Gesture Identification Based On Neural Network

Tamilarasu Viswanathan, M Mathankumar, R Ramya

Abstract-This paper presented a Gesture based interaction has a wide run of applications in a computing environment, which is a normal way of human machine interaction. It gives an productive human-machine interaction for intuitively and shrewdly computing. The accelerometer sensor is utilized for information securing. The motion acknowledgement basically comprises of two stages: Training and Testing stage. The training stage is performed offline and it comprises of collection of speeding up signals from the accelerometer sensor and the highlight extraction of the speeding up signals. The testing organize is done online. In this venture, two signals are utilized with two highlights. All the two signals are prepared utilizing a single arrange. The strategy utilized to prepare the signals is Extraordinary Learning Machines (ELM) which is a sort of neural organize. The calculation is recreated in overshadow and actualized in arduino for genuine time. The exactness watched for all the three signals is more than 90%.

Key Words: Gesture, Gesture Recognition, Arduino,Neural Network, Machine learning.

I. INTRODUCTION

To improve the quality of life, increasingly more researches has been coordinated towards common human-machine in- teraction. Individuals prefer conventional method which is adaptive and easy way for them to intereact. Pressing button gives the conventional way of giving commands to household apparatuses. Such kind of operation is not characteristic and in some cases indeed badly designed, particularly for ancient individuals or outwardly debilitated individuals who discover troublesome to recognize the buttons on the gadget. To make individuals comfortable to associated with the machine ac- tually, motion based interaction came into presence. Motion Acknowledgment has ended up one of the most critical inquire about regions in the field of shrewdly computing. Most of the past works on the motion acknowledgment are completely based on the computer vision methods. The precision is completely subordinate on the lighting condition and camera confronting points. On the off chance that there is not antic- ipated lighting condition, at that point it will be troublesome to recognize the signal precisely. In expansion, it is too not comfortable on the off chance that individual is required to confront the camera straightforwardly to total a motion. Motion acknowledgment from accelerometer information is an developing procedure for motion based interaction, which suits well in the shrewdly computing environment. With the tremendous development in MEMS (Small scale Electrical Mechanical Framework) innovation, individuals can either wear or carry the accelerometer sensor,

These wireless enabled devices provide the interaction with many applications like gaming, remote control, and other attractive applications. The acceleration data is given by the acceleration sensor based on the linear motion. In processing the accelerometer data, there are several stages involved. This paper fully concentrates on the pre-processing stages and the offline stages to process the incoming gesture data. The main objectives of this work is

- Gesture based interaction has a wide run of applications in a computing environment, which is a normal way of human machine interaction.
- It gives an productive human-machine interaction for intuitively and shrewdly computing.The accelerometer sensor is utilized for information securing.
- The motion acknowledgment basically comprises of two stages: Training (Offline)and Testing stage (online).
- Innovation of this proposed novel techniques is
- To apply the Extreme Machine Learning based Neural network for training and Testing for the first time.
- To ensure the validations of proposed methods the ges-tures ”w” and ”8” are presented purely online.

II. OVERVIEW OF THE PROJECT

To recognize the gesture accurately the project flow has several stages. Gesture has to be identified correctly as well as complexity, processing and efficiency of the gesture should also be taken care. There are two stages ,one is the online stage and the other is the offline stage. The offline stage mainly depends on the training process. It includes many process like filtering ,feature extraction. Neural network has to be trained continuously in order to get better results. Online process is a process which includes preprocessing stage. This is a process where real time results can be seen which has been shown in arduino.The algorithm used to train the network is the extreme machine learning algorithm which is more efficient and gives more accurate results. Two gestures are used and they are W and 8.These gestures are trained from certain group of people which includes both male and female . All these gestures are trained with different positions. Speed also gets varied based on the

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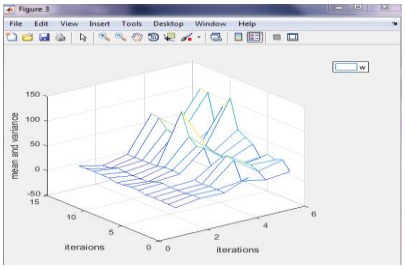

Fig. 1. Collected Sample Data for Gesture 'W' position.

