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AN OVERVIEW ON HUMAN GESTURE RECOGNITION

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Abstract:

The objective of this paper is to provide an outline on the subject of Human Gesture Recognition. It primarily contains the elementary explanations and vocabulary, a study on the technologies and tools used in the existing and current systems of the field, architectures used in the ground of Gesture Recognition and finally the applications of Gesture Recognition and number of references for each of the concepts used.

Keywords: Gesture Recognition, Gesture classification, Key Scetch, Unicursal Gesture Interface.

1. Introduction

Humans are interacting with the computer system quite effectively compared to the earlier days. Humans made the machine to understand like a human; hence the machines are improvised to work well with various factors – one of the important key factors is Gesture Recognition with which the human is communicating through the system like giving signs to another human vice versa.

The development in the field of Gesture Recognition is having high quality of interaction and also has a qualified diverse separating in the history of Gesture Recognition [1]. The gesture Recognition has a wide range of research branches on how to simply the issues while communicating the human with the system.

This paper mainly emphasizes an overview on the features of the Gesture Recognition and its working system. The subsequent section(s)drive a short on the basic definitions and terminologies on the Gesture Recognition; a summary of the past and current methodologies used in the field; a description of the different architectures of the Gesture Recognition system and the final section will provide the applications in the respective filed.

2. Human Gesture Recognition: Definition, Terminology

A gesture is a measure of a part of the body, stating a feeling by means of hand or head to direct an idea or meaning. Gestures can be studied from the different fields like drawing on socio-cultural theory, psychology, anthropology,

linguistics, behavioural science, neuroscience, communication, performance studies and dance, and computer science [2]. Gestures are usually considered under the larger term of kinesics that encompasses movement, posture, stillness, head movement, gaze, and facial expressions. Now-a-days the Human Gesture system plays a vital role in interacting with the machine than the devices.

A position is a precise formation of hand flexion detected at some time of occurrence. A sign is an arrangement of positions linked through the gestures by a period of time. In general, a gesture contains one or more postures in sequence occurring on the time axis. These kind of gestures initiate remarkably in outgoing circumstances with respect to the physical world by which the exchange can take place is also the focus of conversation [2].

Functionality and usability are the most key terms by which the users can accept the system or not. The real designed system can finally be defined by what the system can do which implies the working conditions of the system in the extreme levels (high and low) [3]. System functionality can be described by the set of actions or services that offer to the users and it can be observed easily when all the users are using it efficiently. System usability provides how the functionality of the system is effectively utilized for the goals and users. When there is an appropriate steadiness in between the functionality and usability of the system then automatically the success of the system can be achieved [4].

3. Related research

Human Gestures are having a worthy progress in the few years and which shows the unmanageable things to recognize with the concepts and also users can analyse it clearly. Gestures in humans allows to interact with the computer naturally and effectively using non-verbal communication. The progresses through in the past few years on Human Gestures is having an incredible to recognize the features of the system like which model is creative, real [4].

The gestures of a human communication are classified into two types; one is Verbal and the other is Non-verbal communication [5]. The Verbal communication gestures are again divided into four types. Iconic Gestures are strictly related to speech, showing what is being said. It represents object attributes, spatial relationships and actions. For example, a speaker is describing with his hands about a person is tall or short. Deictic Gestures represents pointing movements and especially focus on the finger pointing to an object by the body part such as chin, head and nose etc. [6]. For example, if you were talking about someone across the room you might point them out to your interlocutor.

Metaphoric Gestures stretches an abstract idea into a more precise whereas Iconic gestures represents into concrete. Making your hands into a heart shape and placing them on your chest might indicate your affection for a loved one.

There is a special kind of gesture called Beat gestures, which can be observed by a hand or arm as beating of a finger [7]. Beat gestures can be as short as a single beat or as long as needed to make a particular point. Beating and repetition plays to primitive feelings of basic patterning, and can vary in sense according to the context [8][9]. A beat is a staccato strike that creates emphasis and grabs attention. In a particular conversation [10], a short and single beat will have more importance, whereas the repeated beats can hammer home a critical concept.

