Sign Language Detection

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Abstract

This project focuses on detection of sign for hand gesture techniques and introduces merits and drawbacks in various circumstances. The hand segmentation theory and hand detection system is used for constructing hand gesture recognition by using Python with OpenCV. The hand gesture is as a natural interface which motivates research in gesture taxonomies, representations, and recognition methods/algorithms and software platforms/ frameworks, all of which are covered with detail in this project. The ever increasing public acceptance and fund for multinational projects emphasizes need for sign language. The desire for computer-based solution is important in recent age of technology for deaf people. Still, researchers are studying the problem for quite sometimes and results are showing promises. This project represents the comprehensive review of vision oriented sign recognition methodologies, emphasizing importance of taking things into consideration moreover with algorithm's recognition accuracy during predicting the success in real world scenario. This project matches given image with dataset images with numerous categories of sign (gestures). Here the convolutional neural network (CNN) has been implemented to increase the accuracy level. This project applies gray scale conversion, then binary image conversion and finally histogram construction and matching of given test image with data set images. The coding language used is Python 3.8.

I. INTRODUCTION

The increased public acceptance and funding of international projects emphasizes necessity of the sign language. The desire for the computer-based solution is significant in this age of technology for deaf people. However, researchers are attacking the problem of quite sometimes now and the results show some promises. Although interesting technologies become available in voice recognition, but there is currently no commercial solution for sign recognition in markets. The goal is to make computers for understanding human language and developing a user-friendly HCI (human computer interface).
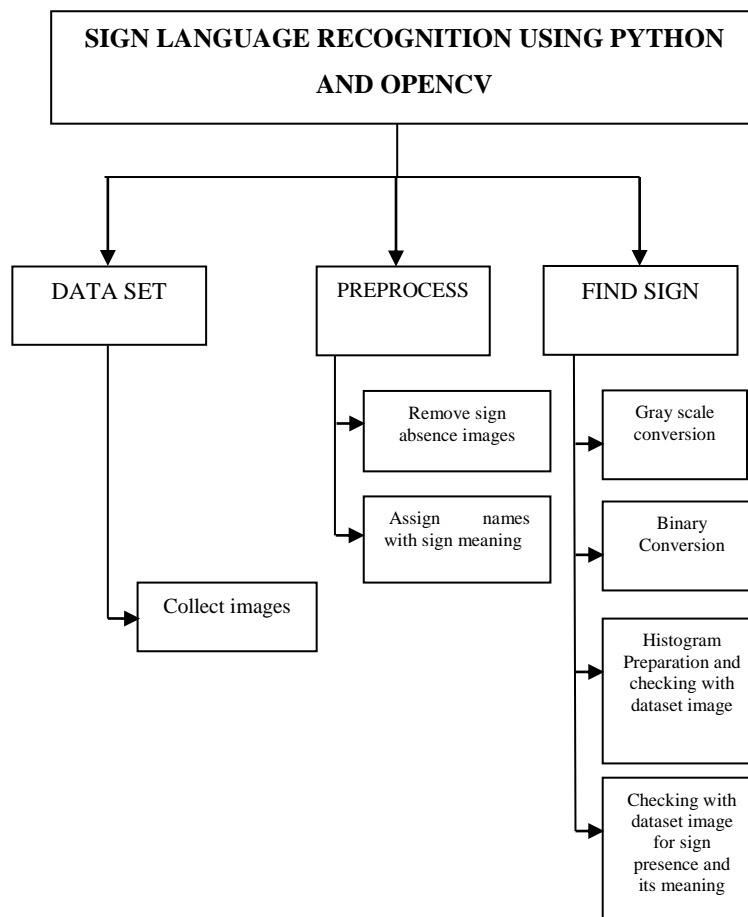
Some steps toward this goal include teaching a computer for recognizing speech, human gestures and facial emotions. Gestures are non-verbal exchanged information. Gesture recognition is an aspect of human-computer interaction which demonstrates the academic treatise and is vital for popularizing notion of the human-to-human connection and open dialogue that implies the correlation between user and machine [1].

Gesture analysis is the scientific field which recognizes gestures like hand, head, arm and even structural motions which usually entail the certain posture and/or motion. Using hand gestures, individual may tell/send out more information in shorter amount of time. Several approaches are explored in application of computer-vision ideas to real-time processing of gesture outputs. [2].

The Computer Vision study concentrates in gesture recognition in open CV framework with Python language. Language is huge part in communication. Languages are useless for persons with disabilities. Gesture is vital and meaningful communication mode for visually impaired person. So here is the computer-based method for regular people in understanding what differently-abled

individual try to say. To monitor, there are numerous similar algorithms and object recognition systems.