It works at a sampling rate of 200 Hz. The performance of the network is analysed and tested with different sets of people

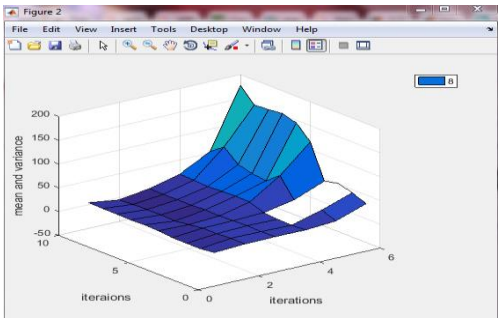

Fig. 2.Collected Sample Data for Gesture '8'

A.Online Stage - Pre Processing

Online stage refers to the preprocessing stage. Low pass filter is used which filters the sampled data .These sampled datas are collected from the accelerometer sensor which is preprocessed and filtered. The real time values are calculated by taking mean and variance of the observed value. Maximum number of samples are taken to gain more accuracy in the result. The neural network will process the input gesture and the output is obtained more accurately.

B. Offline Stage -Processing And Extraction

This is the stage which includes filtering process and feature extraction. In this stage the training of neural network takes place.In this stage ,the preprocessed inputs are feeded to the neural network which is then further filtered and trained. Based on the linear motion of the device, the accelerometer will sense the data and the datas will be collected for all the two gestures.

Low pass filter is used which filters the noise. The complexity is reduced by using this low pass filter. Feature extraction is the stage where all the unique features of the gestures are obtained .The complexity gets increased by adding more features. In order to process the trained data and to produce accurate results, a generic network has to be build.Extreme Learning Machine which is a type of neural network,which is a kind of generic network is used in this project.

C.Neural Network - Extreme Learning Machines

In this project, neural network called Extreme Machine Learning is used.In general ,the computation of neural network will be faster and can get more accurate and better results. These neural network is the combination of more programs and data structures which mimics the human brain artificially.In general ,neural network consists of three important layers named ,input layer,output layer and hidden layer.Artificial neural network is a wide area,which includes recognition of image,recognition of voice etc.In the artificial neural network prediction and analysis of data is made easier and is one of the more efficient method.This neural network has wide range of application .For eg, Cancer treatment in Medical field,agriculture,defence etc. These artificial neural network doesn't impose any restrictions on the input variable. Response time for artificial neural network is very less and hence complexity of the network is also less. New datas can ,be added ,that is informations can be replaceable by deleting the old data and by adding new data.

D.Extreme Learning Machines – Simulation and Results

In most of the neural network ,hidden layers has to be tuned and learning speed is not that much good when compared to extreme learning machine. In ELM,the hidden nodes can be randomly assigned and there is no need of updation of weights. It has single or multilayer hidden nodes for classi- fication, regression,compression and are feed forward neural network.When compared to back propagation,the learning speed is very high and will produce good generalization performance. There are many activation function available.The activation function used hear is the sigmoid function which is a non linear function.It converts the input into more useful output. Without the activation function ,the system would be simply linear .Though ,linear functions are simple in computing, they have their limitations in complexity and has less power to learn complex mapping from the datas. Activation function plays a vital role in a neural net- work .Without this,it is tough for the neural network to learn and model other complicated datas such as speech, audio etc. Hence, we always prefer deep learning to perform complicated,non-linear big datasets in order to obtain more accuracy and better results. This extreme learning machine algorithm,has three following steps:

• Input weights of hidden node parameters are generated randomly.

III. EXPERIMENTAL RESULT

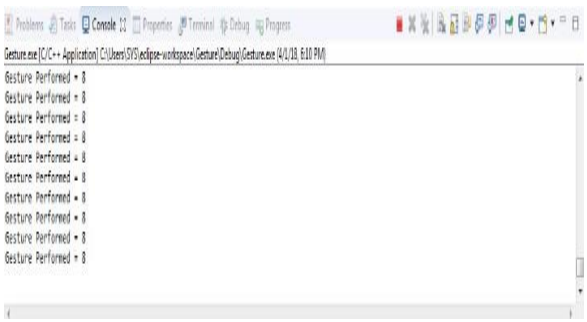

Fig. 3. Gesture 'W' - Eclipse Output

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Fig. 4. Gesture '8'- Eclipse Output

Fig. 5. Gesture 'W' - Arduino Serial Output

• Input vectors and the weights of the hidden layer has to be multiplied in order to calculate the output matrix (Activation Functions) .

• Output weight vectors have to be calculated.

IV. HARDWARE RESULT

This is the testing stage ,where the preprocessed and training datas are finally tested for the accuracy .These gestures are asked to perform by many of the people and those group of datas has been collected and tested for accuracy. More than, 90 percent accuracy has been obtained.

Fig. 6. Gesture '8'- Arduino Serial Output

V.CONCLUSION AND FUTURE SCOPE

Ranges for w and 8 has also been extracted from MAT-LAB,Gestures has been simulated simulated in eclipse and Real time results implemented in Arduino Due.In future,except these two gestures, in the same network, other gestures are going to be used and test accuracy will be tested. There is another layer called application layer in which The gestures which are tested using this algorithm will be mapped.

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