International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 06 Issue: 12 | December - 2022 Impact Factor: 7.185 ISSN: 2582-3930

Sign Language Recognition using Machine Learning

Rohan Golam*, Siddhant Zingade*,Yash Khot*, Saloni Khushwaha* , Prof. Dr. Jyoti Mali**

* Department of Electronics and Telecommunications,[1] Atharva College Of Engineering
[1] Mumbai-095, Maharashtra

***ABSTRACT*-This is a paper for a Sign Language Recognition System. The end user will be able to learn and understand sign language through this system. Machine Learning is an up and coming field which forms the basis of Artificial Intelligence. Machine Learning has been widely used for optical character recognition that can recognize characters, written or printed. The principles of supervised learning have allowed us to come up with many classification, prediction and identification systems. Sign Language is mainly used by deaf (hard hearing) and dumbpeople to exchange information between their own community and with other people. It is a language where people use their hand gestures to communicate as if they can't speak or hear.**

Keywords: Sign language, image recognition, machine learning, Support Vector Machines (SVM)

1.INTRODUCTION

Communication is very crucial to human beings, as it enables us to express ourselves. We communicate through speech, gestures, body language, reading, writing or through visual aids, speech being one of the most commonly used among them. Visual aids, or an interpreter, are used for communicating with them. However, these methods are rather cumbersome and expensive, and can't be used in an emergency. Sign Language chiefly uses manual communication to convey meaning. This involves simultaneously combining hand shapes, orientations and movement of the hands, arms or body to express the speaker's thoughts. People with hearing disabilities and/or speech disabilities use a standard sign language which cannot be understood by people who do not know it. Also, learning sign language is hindered by their disability. A modern learning and translation tool for sign language implemented in Machine Learning can significantly affect the ease of Sign Language Communication. However, the following factors pose some challenges to this system: 1. The conditions of the illumination in the place where this system is used has to be considered, as it plays an important role in the accuracy of the recognition. 2. It has to be made sure that the hand gesture is at an ideal distance from the camera 3. The camera must capture the hand up to the wrist at least, and it must not focus on background subjects 4. Identifying the features of the symbols that can be used in the system to get a better accuracy This system aims to consider these challenges and recognize Sign Language Symbols .

2. DATASETS

For this project, we use the ASL(American Sign Language) dataset.

2.1 ASL (American Sign Language)

American Sign Language (ASL) is a complete, natural language that has the same linguistic properties as spoken languages, with grammar that differs from English. ASL is expressed by movements of the hands and face. It is the primary language of many North Americans who are deaf and hard of hearing and is used by some hearing people as well. ASL is a complete and organized visual language that is expressed by both manual and non-manual features.

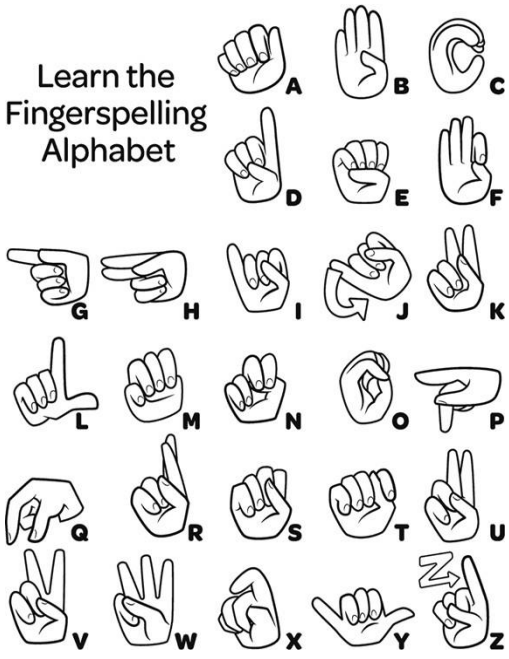


fig.2.1 American Sign language

3. ALGORITHM

3.1 SVM (Support Vector Machine)

Support Vector Machine or SVM is one of the most popular Supervised Learning algorithms, which is used for Classification as well as Regression problems. However, primarily, it is used for Classification problems in Machine Learning.

The goal of the SVM algorithm is to create the best line or decision boundary that can segregate n-dimensional space into classes so that we can easily put the new data point in the correct category in the future. This best decision boundary is called a hyperplane.

SVM chooses the extreme points/vectors that help in creating the hyperplane. These extreme cases are called support vectors, and hence the algorithm is termed as Support Vector Machine. Consider the below diagram in which there are two different categories that are classified using a decision boundary or hyperplane:

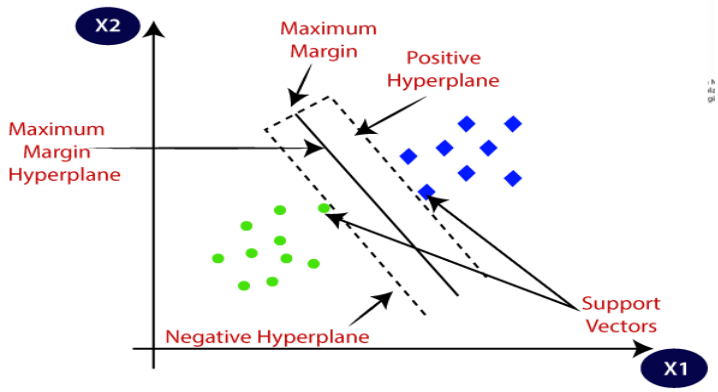


Fig 3.1 SVM (Support Vector Machine)

3.1.2 Types Of SVM

Linear SVM: Linear SVM is used for linearly separable data, which means if a dataset can be classified into two classes by using a single straight line, then such data is termed as linearly separable data, and classifier is used called as Linear SVM classifier. **Non-linear SVM:** Non-Linear SVM is used for non-linearly separated data, which means if a dataset cannot be classified by using a straight line, then such data is termed as non-linear data and classifier used is called as Non-linear SVM classifier.