This allows identification of gestures that overcome the boundaries and disadvantages of earlier systems. Various robust approaches in gesture recognition are developed as well as reported to function well. The video/image is one of the demonstrations of hand gesture detection systems to operate a robotic arm. Adaptive boosting, Neural networks and Support Vector Machine are the algorithms utilized in reconnaissance. Hand gestures [3] are implemented with the use of convex hull for better fingertip identification.

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┌─────────────────────────────────────────┐
│  SIGN LANGUAGE RECOGNITION USING PYTHON  │
│              AND OPENCV                   │
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    ┌────────┐  ┌──────────┐  ┌──────────┐
    │DATA SET│  │PREPROCESS│  │FIND SIGN │
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DATA SET	PREPROCESS	FIND SIGN
	Remove sign absence images	Gray scale conversion
	Assign names with sign meaning	Binary Conversion
		Histogram Preparation and checking with dataset image
Collect images		Checking with dataset image for sign presence and its meaning

The accuracy result for corresponding paper is more than existing systems. The objective is to highlight effective methods widely of capturing gestures which are fundamental in recent past. It explains also how to identify skin colors in shape identification using convex hull approach and the YCbCr color space transformation. For accurately formed results, ten users provide 330 cases of various hand movements.

It also describes a python-based Linux-based hand motion recognition system. The algorithm utilized isn't depending on the context. It recognizes the number of fingertips and as well as the task carried out per requirement The 2011 Indian census cites roughly 1.3 million people with "hearing impairment". In contrast to that numbers from India's National Association of the Deaf estimates that 18 million people roughly 1 percentage of Indian population are deaf. These figures provided the impetus for our endeavour.

Hence the need for a system since these speech impaired and deaf persons require an appropriate route to communicate with regular people. Not everyone can comprehend the sign language of the disabled. As a result, the project aims to transform sign language motions into text that can be read by ordinary people.

II. LITERATURE REVIEW

Swapnil Athavale and Mona Deshmukh."Dynamic hand gesture recognition for human computer interaction",2014:The authors stated that as computers are becoming more pervasive today, facilitating natural human–computer interaction (HCI) have a positive impact in their uses. So, there has been growing interests in development of new approaches and technologies to bridge the human–computer barrier. The ultimate aim is to come up with HCI to the regime in which interactions with computers will be as natural as an interaction between human beings, and to this end, incorporate gestures in HCI is one of the important research areas.

Gestures have been considered as an interaction technique that could potentially deliver natural, creative and intuitive methods to communicate with the computers. The hand gestures use as a natural interface serves as motivating force to research in gesture taxonomies. Gesture recognition is being done in three main phases i.e. a) detection, b) tracking and c) recognition. The main goal of this project is to provide researchers in field of gesture based HCI with a summary of progress achieved up to date and then to help identify areas where further research is needed.

Computer is used by more people either at their spare time or in their work. Special input/output devices are being designed over years with the purpose of easing the communication between humans and computers; two most known are keyboard and mouse. Every new device are being seen as a try to make the computer more intelligent and making human beings able to do more complicated communication with the computer.

This has been possible due to result oriented efforts being made by computer professionals to create successful human computer interfaces. As the complexities of human needs are turning into many folds and continues to grow, need for Complex programming ability and intuitiveness are the critical attributes of computer programmers to survive in the competitive environment. The computer programmers are incredibly successful in easing communication between computers and human. With the emergence of new product in markets; it attempts to ease complexity of jobs performed.

Earlier, Computer programmers are avoiding such kind of complex programs as focus was more in speed than other modifiable features. But, a shift towards a user friendly Environment has driven them to revisit focus area. The idea is to make the computers understand human language and then develop a user friendly human computer interfaces (HCI). Making a computer understand speeches, facial expressions and also human gestures are some of the steps towards it. Gestures are non-verbal exchanged information.

A person can do innumerable gestures at a given time. Since human gestures are perceived through visions, it is the subject of great interest for computer vision scientists/researchers. The project aims to find human gestures by creating an HCI. Coding of the gestures into machine language demands the complex programming algorithm. In present world, interaction with the computing devices is being advanced to such an extent that as humans it become necessity and humans cannot live without it.

The technology has become so embedded into daily lives that we are using it to work, communicate and even entertain our self. It is widely believed that communication, computing and display technologies progress then, but existing techniques may become a bottleneck in the effective utilization of available information flow. To efficiently use them; most computer applications require more and more interaction.

GRS Murthy and RS Jadon."A review of vision based hand gestures recognition", 2009:the authors stated that with ever-increasing diffusion of computers into society, it is widely believed that the present popular mode of interactions with the computers (keyboard and mouse) become a bottleneck in the effective utilization of information flows between computers and human.

