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Research paper

Raspbot

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Abstract

Sign language is a language that uses manual communication to convey meaning. This includes simultaneously employing hand gestures, movement, orientation of the fingers, arms or body, and facial expressions. RASPBOT has been designed to understand not only human voice but hand signs language as well. It has been designed in such a way that it can be used by a wide variety of individuals. RASPBOT allows the users to: Ask a question normally or ask a question using sign language. RASPBOT recognizes the Hand Signs and produces the recognized Alphanumeric Character as output. It forms meaningful sentences and give responses to the queries by recognizing the characters thus breaking down the barriers between normal people and specially disabled people. These features have been represented by functions in the program. RASPBOT then understands the question and then replies appropriately.

Keywords: *Chatbot, RNN, Convolutional Neural Networks, Sign Language ,Deep Learning..*

1. Introduction

Chatbot presents a new way for individual to interact with computer systems. A Chatbot allows a user to simply ask questions in the same manner that they would address a human being. Traditionally performed human works are replaced by chatbots like customer service agents and educators thus replacing the jobs of individuals. The performance of the chatbots has improved from the rule based Chatbot which is the initial one to era of rapid development in the field of Artificial Intelligence (AI). In the era of AI Chatbots can learn from the experience and chat like a human being and there is large potential research opportunity due the emergence of Deep Learning Technology [1]. Chatbot has already taken on a large diverse tasks and roles although their existence and development has not taken more years and because This new technology may change the direction of future research in chatbots [2].

This paper presents the design and development of intelligent voice recognition Chatbot. The paper presents a technology demonstrator to verify a proposed framework required to support such a bot (a web service). While a black box approach is used, by controlling the communication structure, to and from the web-service, the web-service allows all types of clients to communicate to the server from any platform. The service provided is accessible through a generated interface which allows for seamless XML processing; whereby the extensibility improves the lifespan of such a service. By introducing an artificial brain, the web-based bot generates customized user responses, aligned to the desired character. Questions asked to the bot, which is not understood is further processed using a third-party expert system (an online intelligent research assistant), and the response is archived, improving the artificial brain capabilities for future generation of responses [3].

Studying machine learning opens a world of opportunities. One can help create cutting edge ML applications, like the Face book tag suggestions, online shopping suggestions etc..In the field of machine learning, the possibilities are truly endless. It's possible to quickly and automatically produce models that can analyse bigger, more complex data and deliver faster, more accurate results.

Machine Learning is an area in computer science which gives the computers the ability to learn without being programmed explicitly. Machine Learning uses computers, which focuses on production making, which is related to computational statistics.

A Chatbot is a computer program which communicates via optic or textual methods. These programs are usually designed to simulate a conversation between human and its partner. Chatbot are usually integrated in dialog systems for various purposes like information. acquisition or customer service. Chatbot uses Natural Language processing to understand human language.

Convolutional Neural Network or CNN is a specific type of artificial neural network that utilizes perceptrons, which is a machine learning algorithm to analyse the data. Major applications of CNN include image and video processing, natural language processing and other various cognitive tasks [7].

Sign language is a gesture oriented language that is used for manual communication. It includes gestures such as hand movements, body language and facial expressions. A Chatbot uses Natural Language Processing to understand the human language and their Learning capabilities are based on Machine Learning algorithms [5].

Some of the well-known chatbots are[4]:

•ELIZA (First Chatbot – 1966)

•A.L.I.C.E. BOT (Artificial Linguistic Intelligent Com puter Entity -1994)

•CLEVERBOT (1997)

•NIKI CHATBOT (2015)

Some of the areas where chatbots have been implemented are Customer Services, Instant Messenger, Blogging, Games, and Web Navigator [4].

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2. Proposed Methodology

RASPBOT is specially designed for the deaf and dumb people which recognizes the Hand Signs and produces the recognized Alphanumeric Character as output as shown in Figure 1. It forms meaningful sentences and give responses to the queries by recognizing the characters thus breaking down the barriers between normal people and specially disabled people.
The microphone and webcam are used for taking input where webcam is used to capture hand gestures and microphone is used for voice input. Natural Language processing is used to understand and process the voice inputs given by the user, and the hand gestures captured by the webcam from the users are processed using Deep learning Algorithms such as Convolutional Neural Networks, and Recurrent Neural Networks.

