest-neighbor search, though easy to implement, will generally not compensate for variations in gesture execution time.

The Leap Motion device is a consumer-grade device, especially designed for HMI applications. It has been conceived for close interaction using the hand motion in a contactless way. The device is able to estimate a hand skeleton for certain hand poses, and also to perform its tracking.

To measure the number of times any unintended motion was detected, we conducted an hour-long test in each of the two locations. Users sat in front of the laptop, but neither performed any explicit gesture nor typed on the keyboard. For the home environment, an average of 2.5 false motion events occurred per minute, whereas for the café 6 events per minute were detected.

4. CONCLUSION & FUTURE SCOPE

Additional gesture recognition opportunities exist in medical applications where, for health and safety reasons, a nurse or doctor may not be able to touch a display or trackpad but still needs to control a system. In other cases, the medical professional may not be within reach of the display yet still needs

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to manipulate the content being shown on the display. Appropriate gestures, such as hand swipes or using a finger as a virtual mouse, are a safer and faster way to control the device.

Gesture recognition may be used in automobiles for user control, and among other motivations as an incremental convenience and safety capability.

Robots, if trained to recognize some gestures can be used in situations of social needs, like rehabilitation or catastrophe, more independently.

A security and smart Internet of Things interaction system based on hand gesture recognition is proposed in this work. When a user points to screen, the target position which the user points to is estimated by a straight line from the user's eye to the fingertip. Therefore, the interaction between human and computer should be activated by the coexisting of eye and hand. In our system, we employ a novel hand segmentation algorithm which combines the pictorial structure model, hierarchical chamfer matching algorithm, and curve fitting that segments hand regions accurately and efficiently. Furthermore, we propose an adaptive pointing direction estimation method for cursor calibration. An adjusting process is presented to correct the offsets between the target position and the calculated position arising from diverse individuals and lack of depth information. Experimental results show that our system provides a natural and friendly human-computer interaction and possesses satisfactory and accuracy of cursor positioning under complex backgrounds.

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