Emblems are the definite gestures having a precise meaning that are intentionally used and knowingly understood [6]. These emblem gestures are primarily used to substitute for words and are close to sign language than everyday body language [10]. For example, holding up the hand with all fingers closed in except the thumb finger, can represent for 'OK' or 'done' (if the palm is away from the body) or a rather rude dismissal if the palm is towards the body. Similarly, some of the other emblems gestures in American culture are closing by all fingers of hand except the index and middle finger will represent it as a 'Victory'. There are several emblems look to exist in French and Italian culture than in America, but in few nations do these gestures appear to found more than 10% of the gestures formed by speakers [5]. Hence the emblematic gestures are very easy to remember.

By the motion of the hand and wrist gestures are symbolized with a classification of critical points (local minima and maxima) [11][12] and more springy in matching a gesture both spatially and temporally and thus diminishes the computational requirement. Gestures with changed orientation commonly specify different objects in sign language. The Gestures are used to communicate among the people in a natural way. Now-a-days the system is also recognizing some of our human gestures by using the sensors in the Gesture Recognition System.

UGI is a thumb gesture is used to enlarge the number of gestures possible from a TV remote with a touchpad. UGI pairs a shape with orientation to create a command [13]. According to the Unicursal figures[14] - To remember easily, the user's thumb shapes will start and end at the same positions. For the Handheld devices with touch pads, Unicursal Gesture Interface is a new kind of thumb gesture interface which gives the user to work freely with the system.

4. Gesture Recognition System

Gestures are more likely of nonverbal communication and which are visible bodily actions and used to communicate important messages, either in place of speech or together and in parallel with spoken words [15]. Gesture vocabulary is a set of gestures and their meanings. The tenacity of a gesture-capture sensor is to convert a gesture into digital form. The Gesture Recognition System contains the pitches like Input, Gesture Capture Sensor, Segmentation

(Tracking), Feature extraction and State Machine as shown in the figure 1. Where the input can be given in the form of Gestures like Hand, Arm, Face, Body and eye movements and these inputs are captured by the sensor. Segmentation is the drawing out of the object of interest (e.g., the hand) from the background and the purpose of its position in the scene. Tracking involves the position and/or shape of the same object in every mount of a video structure. In recognition algorithm, the features are used for classification to provide the statistical parameters in both before and after object segmentation. In computational algorithm, the representation of an object can be taken by the recognition mechanism and categorises the object into some well-known class type. The state machine is an appliance which can be used as a sorting of the recognized gesture to change or adjust the state of an electrical or mechanical kit. The state machine is application dependent in its nature [15].

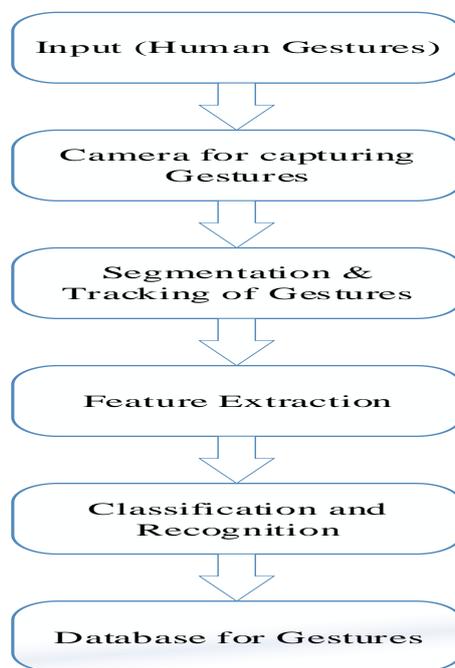


Fig.1: Gesture Recognition System.

The gesturer is entrenched within the context of use both the environment and gestures. A Physical Stimulus can be given as an input to the capture sensor like light waves, sound waves, etc. which is controlled by the gesture. Gestures may be limited to the plane (2-D gestures) or free (3-D gestures), and may be static like configuration based, dynamic by means of motion based, or both. Some of the Gesture based applications in terms of physically based Manipulation like 3D Design Applications such as CAD and telerobotics form the platform of applications that require 3D input to be powerfully used. The hand gestures vary from location to location and which are showed in the Figure 2.1 The different types of face gestures make the system to understand in a better fashion in a natural way but it's a complicated system, because the humans have a different kinds of face gestures as shown in the figure 2.2.

