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Wearable Based Sign Language Recognition

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Research Article

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Abstract: One of the most important things in a person's life is money. Finance is necessary to go forward in life, whether one is physically handicapped or not. The visually challenged may find it difficult to utilize ATMs, which are often used to take money out of bank accounts. The blind may make their life easier by using basic sign languages to obtain money from ATMs. These are some studies that have addressed the recognition of sign language.
Keywords: Sign Language; ATM; Hand Gestures; Survey; Otsu; Gloves; Wearables

INTRODUCTION

A. Intelligent Wearable Hand Device with Sensor Fusion for Sign Language Interpretation System

A deaf or mute individual may communicate using hand gestures. The use of manually displayed hand motions for easy presentation is made possible by the paper. In this research, a wearable hand device is used to achieve smart sign language interpretation. "Five sensors, two pressure sensors, and a 3-axis inertial motion sensor" make up this apparatus. Thus, "a wearable device with a sensor module," "a processing module," and "a display unit mobile application module" comprise the overall system.

When this gadget is worn, the sensors on the fingers gather and analyze the data using an internal vector machine classifier. The identified gesture is then relayed over Blue Tooth to the mobile application. Currently, an Android software has been created that produces audible speech output from the received text. This article employs the vision method methodology.

Initially, the motions were captured 20 times for a minimum of 10 seconds each and stored in a file format. Subsequently, the primary obstacle throughout the preprocessing phase was the variation in hand size. A smaller hand's flex sensors varied less than those of a bigger hand. As a result, they calculated the mean and SD independently for every individual based on the sensor values. "Complete bend," "partial bend," and "slight bend" were the three sections that made up the flexion division. The first version of gesture recognition uses just flex and inertial sensors; the second version adds pressure sensors for sensor level fusion. Pressure sensors are necessary since certain alphabets fall in the same area. For instance, the second pressure sensor on the middle finger for U is higher than that of V. This was also done for other alphabets that were comparable.

According to the testing findings, the first version sans pressure sensors may obtain an average accuracy rate of 65.7% for sign language recognition. The wearable system's second iteration, which included pressure sensors, significantly improved the identification accuracy rate to 98.2%.

The main difficulty the authors encountered was the fact that various sign languages, such as American sign language (ASL) and German sign language (GSL), varied somewhat from one another. It becomes difficult to create a uniform sign language interpreter.

B. Techno-Talk: A Translator for American

Sign Language (ASL) Observation [4]

The American Sign Language Translator is used in the relevant article. First, a deaf or mute person may wear an electronic wearable glove and communicate using a speaker and an LCD display.

In this case, an accelerometer and flex sensors installed on the gloves serve as the input. When they are bent, the resistance of the flex sensor creates a potential difference. The potential difference measure is used to compute the angle of bent. After completing the A/D conversion, the microcontroller processes the voltage that results from this fluctuation in resistance.

The results from the flex sensors are then compared to a predetermined value specified in the controller. The corresponding alphabet appears on the LCD display if all of the values for a given sign match. This presents a problem when the flex sensor readings are almost identical, such as "U" and "V." In these situations, we record the hand axis using the accelerometer.

In the next phase, the Arduino Mega 2560 receives both of these data as input, and the outputs are the voice box shield, LCD, and speaker. Lastly, the microcontroller recognizes the gesture shown depending on the data being processed.

The wearable gloves are uncomfortable to wear all the time, which is the paper's downside. Additionally, because viruses may spread via the interface, this is an unsafe habit.

Additionally, a number of gesture detection techniques based on image processing have been included. As part of their algorithm, they use the following two techniques.

C. Morphological Filtering Applications to image processing and analysis [5]

The applications of morphological erosions, dilations, openings, and closings to picture edge identification, impulsive noise cleaning, median filtering, region filling, skeletonization, and 2-D form recognition are summarized in this study.

The process of eliminating the white pixels from the backdrop is called erosion. The technique of removing black pixels from hand motions is called dilation. In image processing, region filling is a morphological method. In this case, the area might be either the inside or the frontier.

D.A. Gray-Level Histogram-Based Threshold Selection Method [6]

An automated threshold selection technique for image segmentation is provided that is nonparametric and unsupervised. The discriminant criteria chooses an ideal threshold in order to optimize the separability of the resulting classes in gray levels. Only the zeroth- and first-order cumulative moments of the gray-level histogram are used in this straightforward process. The approach may be easily extended to multi-threshold issues. Additionally, a number of experimental findings are provided to bolster the method's validity.

CONCLUSION

The techniques demonstrate "invasive" gesture recognition techniques; the gadgets must be worn by the user, which may be unsanitary when using ATMs that are accessible to the general public. Additionally, the majority of the publications have focused on image processing methods that may be sluggish when applied to real-time video. Therefore, our goal is to create a quicker algorithm to protect the person's money without using any "invasive" methods.

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