Sound Check – Use Case

Introduction

Sound Check is an Android mobile application that aims to determine a person's biographic and geographic information based on their audible frequencies. It is based on the assumption that one's environment and lifestyle is related to one's biographic and geographic information. A key component of the environment and lifestyle is sound. By collecting and analyzing a set of population's audible frequencies versus their biographic and geographic information, this application can classify an unknown person into a particular biographic or geographic category based on their audible frequencies.

Scope

The scope of this version is as follows:

- This is an MVP version that estimates age based on a small subset of 5 data points. Each data point is a pair containing sound frequency and age. It determines a person's age by using machine learning by applying a simple Linear Regression to the data points, and using the resulting model to estimate the person's age.
- This version does not contain an ability to train the AI. It only applies a set of pre-existing information (the data points mentioned above) from an already trained AI. The source of the data for the data points is: https://youtu.be/VxcbppCX6Rk
- The following can be done to further improve results:
  - Additional data points can be incorporated in the model used for classification.
  - Better machine learning techniques other than linear regression can be applied.
  - Additional audio properties such as decibels can be incorporated.

Pre-conditions

This application will require the following pre-conditions:

- A source for generating the full range of tone frequencies. Several sources exist including this website: http://www.szynalski.com/tone-generator/
- A quiet room, to minimize other sound interfering with the tone frequencies.

Components

The following key components will be required for the successful implementation of this application:

- **Recorded sound data:** This sound data will typically be captured from the microphone. This is sound data recorded from the environment.
- **Fast Fourier Transform:** This algorithm performs a fast analysis on the recorded sound data to filter out audio frequencies, and return the peak frequency, which is then used during training and classification by AI.
- **Artificial Intelligence:** This has two purposes:
  - Training to build a model that can be used for classification of new data. This is not yet implemented in the current version.
  - Classification of new data.

Considerations

Sound source for generating tone/sound frequencies

Whereas the tone frequencies can be generated by the mobile application, this would not be the case because of the following reasons:

- **During testing (use case scenario):** To prevent the application from feeding back on data that it has generated. This enhances the integrity of the application where it's guaranteed that the sound frequency data collected was the same as the sound frequency in the environment, thus the sound frequency that the test subject was hearing.
- **During machine learning training (use case scenario):** Allows a person conducting a test (the tester), to do so with multiple people (test subjects) while controlling the audio frequency. The test subjects would be required to enter their biographic and environment information in the application before the test is conducted. The tester would then play a variety of tone frequencies. The test subjects would press a button to confirm whether they heard the tone or not.

  This opens up the opportunity for some psychological analysis of how hearing different tone frequencies creates an illusion that the tone frequency is still playing even when it's not. To conduct such a test the tester would play the frequency for a short period of time, request the test subjects to confirm if they can hear a frequency. The tester would then pause the playing of the frequency for another short period of time and again request the test subjects to confirm if they can hear a frequency. During these tests, test subjects are not presented with the frequency value of the audible sound on the UI.