REAL TIME COMMUNICATION SYSTEM POWERED BY AI FOR SPECIALLY ABLED

LITERATURE SURVEY

DOMAIN NAME: ARTIFICIAL INTELLIGENCE

TEAM ID: PNT2022TMID29700

BATCH: B11-5A1E

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Paper 1: ARTIFICIAL VOICE SYNTHESIZER USING FUZZYLOGICS

Published year: February 2017

Author: Adiline Macriga G, Kruthiga K and Anusudha S

Journal Name: IEEE

Summary: Speech is one the most important ways of interaction in this drastically developing communication era. Lamentably, the mute people are dispossessed of this boon. “Artificial Voice synthesizer” helps them to overcome this difficulty and communicate with the world in an efficient way. The principle objective of the artificial voice synthesizer is to make dumb people to communicate easily with other people even who cannot understand the sign language. Communication can be made easier by giving artificial voice to the dumb people so that they do not face any kind of difficulty in communicating with the world. This device makes use of neural sensors which is fixed over the head and behind the user's ear lobe. The users can make their usual signs for conveying their ideas. The sensors senses the brain impulses as each hand movement have a specific set of brain impulses and then some specific calculations are made using Discrete Fourier Transform. The fuzzy logics in Artificial intelligence is used to match the obtained solutions of the converted signals with the stored solutions so that it converts the impulses into voice and gives that voice(the translated, artificially synthesized voice of the dumb people) as output which makes others to understand their comments easily. Thus the “Artificial voice synthesizer” comfort the dumb person in overcoming their disability by communicating like a normal person.

Methodology used: Fuzzy logic, Artificial intelligence and Gesture recognition

Paper 2: REAL-TIME SIGN LANGUAGE CONVERTER FOR MUTE AND DEAF PEOPLE

Publication year: September 2021

Author: Santosh Kumar Bharti and Akshit J Dhruv

Journal Name: IEEE

Summary: Deaf people may get irritated due to the problem of not being able to share their views with common people, which may affect their day-to-day life. This is the main reason to develop such system that can help these people and they can also put their thoughts forward similar to other people who don't have such problem. The advancement in the Artificial intelligence provides the door for developing the system that overcome this difficulty. So this project aims on developing a system which will be able to convert the speech to text for the deaf person, and also sometimes the person might not be able to understand just by text, so the speech will also get converted to the universal sign language. Similarly, for the mute people the sign language which they are using will get converted to speech. We will take help of various ML and AI concepts along with NLP to develop the accurate model. Convolutional neural networks (CNN) will be used for prediction as it is efficient in predicting image input, also as lip movements are fast and continuous so it is hard to capture so along with CNN, the use of attention-based long short-term memory (LSTM) will prove to be efficient. Data Augmentation methods will be used for getting the better results. TensorFlow and Keras are the python libraries that will be used to convert the speech to text. Currently there are many software available but all requires the network connectivity for it to work, while this device will work without the requirement of internet.Using the proposed model we got the accuracy of 100% in predicting sign language and 96% accuracy in sentence level understanding.

Methodology used: Artificial Intelligence, Gesture recognition and CNN

Paper 3: A HAND GESTURE RECOGNITION BASED COMMUNICATION SYSTEM FOR MUTE PEOPLE

Published year: November 2020

Author: Iram Haider, Mohammad Ammar Mehdi, Asjad Amin, Kashif Nisar

Journal Name: IEEE

Summary: Communication between deaf-mute people becomes more difficult in everyday life. Muteness creates a speechaffliction where the patient is unable to have the normal capacity to speak resulting in the complete absence or at least a significant loss of verbal communication under neurological diseases. Sometimes the major cause of muteness is deafness. Around 466 million people worldwide are deaf and mute, and 34 million of these are children. The communication among a deaf and listening to person poses to be an excessive hassle compared to communication among blind and regular visible humans. Gestural type of communication called Sign language which is observed amongst deaf groups in the world. We proposed a Deaf-Mute verbal exchange device that translates the hand gestures to audio massage as an interpreter. The purpose to develop this plan, is to facilitate humans with the help of a deaf-mute communication interpreter device. In the designed model, we used the KINECT sensor-based system to interpret hand gestures. The KINECT sensor captures the motions of mute people like images and then after segmentation, it identifies the gestures which are then decoded into meaningful audio messages that enable the communication more effective. The proposed system is user friendly, as it is easy to use and capable to build efficient and effective human computer interaction.