Vision based Gesture recognition has a potential to be natural and powerful tool that support efficient and intuitive interaction between human and computer. Visual interpretation of hand gestures help in achieving ease and naturalness desired to Human Computer Interaction (HCI). This motivated many researchers in the computer vision-based analysis and interpretation of the hand gestures as a main active research area.

They surveyed the literatures on visual interpretation of hand gestures in context of its role in the HCI and numerous seminal works of researchers are also emphasized. The purpose of this review is introducing the field of gesture recognition as the mechanism to interact with computers.

With the development of information technology in the society, we expect that computer systems to the larger extent are embedded into the environment. These environments impose needs for new types of human computer interaction, with interfaces that are easy to use and also natural. The user interface (UI) of personal computers has evolved from a text-based command line tool to a graphical interface with mouse and keyboard inputs.

But, they are inconvenient and unnatural for many people. The hand gestures use provides an attractive alternative to the cumbersome interface devices in human-computer interaction (HCI). User's generally use hand gestures to express their feelings and notifications of thoughts. So, in particular, visual interpretation of hand gestures help in achieving ease and naturalness desire to HCI. Vision has a potential of carrying the wealth of information in non-intrusive manner and also at low cost, therefore it constitutes very attractive sensing modality to develop hand gestures recognition.

Vinayak S Kunder, Aakash A Bhardwaj, and Vipul D Tank."Sign language recognition system": That authors focused on reviewing the literatures on hand gesture techniques and also introducing their merits and limitations in different circumstances. The theories of hand segmentation/ hand detection system, which employ Haar cascade classifier, were used to construct the hand gesture recognition with Python and OpenCV. The use of hand gestures as the natural interface motivated research in gesture representations, taxonomies, and recognition algorithms, and software platforms/frameworks, all of which are briefly covered in that paper.

They represented the comprehensive reviews of vision based sign recognition algorithms published in previous 16 years, emphasizing importance of taking the things into consideration in addition to algorithm's recognition accuracy during predicting its successful in real world applications.

The increased public acceptance and funding of international projects emphasizes necessity of the sign language. The desire for the computer-based solution is important in these age of technology for deaf people. However, re- searchers have been studying the problem sometimes now and results are showing some promises.

Although interesting technologies are becoming available for voice recognition, there is currently no commercial solution to recognize sign on the market. The goal is to make the computers to understand the human language and then develop a user-friendly human computer interface (HCI). Some steps toward this goal include teaching the computer to recognize speech, human gestures and facial emotions.

III.PROPOSED METHODOLOGY

The existing system focuses on checking the image with hand gesture sign present or not. The image is checked exactly with the data set image and if it matched with any of the image in dataset, then it is decided as sign present in the given image. No binary image conversion and histogram checking is made for test image with data set image collection. Even slight variation in given image can be declared as sign absence.

- Data set images with hand gesture available are collected but not categorized with sign meaning.
- Input images are checked only for sign present or not.
- Binary image preparation and histogram presence checking is not made for test image.
- Only hundred percent match of given image with dataset image are taken for sign presence.

The proposed system focuses on existing system work and in addition, it checks the image with hand gesture sign present along with the meaning of sign. The image is first gray scale converted and binary image conversion takes place. Then histogram values are prepared and checked

with the data set image and if it matched with any of the image in dataset, then it is decided as sign present in the given image.

Binary image conversion and histogram checking of test image with data set image collection not only finds the presence of sign but also meaning of sign is also found out.

1. DATA SET COLLECTION

The dataset is collected which contain images with hand gesture sign as well as its category. Some of the categories are happy, welcome, eating, thank you, sorry and please, etc.

2. GRAYSCALE CONVERSION

The dataset is collected which contain images with hand gesture sign as well as its category. Some of the categories are happy, welcome, eating, thank you, sorry and please, etc. During input image checking for sign presence, the image pixels are converted to its grayscale value for both input image as well as images in dataset folders.

**3. BINARY IMAGE CONVERSION AND HISTOGRAM PREPARATION**

During input image checking for sign presence, the image pixels are converted to its grayscale value and then binary values are prepared, then histogram values are prepared for both input image as well as images in dataset folders.

4. FIND SIGN PRESENCE IN IMAGE

During input image checking for sign presence, the image binary values (histogram data) are compared with all images in dataset folders which are also prepared with histogram values.

