

AN AI BASED AIR GESTURE KEYBOARD

Rohan Saligrama¹, Mohammed Faiz Shariff², Siddesh B³, Sudarshana V⁴, Sunil Kumar B R⁵

Student, Department of Computer Science, Vidhyavardhaka College of Engineering, Mysore, India¹⁻⁴

Assistant Professor, Department of Computer Science, Vidhyavardhaka College of Engineering, Mysore, India⁵

Abstract: There are many systems on gesture recognition which already exists but in many systems user should remember many different gesture signs which makes it much difficult. In this paper we scrutinize the contribution of Artificial Intelligence in the field of healthcare in developing a system to communicate with computer using hand gestures that finds its importance in technology and also helps the visually impaired.

AI based air gesture keyboard is a model that includes Air-writing which is especially useful for user interfaces that do not allow the user to type on a keyboard. The system uses an Arduino board interfaced with an accelerometer. This has a combined program structure to recognize both alphabets and numbers as per requirement.

This model maintains a dataset in order to realize every gesture differently the system is trained with the same gesture many number of times to recognize. This gesture can then be assigned to perform a task on the computer and uses an algorithm to pick the input from the user.

Keywords: gesture, Artificial Intelligence, arduino, MPU6050.

I. INTRODUCTION

Improving and aiding people with computer technologies has found greater interests in every field. Especially in medical and health care researches are been carried In an every possible way to address this visually impaired and blind people are Preferring computers in recent years instead of traditional reading and writing in braille.

There are many solutions available for interaction are keyboards with sound feedback, voice recognition and Braille and finger interfaces. Interfaces based on sound finds a disadvantage with respect to effectiveness in a crowded areas. The gesture give admiring modality for general relationship.

Motion gestures are meant to be simple so that a user can easily memorize and perform them. For the general interaction these Motion gestures imparts a approbatory modality. In order to make it easier for the users to remember and produce the gestures remove from however-control. AI based gesture keyboard is one of the system based on machine learning algorithm and systemized by python programming language The main purpose is to develop and build a efficient system to recognize the gesture and produce the dedicated functions that we decide. We will exhibit this by training the system to recognize the different letters that we make in air the Arduino board will be interfaced with an accelerometer and the device will be attached to the hands of user the input will be provided by the accelerometer to the microcontroller the input that it gets is about the hand's coordinates. An algorithm will be used to pick this data a separate database is maintained to remember and differentiate the gestures after all these we are going to train the system by giving the same input many number of times so that it will gather the required information about how the gesture will look like this gesture can then be assigned to perform a task on the computer.

The gesture based interaction will be replaced by the conventional interaction methods and provides us the kind of reality. The way we control computer is not just press action .It becomes more richness with a development of science and technology.

II. LITERATURE SURVEY

A. Vidy Chitre provides the structure of the arduino pro microcontroller board and describe the use of device MPU-650 which is an accelerometer that finds its application in motion tracking. Also explains about how it is adapted in order to utilize lower power ,how it is made cost effective and to provide high performance requirements of wearable sensors.[4]

B. Dhruvateja in his paper emphasizes the contribution of how Artificial Intelligence and Machine Learning towards the development communicate with computer using hand gesture and it has helped in automating processes to help visually impaired people.[1]

C. Markus illustrate demonstrates/data classification technique by using the, Convolutional Neural Network

(CNN) and Support Vector Machine approach (SVM). Thus explains how it performs the classification space for all inputs. Classification is mainly used for recognizing and differentiating the letters of the user inputs. Francisco Arce has discussed about recognition process by using the Artificial Neural Network (ANN) methods.[6]

D. Pavithra Ramaswamy proposed an air writing system by making use of depth, color and information of movement and how it makes the entire system user-friendly she majorly specifies the implementation of finger motion tracking system that enables easier typing.[11]

E. Naved Ahamed explains the difficulties in massive data inputs and how this limitations has been overcome by new input methodologies providing greater way to communicate. He suggests that gesture could nicely serve those people who are visually impaired by providing effective service.[2]