Methodology used: Artificial Intelligence

Paper 4: SMART WEARABLE HAND DEVICE FOR SIGN LANGUAGE INTERPRETATION SYSTEM WITH SENSORS FUSION

Published Year: February 2018

Author: Boon Giin Lee and Su Min Lee

Journal Name: IEEE Sensors

Summary: Gesturing is an instinctive way of communicating to present a specific meaning or intent. Therefore, research into sign language interpretation using gestures has been explored progressively during recent decades to serve as an auxiliary tool for deaf and mute people to blend into society without barriers. In this paper, a smart sign language interpretation system using a wearable hand device is proposed to meet this purpose. This wearable system utilizes five flex-sensors, two pressure sensors, and a three-axis inertial motion sensor to distinguish the characters in the American sign language alphabet. The entire system mainly consists of three modules: 1) a wearable device with a sensor module; 2) a processing module; and 3) a display unit mobile application module. Sensor data are collected and analyzed using a built-in embedded support vector machine classifier. Subsequently, the recognized alphabet is further transmitted to a mobile device through Bluetooth low energy wireless communication. An Android-based mobile application was developed with a text-to-speech function that converts the received textinto audible voice output. Experiment results indicate that a true sign language

recognition accuracy rate of 65.7% can be achieved on average in the first version without pressure sensors. A second version of the proposed wearable system with the fusion of pressure sensors on the middle finger increased the recognition accuracy rate dramatically to 98.2%. The proposed wearable system outperforms the existing method, for instance, although background lights, and other factors are crucial to a vision-based processing method, they are not for the proposed system.

Methodology used: Machine Learning and Gesture Recognition

Paper 5: **INVESTIGATING OF DEAF EMOTION COGNITION PATTERN BY EEG AND FACIAL EXPRESSION COMBINATION**

Published year: February 2022

Author: Yi Yang, Yu Song, Xiaolin Song, Qiang Gao, Zemin Mao, Junjie Liu

Journal Name: IEEE

Summary: With the development of sensor technology and learning algorithms, multimodal emotion recognition has attracted widespread attention. Many existing studies on emotion recognition mainly focused on normal people. Besides, due to hearing loss, deaf people cannot express emotions by words, which may have a greater need for emotion recognition. In this paper, the deep belief network (DBN) was utilized to classify three category emotions through the electroencephalograph (EEG) and facial expressions. Signals from 15 deaf subjects were recorded when they watched the emotional movie clips. Our system uses a 1-s window without overlap to segment the EEG signals in five frequency bands, then the differential entropy (DE) feature is extracted. The DE feature of EEG and facial expression images plays as multimodal input for subject-dependent emotion recognition. To avoid feature redundancy, the top 12 major EEG electrode channels (FP2, FP1, FT7, FPZ, F7, T8, F8, CB2, CB1, FT8, T7, TP8) in the gamma band and 30 facial expression features (the areas around the eyes and eyebrow) which are selected by the largest weight values. The results show that the classification accuracy is 99.92% by feature selection in deaf emotion reignition. Moreover, investigations on brain activities reveal deaf brain activity changes mainly in the beta and gamma bands, and the brain regions that are affected by emotions are mainly distributed in the prefrontal and outer temporal lobes.

Methodology Used: Emotion recognition and Electroencephalogram

Paper 6: ARTIFICIAL INTELLIGENCE ENABLED VIRTUAL SIXTH SENSE APPLICATION FOR THE DISABLE

Published year: April 2020

Author: Aditya Sharma, Aditya Vats, Shiv Shankar Dash, Surinder Kaur

Journal Name: American Scientific publishing group

Summary: The sixth sense is a multi-platform app for aiding the people in need that is people who are handicapped in the form of lack of speech (dumb), lack of hearing (deaf), lack of sight (blind), lack of judicial power to differentiate between objects (visual agnosia) and people suffering from autism (characterized by great difficulty in communicating and forming relationships with other people and in using language and abstract concepts). Our current implementation of the product is on two platforms, namely, mobile and a web app. The mobile app even works for object detection cases in offline mode. What we want to achieve using this is to make a better world for the people suffering from disabilities as well as an educational end for people with cognitive disabilities using our app. The current implementation deals with object recognition and text to speech and a speech to text converter. The speech to text converter and text to speech converter utilized the Web Speech API (Application Program Interface) for the website and text to speech and speech to text library for the mobile platform.

Methodology Used: Artificial Intelligence

Paper 7: DESIGN AND DEVELOPMENT OF HAND GESTURE BASED COMMUNICATION DEVICE FOR DEAF AND MUTE PEOPLE

Published year: December 2022

Author: Omkar Vaidya, Sanjay Gandhe, Abhishek Sharma, Asit Bhate, Vishal Bhosale and Rushabh Mahale

Journal Name: IEEE

Summary: According to World Health Organization (WHO), the 5% of world's population is disabled of speaking and hearing. That makes a large number of people who are deaf and mute in whole world and communications between deaf-mute and a normal person has always been a challenging task. We have developed a cheap, reliable and efficient device that would help deaf-mute people to work with other normal people efficiently towards the development of humanity. In this paper, 3-D accelerometer is used to detect the gesture of disable person and based on it customized database is generated which is processed through nodeMCU and Raspberry Pi and displayed the message on LCD screen. The Support Vector Classifier algorithm is used in proposed system. The experimental analysis gives comparison of proposed system with existing machine learning algorithm and shows that our system outperforms well in terms of translating complete sentence instead of single alphabet which resulted into increased accuracy of device.