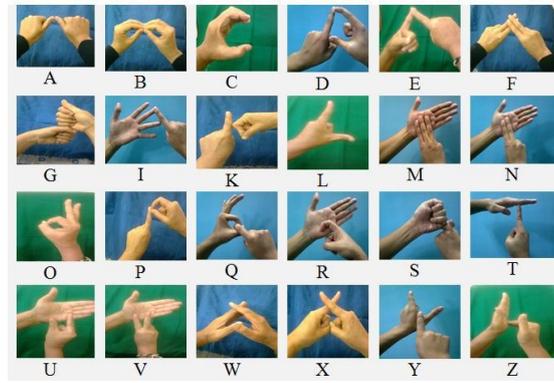


Fig. 2.1 [16] – Sign Gesture.

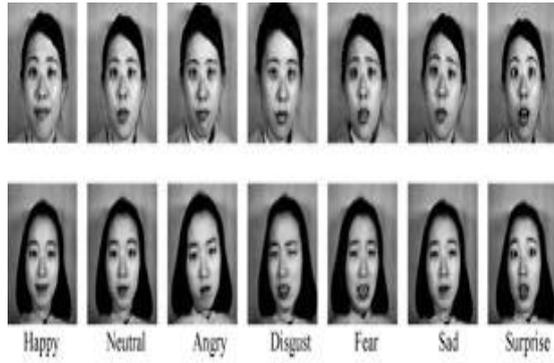


Fig. 2.2 [17] – Face Gesture.

Key Scetch is a new gesture-based text entry process that develops menu-augmented soft keyboards. From the figures 3.1 and 3.2[18] [19], the keyboards have a radial menu is shown around a character as soon as the character is compelled. Each menu item is connected with a character. Key Scetch lies in the introduction of compound strokes connecting in a sequence more characters located in the menu [18]. Text entry on devices armed with a touch-screen is often inefficient, because of the difficulty of using many fingers. An extensive method is the use of a soft keyboard (e.g., with a QWERTY layout) [20] on which the user has to tap to enter a single character at a time as shown in the below figures 3.1 and 3.2.



Fig. 3.1 - Keyscrech

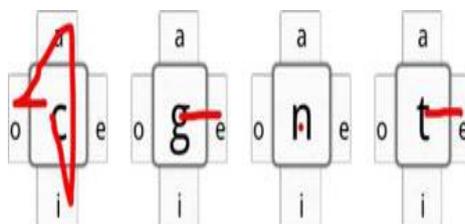


Fig.3.2. Keyscrech (gesture).

In order to permit the users to enter a whole word (and a trailing space) with a single stroke (word-level unistroke) without ambiguity, a circular layout was announced with the Cirrin soft keyboard [19] [21]. The above Figure 3.1 shows a QWERT layout with the radial menu, where the user can freely enter the multiple characters which had shown in the figure 3.2 respectively [22] [23].

By using the radial menu method, the user can easily enter 'n' number of characters with no time and thereby it reduces the burden to enter multiple entries.

KeySretch demands further improvement action compared to the traditional system. However, the total number of modifications (planned as the orders of backspace characters) was lesser through KeySretch (1721) than with the traditional method (2045). Human Gestures are more effective than the spatial language in encoding spatial information [24].

5. Applications

Gesture Recognition has a wide range of applications in the various fields like identifying sign language – communication for the deaf people, monitoring the medical patients [25] [26] [27], communicating the computer machines in the natural way (virtual environment), providing a flexible learning interaction to the young children and controlling the robots along with the wearable computers. Biometric recognition is also a part of the human recognition and which mainly focuses of the multimodal approach towards the human body characteristics such as fingerprints, facial patterns, eye retina, DNAetc [28].

Augmented Reality technology provides a better kind of lively applications [29] with respect to the 3D hand gesture recognition.

6. Conclusion

The study discussed in this paper has shown how the users appearing several features of gestures –Iconic, fatigue, satisfaction, and efficiency. KeySretch is outstanding gesture recognition in terms of the radial menu and its results are effective in speed.

With respect to the numerous gestures what we have taken are completely focused on the primary pitch gestures which are present in the current NVVI literature, tones that are having constant pitch (flat tones) falling or rising tones, and gestures with oscillating pitch. The entire human gestures that are placed in the gesture vocabulary are working with the suitable systems like trajectory matching for dynamic hand gesture recognition through the Hand motion tracking system.

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