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Project Term Paper

Title

Music Shuffler Development

Group

Ice Cream

Summary

Mobile app development (full stack)
Design and implement a mobile app that streams and recommends music based on real-time GPS state.

Objectives

- Objective 1
  Build web service to support real-time music streaming.
- Objective 2:
  Design interactive UI on mobile that enables functions including login, music player and motion state recording.
- Objective 3:
  Implement algorithms on music recommendation and shuffling.

Tools

- Database
  SQL Server
- Webservice
  asp.net
  Database and backend connected with LINQ
- User Interface
  Android Application

Backend and front end interface connected by http in parallel with post method

- Decoding
  JSON parser
- GPS data capture
  Android location service

Project Deliverables

Demo url
https://220-134-208-109.hinet-ip.hinet.net/MusicShuffler/service/load.aspx
https://www.youtube.com/watch?v=OIombVqfFyM

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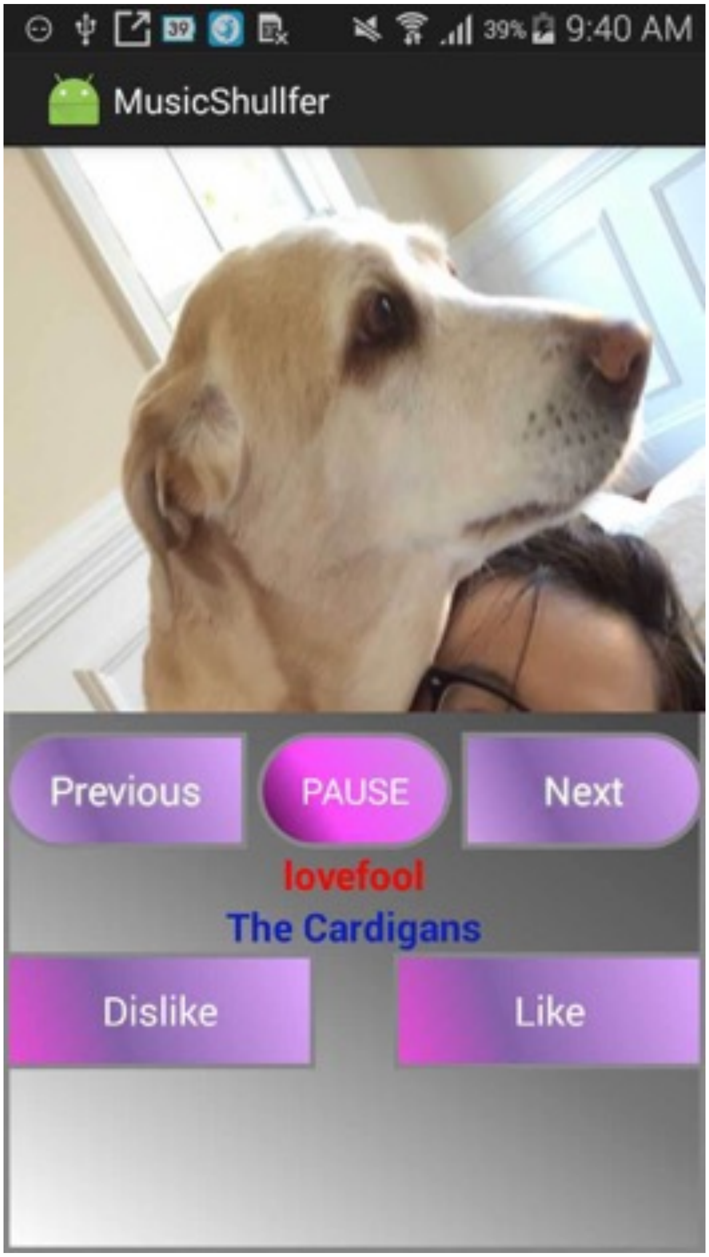
Delivery date 2016-4-16



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Machine Learning - Music Genre Recognition

Sketch

We will use sound-based features together with user inputs to determine the genre of the music that our application provides. There will be multiple classes of the genres and some classes are customized through user's 'likes'.

Goal

Initially, we put a bunch of randomly imported MP3 files into the server hard disk. Our task is to sort them according to the music genre into different folders such as soft, median and intense.

Later as we collect more user data, there is going to be extra classes representing the user's own genre categories.

Terminology

- Convert mp3 into a WAV format with ffmpeg

- Decompose music into with Mel Frequency Cepstral Coefficients (mfcc)

  The Mel Frequency Cepstrum (MFC) encodes the power spectrum of a sound, which is the power of each frequency the sound contains. It is calculated as the Fourier transform of the logarithm of the signal's spectrum.

  With a duration of 3 minutes, quality music file has a spectrum of over 80 billion frames (40,000+ per second). MFC retrieves and transforms those information effectively. The mfcc module in Python condenses the frames into 13 features.

- Training the classifier with Support Vector Machine (SVM)

  C-Support Vector Classification (SVC) in our case

- Fit classifier on music and give weights based on user's preferences when generating playlists

Tools

Python - SQL Server: pysql

wav conversion: pydub.AudioSegment, ffmpeg

mfc conversion: sklearn.talkbox.mfcc

SVM classifier: sklearn.svm

other: glob, scipy.io, matplotlib specgram, roc

Summary

We successfully created a classifier that showed really usable performance using MFC features. Though due to the limit on sample size, further steps to verify accuracy of our model are yet to be taken.

All of our primary objectives are met on schedule.