3.2 k-NN (k-Nearest Neighbors)

The k-nearest neighbors (KNN) algorithm is a simple, supervised machine learning algorithm that can be used to solve both classification and regression problems. It's easy to implement and understand, but has a major drawback of becoming significantly slows as the size of that data in use grows.

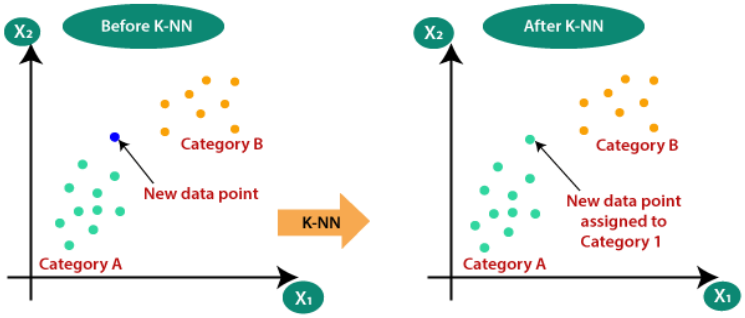
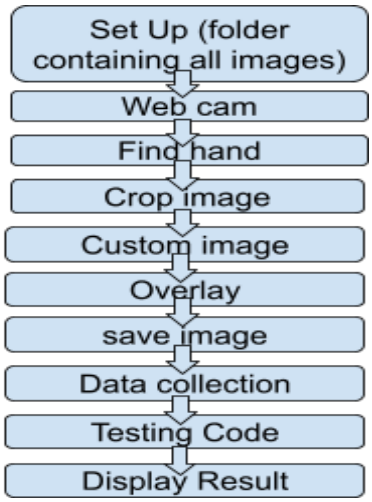


Fig 3.2 k-NN (k-Nearest Neighbors)

4.FLOW CHART



5. ADVANTAGE

It is the most potent and effective way to **bridge the communication gap and social interaction between them and the able people**. Sign language interpreters help solve the communication gap with the hearing impaired by translating sign language into spoken words and vice versa.

6. LIMITATION

Sign language requires the use of hands to make gestures. This can be a problem for people who do not have full use of their hands. Even seemingly manageable disabilities such as Parkinson's or arthritis can be a major problem for people who must communicate using sign language. Having a broken arm or carrying a bag of groceries can, for a deaf person, limit communication. The amount of light in a room also affects the ability to communicate using sign language.

7. FUTURE WORK

We can develop a model for ISL word and sentence level recognition. This will require a system that can detect changes with respect to the temporal space. We can develop a complete product

that will help the speech and hearing impaired people, and thereby reduce the communication gap.

.8. CONCLUSION

An American Sign Language Interpreter has been implemented based on a Support Vector Machine Classifier (SVM). The system requires some constraints, like a white background and the palm of the hand to face the camera. Further, similar symbols were sometimes misinterpreted for one another. This could be due to the limited training provided to the system. The system might overcome these limitations if a more detailed dataset in different environmental conditions is provided for training. Also letters that needed movement of the hands could not be properly identified.

.8. REFERENCE

1. Adeyanju, I. A., Omidiora, E. O., & Oyedokun, O. F. (2015). Performance evaluation of different support vector machine kernels for face emotion recognition. In Proceedings of the SAI intelligent systems conference, intellisys 2015 (pp. 804–806). https://doi.org/10.1109/IntelliSys.2015.7361233

2. Camgoz, N. C., Hadfield, S., Koller, O., & Bowden, R. (2017). SubUNets: End-to-end hand shape and continuous sign language recognition. In Proceedings of the IEEE international conference on computer vision (pp. 3075–3084).2017-Octob.https: //doi.org/10.1109/ICCV.2017.33

3. Video on Easy hand sign detection Murtaza workshop https://youtu.be/wa2ARoUUdU8

4. Sign Language Recognition ,Muskan Dhiman https://edu.authorcafe.com/academies/6813/sign-language-recognition

5. Support Vector Machine https://www.javatpoint.com/machine-learning-support-vector-machine-algorithm

6. C. Dong, M. C. Leu and Z. Yin, "American sign language alphabet recognition using microsoft kinect", Proceedings of the IEEE conference on computer vision and pattern recognition workshops, pp. 44-52, 2015.

7. S. Kido, Y. Hirano and N. Hashimoto, "Detection and)", *2018 International Workshop on Advanced Image Technology (IWAIT)*, pp. 1-4, 2018.

8. Qutaishat Munib, Moussa Habeeb, Bayan Takruri and Hiba Abed Al-Malik, "American sign language (ASL) recognition based on Hough transform and neural networks", *Expert Systems with Applications*, vol. 32, no. 1, pp. 24-37, 2007, ISSN 0957-4174.

9. Mukesh Kumar Makwana, " Sign Language Recognition",M.Tech thesis, Indian Institute of Science, Bangalore

10. Sakshi Goyal, Ishita Sharma, S. S. Sign language recognition system for deaf and dumb people. International Journal of Engineering Research Technology 2, 4 (April 2013).

11. Kumar S, Yadav G, Singh HP, Malhotra S, Gupta A (2018) SVM classifier and hand gesture based sign language recognition. In: International conference on intelligent circuits and systems (ICICS). Phagwara
12.