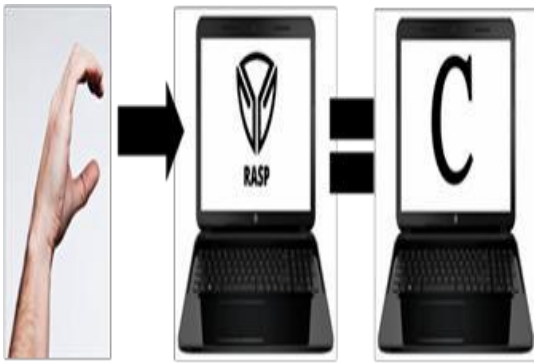


Fig. 1: Proposed Methodology

As mentioned above RASP takes in hand gestures from the user which is then processed using CNN, a Deep learning algorithm. First the feature extraction is done and training of the data set is carried out. Since we are using the CNN algorithm the no separate feature extraction algorithm is used as CNN itself does it automatically. Sequential Analysis is carried out during the training of the data (sign gestures).During the training of the data each sign character is assigned with the unique number which is used during the testing of data set. The captured image is then compared with the trained dataset and then the appropriate sign character is predicted as the output as shown Figure 2 for better understanding. The sequence of sign characters one of the other is given to form a words and then meaningful sentence which in turn given as an input to the RASPBOT for which the proposed bot has the give the meaningful response in voice as well as in text

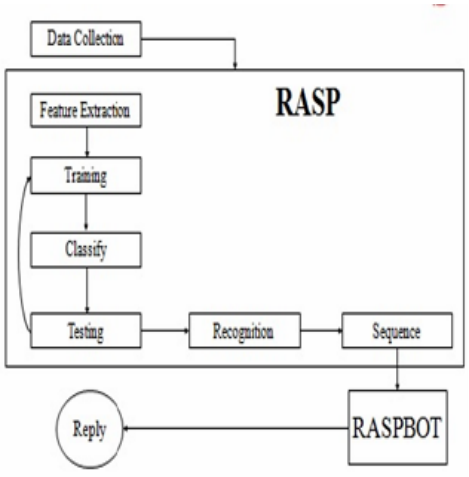


Fig. 2: Block Diagram of the Proposed Methodology

3. Sign Language Recognition Using CNN

A convolutional neural network (CNN) is a specific type of artificial neural network that uses perceptrons, a machine learning unit algorithm, for supervised learning, to analyse data. CNNs apply to image processing, natural language processing and other kinds of cognitive tasks. A convolutional neural network is also known as a ConvNet.

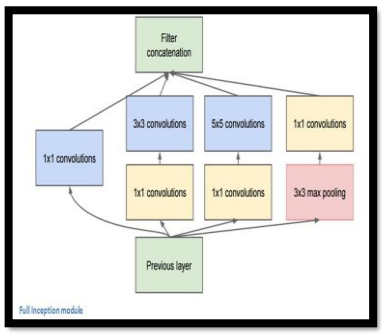


Fig. 3: Inspection Module

The bottom box is the input and the top one is the output of the model .Basically, at each layer of a traditional ConvNet, you have to make a choice of whether to have a pooling operation or a conv operation.
What an Inception module allows you to do is perform all of these operations in parallel as shown in Figure 3.