TABLE I : ACCURACY TABLE

Various papers	Algorithm	Accuracy	Technology
Hand gesture using Artificial Intelligence [1]	Convolution Neural Network (CNN)	--	Artificial Intelligence and Machine Learning
Hand Gesture Recognition Interface for Visually impaired and blind people[6]	Hand Gesture Recognition Interface for Visually impaired and blind people[6]	94.24%	Touchpad
Machine Learning based energy efficient smart gesture keyboard using wireless sensor[2]	Support Vector Machine (SVM)	98.94%	MEMS Technology
Gesture recognition using Micro-Doppler signatures with CNN[3]	Convolution Neural Network (CNN)	85.6%	Micro-Doppler Signatures
Arduino and Remote based Gesture Keyboard[4]	Support Vector Machine (SVM)	98%-100%	Arduino and Remote based
Accelerometer-Based Hand-Gesture Recognition Using ANN[8]	Artificial Neural Network (ANN)	94%	Accelerometer
Detecting Mid-Air Gestures for Digit Writing With Radio Sensors and a CNN[9]	Convolution Neural Network (CNN)	90%	Radio Sensors
HGR Based Text Input Method for AR/VR Wearable Devices[10]	Convolution Neural Network (CNN)	92.6%	AR/VR Wearable Devices

The above table-1 shows the Algorithm, Accuracy and the type of Technology used in various papers.

III. PROBLEM STATEMENT

The traditional interaction mainly uses keyboard and mouse to perform text input. User needs to press a key to input one alphabet that the user wants, this study examines how machine learning methods can be used to create a gesture keyboard with the purpose of finding approaches that could enhance future gesture keyboards.

There are many challenges associated with the accuracy and usefulness of a gesture recognition software. Gesture recognition is one of the technology that uses sensor to read and interpret hand movement as commands gesture include different parts of usually actions which are motion by hands, fault expressions and many more.

In normal keyboard some letters won't type, because of some dust that can be stuck in few keys and also some buttons are sticking. There might be some connection issues or problem which is one type of the most common problems that you may see in these keyboards fault components also play a major involvement cost effectiveness is one of the important factor traditional keyboards are a kind of costly which can be overcome by the proposed work.

The main idea was to develop and implement an algorithm which is based on Machine learning using this machine learning methods based algorithm we will be validating if or if it not results in feasible gesture input keyboard the algorithm was evaluated from three perspectives in order to test whether the determined goal has been reached

- Examining the performances with dictionaries of different sizes.
- Examining the performance of different categories of words.
- Examining of usability regarding speed and accuracy.

IV. IMPLEMENTATION

A. Here we are using Arduino and accelerometer to sense and identify the inputs from user

Microcontroller is programmed with Arduino IDE which has inbuilt functions available which makes programming easy. For recognizing gesture, the environment is written in python and based on Processing and other open-source software.

Firstly the sensor module chosen is MPU-650. MPU-650 is an Inertial Measurement Unit (IMU) with six degrees of freedom (6DOF). Inertial Measurement Units is differentiated by the degrees of axis that they are able to measure. The sensor module features a tri-axis accelerometer and a tri-axis gyroscope thus the 6 degrees of freedom.

The Arduino UNO is the main processing of all the sensor data happens in the microcontroller which will be the main component in this project. The objective of using the microcontroller is it serves as a medium for the raw sensor values to be processed into useful information and translated into computer system.

Button switch is one of the design decisions that we came across was how to let the microprocessor know that a sign was being made. One of the options was to have a single push button that would be pressed when we wanted the system to start predicting.

