DISA Proposal

Project VoxCo: An Electronic Aid for Persons with Hearing Impairment

Students:

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Q. What is the need your project is trying to address? How did you establish the need?

People with visual impairment can travel using a white cane (SmartCane), read and write with the help of braille. Analogously, this clicked our minds for the need of making an aiding device for the people with hearing impairment. By a little bit of thought and research, we realised the need of making them aware of stray noises and emergency calls. Being aware of the famous cocktail party problem (problem to hear a specific person amidst of many speaking persons) we realised that conversing with more than one person can be quite challenging for them. Hence, we established the need which we have tried to address through our innovation and help people out of it.

A healthy person is aware of his environment by using his sight and hearing ability. But people with hearing impairment are only aware of the nearabout to what they can see which in a sense is incomplete. Additionally, conversing with people can sometimes be embarrassing and difficult for them. We want to help them. Our project would lead to the betterment of people and thus the society as a whole.

Q. Is this a new project or continuation of prior work done? what prior or ground work is done at the time of submission of this project proposal.

This is a new project.

The principles and techniques (signal processing, blind source separation and mobile app based solution) we intend to use are not new, but their application (used in our project to help the hearing impaired) is fairly uncommon (that is multiple speech-to-text (our original idea), localisation of sound source, and outdoor emergency alerts).

Q. What are the deliverable at the end of this project

VoxCo receives the sound using an array of microphones (which maybe fitted behind the name plate of the person), which helps the person to engage in a conference comfortably and making a record of it if he misses something by reading the labelled conversation later via the speech-to-text convertor through our own built android app, even when conversing with more than one person. And the direction of the sound source is indicated by LEDs which are present in the hardware used for the microphones.

Additionally, the person is alerted to stray noises, car honks (high pitch), thunder or any other emergency situation which is yet another feature of our app.

Q. Describe how you plan to go about accomplishing your objectives

Phase-I: We will first receive signals from individual microphone without overlapping them and amplifying them and feeding each signal individually through connecting cables in real-time to the processing unit and ultimately segregating the waveform of the all the independent sources (three in number) using relevant algorithms (BSS, ICA, PCA etc.).

Phase-II: We will then make an android based application where each waveform is used for speech-to-text conversion of the source (speaking person) using pre-built API's or make new ones and displaying the labelled conversation to the user and save it for future reference.

Phase-III: We will add the outdoor mode in our app which alerts the person of alarming and emergency situations (gauging emergency by intensity and frequency of the sound).

Now, if time permits, we will locate the source (direction) and feed the direction to the user to make him aware of the active source(s) using an array of LEDs.

Q. What is the completion criteria? How will you know when you're done?

Being able to distinguish each source(s) signal and are able to convert it to text, store it and locate the direction of the source is one of the two completion criteria. The second being alerting the person to emergency calls. When our project is competent enough to effectively help people in their lives, then we want to see people benefit using it.

Q. What is the contingency budget required to carry out this project?

Total Budget = 19000/-

Q. How will the contingency be used in your project?

Microcontroller = 5000/-

Analog-to-Digital Convertor = 1000/-

Digital Signal Processor = 4000/-

Splitter/ Bluetooth Module = 2000/-

Directional/Condenser Microphones = 5000/-

Connecting Cables/Jumpers = 1000/-

Amplifier = 1000/-