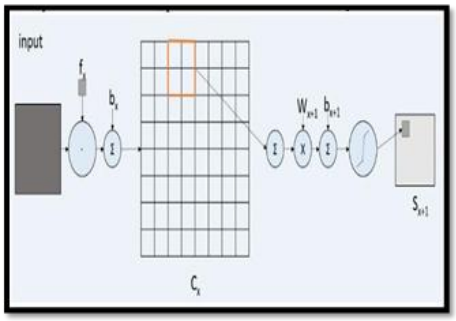


Fig. 4: CNN Process

Inspection module consists of a network in network layer, a medium sized filter convolution, a large sized filter convolution, and a pooling operation. The network in network conv is able to extract information about the very fine grain details in the volume because of 3x3.While the 5x5 filter is able to cover a large receptive field of the input, and thus able to extract its information as well. Pooling operation that helps to reduce spatial sizes and combat over fitting. On top of all of that, have ReLUs after each conv layer, which help improve the nonlinearity of the network. Basically, the network is able to perform the functions of these different operations while still remaining computationally considerate as shown in Figure 4
RASPBOT, present a new way for individuals to interact with computer systems. A RASPBOT allows a user to simply ask questions in the same manner that they would address a human being as shown in Figure 5.

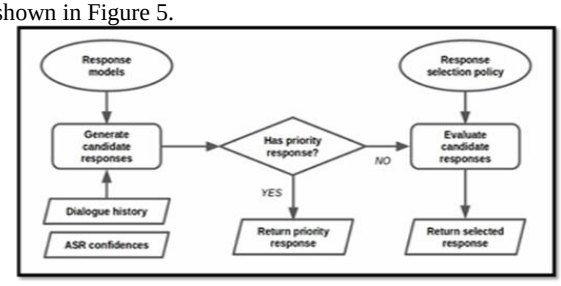


Fig. 5: Flow Diagram of RASPBOT

4. Results and Discussions

RASPBOT does the conversation similar to human partner when the input is given through human voice. Refer Figure 6(a) for output snippet, where the RASPBOT is predicting what the human has spoke by analyzing the voice as input . But when the user tries to converse by using sign language, all the gestures are accumulated to form a meaningful sentence so that RASP can reply appropriately. Refer Figure 7(a) this depicts ASL which is abbreviation for American Sign Language.



Fig. 6: Output Snippet - Voice as Input

When the human tries to do the conversation with the RASPBOT by using sign language, the bot is provided with the meaningful sentence as the input which is formed by recognizing the sign characters. recognizing the characters is done by using the train data set where the unique number is generated for all the sign characters called as score as shown in Figure 7(a).

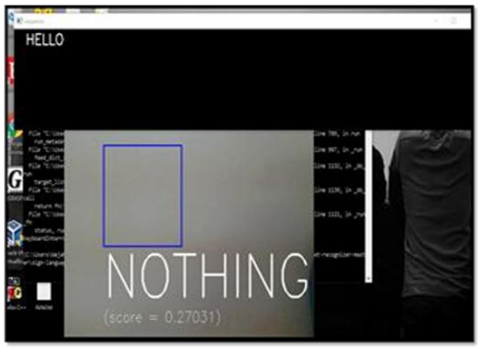


Fig. 7(a): Output Snippet

From figure 7(a) and 7(b) we can see that the score value of alphabet O is 0.27031, for alphabet W 0.54349 and when no sign character is given as input it displays nothing with score value 0.43614.

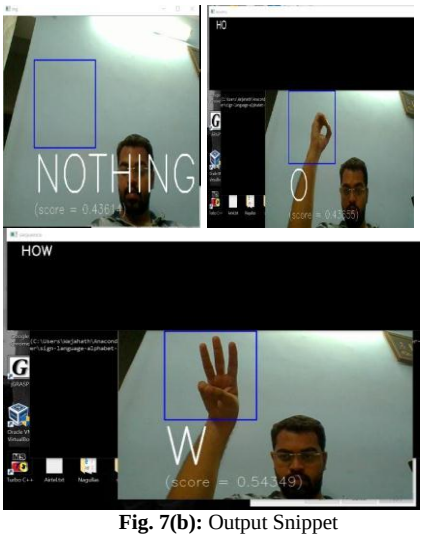


Fig. 7(b): Output Snippet

5. Conclusion

In the proposed method the survey conducted with respect to sign language and Chatbot. First collected the dataset related to American Sign Language which will be used in our work. This dataset will be used to compare and process with hand gestures given by the user. Further, all the recognised hand gestures will form meaningful sentences, for which the developed RASPBOT gives, appropriate audio and textual response. RASPBOT acts as bridge between hearing majority and the deaf community for communication.

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