Project Proposal

Title of the Project: Intelligent Hearing for Android

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Motivation:

Hearing disability is one of the major concerns challenging the mankind. Medical technology has come a long way to cater the needs of the facing such challenges. These advancements have a high cost associated with it. Hearing aid still remains a dream for a common man. A solution to this is a hearing aid that is smart and at the same time affordable. The application performs context aware analysis to perform noise cancellation and enhance the hearing experience of the user. An additional feature of the application is to notify the user important sounds such as alarm, phone ring etc. through a notification sent to his mobile device.

Goal and Objectives:

The objective of this project is to accumulate and analyze the important features of an audio signal. Then process the features through selected machine learning algorithms. The processing framework would be big data framework which would provide faster processing and reduce the application processing time. Feature can be defined in multiple ways. A *feature* is a unit of functionality of a software system that satisfies a requirement, represents a design decision, and provides a potential configuration option.

From a user perspective and a developer perspective it is important to know about the features of the application which will help them to know the use of the applications, basic requirement to use the application semantics and structure of the code respectively. Identifying the required important features would be the most important aspect of the process. Once this is acquired applying the models on these features would yield us the desired result. The project involves feature extraction and weighing the features to pick the appropriate feature vectors. This feature extraction can be done at the client. Next comes applying a learning algorithm that can predict a model for the features provided as input. This would be done using the SPARK MLib package.

Significance:

Today most of us have an access to smart phones. In the USA alone Android smart phones constitutes 53 percent of the mobile market. Choosing Android as the platform for developing the application was ideal to reach bulk of the smart phone users.

System Features:

- An Android application that serves as the smart hearing aid and also provides a user friendly model for the feature extraction.
- A machine learning framework that can provide a model based on the features received from the client end.
- Analysis of audio files to observe their characteristics.
- Collection of features present in an audio file and weighing the features to select the vital features dynamically.
- To send text notifications on various events based on the pattern of previous audios.
- To be able to detect and send alarms on to the device in potential hazardous situations.
- Integration of the client and the processing framework for a complete application that can perform as a smart hearing device.

Related Work:

1. RDF → a formal representation for unstructured data such as text data and sensor data.

2. Machine learning algorithms → Study about classification and regression, clustering, dimensionality reduction, feature extraction.

3. SPARQL → it is a semantic query language for databases used to retrieve and manipulate data in RDF format.

4. Apache Spark → an engine for big data processing, which performs in-memory computations.

Requirements Specifications:

1. An android mobile device with minimum version of Android 5.0 (Lollipop).
2. Android wearable devices with minimum version of Android 5.0 (Lollipop) .

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