Methodology Used: Gesture detection, Node MCU, Raspberry Pi

Paper 8: RECENT ADVANCES IN SIGN LANGUAGE RECOGNITION USING DEEP LEARNING TECHNIQUES

Published year: April 2022

Author: Selvam E Panneer and M Sornam

Journal Name: IEEE

Summary: Communication is essential to express and receive information, knowledge, ideas, and views among people, but it has been quite a while to be an obstruction for people with hearing and mute disabilities. Though there is sign language to communicate with non-sign people it is difficult for everyone to interpret and understand. As reported by World Health Organization (WHO), five percent of the world population of over 300 million people suffers from hearing disability. Technology has grown rapidly in the last few decades with the presence of deep learning and artificial intelligence, but somehow physically impaired people are not able to get the maximum benefit of it due to lack of awareness, accessibility problems, cost, and other reasons. This survey paper discusses the recent development and assistance provided for signers to communicate with non-signers.

Methodology Used: Deep-Learning, Artificial Intelligence

Paper 9: SPEECH VISUALIZATION SIMULATION RESEARCH FOR DEAF MUTE

Published year: October 2010

Author: Jian Wang; Zhi-qiang Han; Li Gao; Sheng-bao Shen; Zhi-yan Han

Journal Name: IEEE

Summary: Deaf-mutes have the stronger advantage of visual identification ability and visual memory ability for color, a new speech visualization method for deaf-mute was proposed,it created readable patterns by integrating different speech features into a single picture. Firstly, series preprocessing of speech signals were done. Secondly, extracting features were done, among them, using three formant features mapped principal color information, using the length of pronunciation mapped width information, using harmonic intensity mapped length information, and then all features used as the inputs of neural network, the outputs of neural network mapped the texture information. We evaluated the visualized speech in a preliminary test, the test result shows that the method has very good robustness, the correct answer rate reaches 94.56% of vowel and consonant, 85.75% of two-bopomofo and 78.05% of three-bopomofo

Methodology Used: Neural Network, Speech signal

Paper 10: IMPLEMENTATION OF VIRTUAL ASSISTANT WITH SIGN LANGUAGE USING DEEP LEARNING AND TENSORFLOW

Published year: July 2020

Author: Dipanshu Someshwar; Dharmik Bhanushali; Vismay Chaudhari; Swati Nadkarni

Journal Name: IEEE

Summary: The paper is all about the system and interface developed, that allows deaf mutes to make use of various voice automated virtual assistants with help of Sign Language. Majority of Virtual Assistants work on basis of audio inputs and produces audio outputs which in turn makes it impossible to be used by people with hearing and speaking disabilities. The project makes various voice controlled virtual assistants respond to hand gestures and also produces results in form of text outputs. It makes use of concepts like Deep Learning, Convolutional Neural Network, Tensor Flow, Python Audio Modules. A webcam first captures the hand gestures, then Convolutional Neural Network interprets the images produced and produces rational languages. These languages are then mapped to pre-defined datasets using Deep learning. For this purpose, Neural Networks are linked with Tensor flow library. The designed system will then produce audio input for the Digital Assistant, using one of the Python text to speech module. The final audio output of the Digital Assistant will be converted into text format using one of the Python speech to text module which will be displayed on the viewing screen.

Methodology Used: Convolutional Neural Network, Learning and TensorFlow

Comparative Statement:

Several conclusions can be drawn from the literature review. First relevant studies can be reviewed in four categories: Data analysis, machine learning, and the use of CNN and ANN neural networks. However, a number of studies may appear in more than one category and their finding ways may overlap. Thus, it is possible to claim that there Is no strict boundary between these categories.

These papers and project try to maximize the communication between specially disabled person and normal people by using AI. The similarities between all the paper tries to understand

the language of disabled person to make an efficient and effective way. By assured that the machine or the device try to understand and then provide the related output to the particular input. Each of the different research paper tries a different way and different methods, devices, algorithm and models to find the desired output which provide the efficient way. And we like to provide the possible way to provide the efficient communication by using the categories like machine learning, ANN, CNN and with the help of deep neural networks.

Future research is needed to observe and investigate the concrete effects of these categories and have a better understanding and correlation of how the most efficient use of the AI neural networks to provide better life for disabled persons.