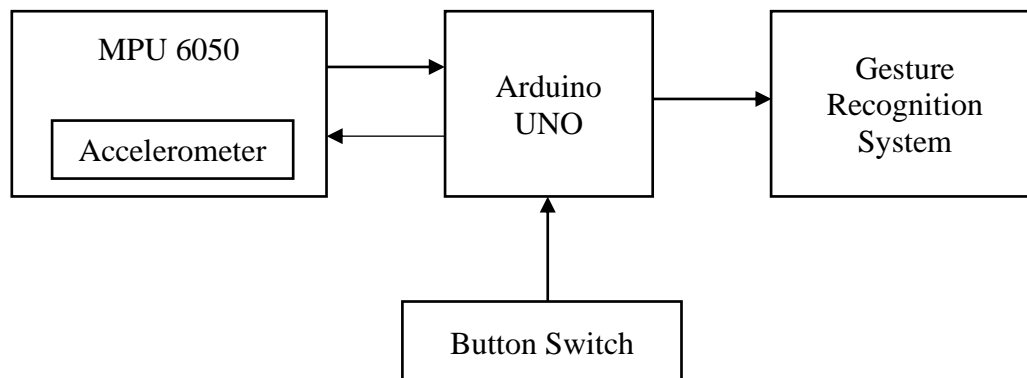


Fig 1. Block Diagram of Proposed System

B. Artificial Intelligence and Machine Learning

In the field of digital world Artificial Intelligence is advancing increasingly and a sub set of Artificial Intelligence, the Machine learning is acquiring over everything since it is viable to train machines just like humans for performing

composite jobs . Thus Machine learning can be used in order to change the current world scenario to develop AI based Air gesture keyboard to provide efficient human computer interaction .We are implementing a system which is of low cost ,very much responsive where a person can make any gesture of numbers and alphabets by simply writing in the air without typing. The gesture coordinates will be read by the sensor and will be picked to convert it into special sequences. The system will be trained with different ways for multiple times .The inputs which were read will be appearing on the computer display were the prediction and the differentiation of the inputs will be done by SVM algorithm which is based on Machine learning.

There are different types of Machine learning techniques they are supervised learning, Unsupervised learning, Reinforcement learning.

Supervised learning uses a training set to teach models to yield the desired output. This training dataset includes inputs and correct outputs, which allow the model to learn over time. The algorithm measures its accuracy through the loss function, adjusting until the error has been sufficiently minimized.

Unsupervised learning the use of synthetic intelligence (AI) tructures algorithms to identify patterns in data sets containing data points that are neither classified nor labelled.

Reinforcement learning is a sort of machine learning in which favorable behaviors are rewarded while undesirable behaviors are punished. In general, a reinforcement learning agent can monitor and understand its environment, respond, and learn through trial and error.

C. Here we are using Supervised Learning for classification

Supervised learning uses a training set to teach models to yield the desired output. This training dataset includes inputs and correct outputs, which allow the model to learn over time. The algorithm measures its accuracy through the loss function, adjusting until the error has been sufficiently minimized. In supervised learning, we have got Numerous algorithms to assemble models, consisting of KNN, Naive Bayes, Decision Tree, ID3, Random Forest, SVM, Regression methods, and so on.... We choose out the finest Approach for recognition.

Here we are using Support Vector Machine (SVM) for recognition of different letters

Support Vector Machines are the classifiers which are widely used supervised learning algorithms. SVM dissociate data points by using hyperplane, who's very basic aim is to find the Maximum marginal hyperplane-MNH, this will differentiate the input data into different class. Classes may be any in number. In our system for example for alphabets, Class 1 represent A class 2 for B etc. In order to get the classification line to have correct results within the available time Regularization is done.

V. FUTURE SCOPE

The proposed remote based gesture keyboard is idiosyncratic idea which provides exculpation at work and also contains and includes multi-linguistic functionality, further improvement and enhancement of this model is not for monitoring the users but also to estimate the use of the gestures in the future. The proposed model can be embedded in smart-watches with additions of high data transfer data rate which can be a part in any industrial or organizational use or educational environment for teaching and students. We can enhance it to make waterproof which can be used in rain or any water space. The model can be combined with the projector so that it can write and explain by combined use of it by entering the content or point without using a traditional keyboard. This system can also be suitable for small children to make them study at an early age witch can keep them engage them in study with delight and joy which may enhance their learning skills and recognition skills.

VI. CONCLUSION

The AI based Air gesture keyboard concept proposed in this paper draws a complete new idea. This system is not only for technical purpose but also can be used in market prospective. The main factor of this project is users don't have to learn precondition or requirements and also do not want to remember certain gesture or buttons as compared to traditional or existing keyboard because of which because of this the air gesture recognition keyboard is very much different from other recognition keyboards. The handwriting differs from one person to another, which causes an issue of 100 percent efficiency and creates a large data set .This can be solved in the future enhancement.

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