**5. FIND MEANING OF SIGN IN IMAGE**

During input image checking for sign presence, the image binary values (histogram data) are compared with all images in dataset folders which are also prepared with histogram values. The data set images are given names with their meaning like happy, thank you etc. The names are extracted and displayed after the input image is matched with any of the data set images.
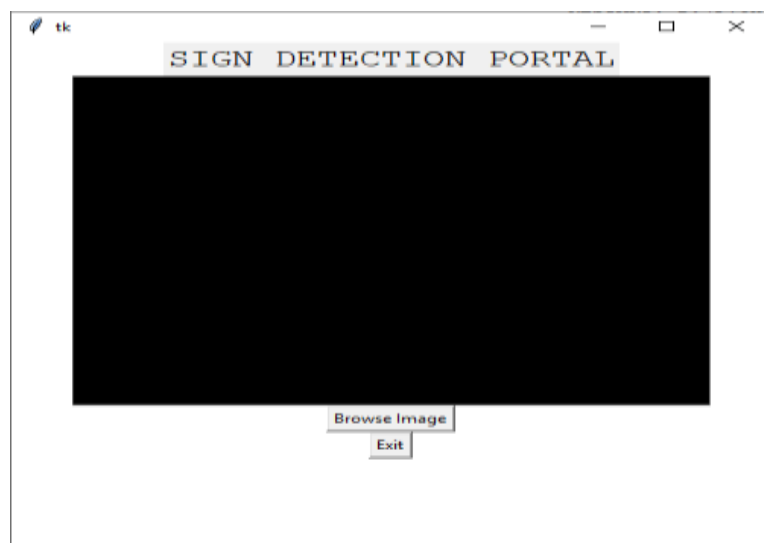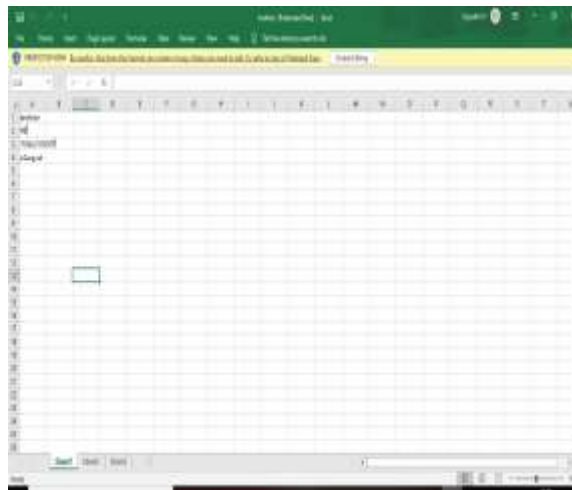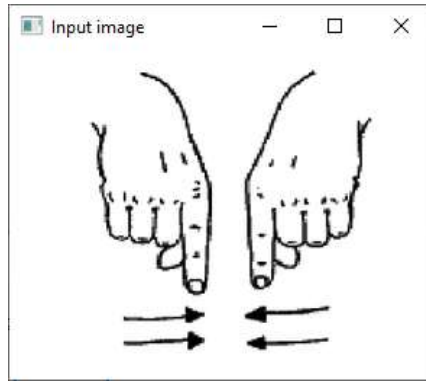
IV. EXPERIMENT RESULTS AND FINDINGS

- The data set images are collected with various hand gesture positions for better classification.
- More input images are collected to be checked with dataset images.
- Both checking for presence of hand gesture sign as well as its meaning in given image is carried out.
- The sign category of given image is also checked with data set images.
- Grayscale and binary image conversion with adaptive thresholds are carried out.
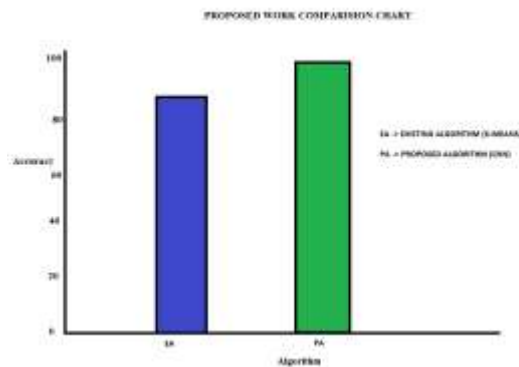
V. CONCLUSION

Applications using in nowadays require a variety of image types as data source for explanation and also the analysis for sign presence. Several attributes are gathered to conduct various tasks like grayscale conversion. Degradation happens when an image is changed from one form to other, like during scanning, sharing, digitalizing, saving, and so on. Thus, the output image is to endure the procedure like image enhancement which includes the range of approaches that strive to develop visual presence of an image. Image enhancement enhances awareness or interpretability of information in the images to human listeners during giving superior input for some other autonomous image processing systems. The image is subjected to extract features then with a variety of order to create the image more understandable by the computer. The project presented an effective tool for preparing expert knowledge, grayscale conversions and preparing histogram values of input image to be checked with dataset images. Furthermore, algorithm could be consistently checked to classify and methods under various conditions like with/without sign images. The further enhancements will be made with still more data set images and SVM, KNN like classification methods could be applied to improve accuracy in prediction.

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