Summer Internship Project Report on

Emotion Controlled Robot using IBM Watson Tone Analyzer

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Abstract

The field of text mining has evolved over the past few years to help analyze the vast amount of textual resources available online. Text Mining, however, can be used also in various other applications. Today audio analysis is also carried out using some text analysis by extracting the textual content from the audio . In this project, we are particularly interested in controlling the movement of arduino robot.We by using transcribed audio recordings convert the audio to the text, detect the speakers' emotions using IBM Watson Tone Analyzer and map them to motion.

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Chapter 1

Introduction

1.1 Domain area of the project

Automated sentiment analysis is indeed useful for a variety of applications and is a vast topic of interest. It can empower interaction between humans and computers by enabling them to communicate in a more natural way, imagine computers that would be able to perceive and respond to human non-verbal communication such as emotions instead of responding conventionally to the events created by the use of a mouse or keyboard. In such a case, after detecting users emotions, computers could personalize the settings according to the users needs and preferences. The motto of our project is to experiment and find a way to analyze audio to give an output of emotion to control Forward, Backward, Left, Right, stop movement of the Arduino robot. The project use IBM WATSON which is an IBM Developer Cloud. It can store, manage and train the data in most secure way.

1.2 Motivation

People who might be in a situation where one might not be able to control robot using remote control or even direct it through his normal voice command. For this very situation and the use of spies where they can't actually give instructions, they can actually control the robot in a secret manner. The person through his emotion can direct the robot during normal conversation.This will lead to controlling of robot without the knowledge of others about the robot is being controlled by the person talking. This can also be considered as a regular voice controller bot running on secret language.This is also a experiment of analyzing emotion through audio.

1.3 Problem Statement

In this project we experiment the need of sentiment analysis of audio and later we explore IBM Watson to detect emotion from the audio and control a robot by mapping emotion to the instruction for direction.The purpose of the project is not mainly to control the robot but is to analyze the audio for emotion.

1.4 Objective

The main aim of this project is to use IBM Watson Tone Analyzer API for detection of emotion and then controlling the robot.

1.5 Project Development Time Schedule

1. Selection of project topic Analysis of Voice : 12 June 2018

2. Found IBM Watson for analysis of textual features : 12 June 2018

3. Built the Bot : 13 June 2018

4. Building a web application using : 14 June 2018

5. Testing the product : 16 June 2018

Chapter 2

Literature Survey

2.1 Previous works

Research has shown a strong and statistically significant correlation between word choice and personality, emotions, attitudes, intrinsic needs, values, and thought processes. Several researchers have found that people vary in how often they use certain categories of words when writing for blogs, essays, and tweets, and that these communication mediums can help predict different aspects of personality:

Fast and Funder (2008)

Gill et al. (2009)

Golbeck et al. (2011)

Hirsh and Peterson (2009)

Yarkoni (2010)

Most of these prior works are based on finding psychologically meaningful word categories from word usage in writing. This research serves as the basis for IBM's work on the Tone Analyzer service. Relying on the scientific findings from psycho linguistics research, IBM is working to infer people's personality characteristics, their thinking and writing styles, their emotions, and their intrinsic needs and values from the words that they write. IBM uses its machine-learning models to evaluate these characteristics by assessing various features of a person's writing.

2.2 Arduino Bot

The bot is a small 2 wheel car with a castor wheel. It's main electronic components are:

Arduino Mega : The Arduino Mega is a micro-computer based on the ATmega1280.It has lots of connectors around the edges which you can use to connect to other electronic stuff. It connects by USB to a PC and there is PC IDE to download and develop programs. It has 54 digital I/O pins, 16 analog inputs, a 16 MHz crystal oscillator, 4 hardware serial ports , a power jack, ICSP Header, and a reset button.It can be a recharge using USB connection or external power supply automatically. It can operate an external supply of 6 -20 volts.

L293D : The L293D is a monolithic integrated motor driver which has 4-channel. It is act as interface between aurdino and the motor ,which allow DC motor to drive on either direction. It can control a set of Two DC motor simultaneously in any direction.

Bluetooth HC05 : Bluetooth module HC 05 connects to the arduino through Rx, Tx pin (through which serial communication takes place) so to start with you need a

Bluetooth terminal app, which is wireless. Through the Bluetooth terminal you can send/receive data (once your devices have been paired) the same way you would on the serial monitor.

2.3   IBM Watson Tone Analyzer

It is based on the theory of psycholinguistics, a field of research that explores the relationship between linguistic behavior and psychological theories. The service uses linguistic analysis and the correlation between the linguistic features of written text and emotional and language tones to develop scores for each of these tone dimensions.

For example, people exhibit various tones in their daily communications: joyful or sad, open or conservative, analytical or informal. These tones can impact the perception of a person's online identity and the effectiveness of their communications in different contexts.

Chapter 3

Project Design

3.1 Learnings & Reflections

3.1.1 Working of IBM Watson

IBM has trained a machine-learning model based on the Support Vector Machine (SVM) to predict tone. For the machine-learning model, IBM has leveraged many categories of features, including lexical features from various dictionaries, n-gram features, the existence of second-person references in the conversation, some dialogue-specific features such as saying thank you. IBM has found that about 30 percent of the sample data had multiple associated tones. IBM therefore elected to solve a multi-label classification task rather than a multi-class classification task. For each tone, IBM trained the model independently by using a One-vs-Rest (OVR) paradigm. The paradigm used the utterances for each class as positive samples and all other utterances as negative samples. IBM identified the tones predicted with at least 0.5 probability as the final tones. For several tones, the training data was heavily unbalanced; IBM therefore identified the optimal weight value of the cost function for each tone during training.

The workflow of the API: Submit JSON or plain text to the service. The service accepts approximately 128 KB of text, which is about 1000 sentences. The service returns results in JSON format, that report the tone of the input.
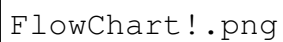
3.2 Implementation details

To build a emotion controlled Arduino. Steps given below were followed in order to make our project

1. Installation of Watson Developer Cloud, Json, Pyaudio and other libraries
   Written in Python and on the DJANGO Framework, it was designed with a major focus on enabling fast experimentation. It allows for reliable prototyping. Moreover it supports both IBM APIs and many audio analysis libraries, as well as combinations of the two.

2. Building the Bot
   There are many components, we first built The chassis then setup motor wheels then connected them to voltage regulator. then assembled the Arduino then set batteries. Then tested the robot through serial communication. Later we configured it for the bluetooth.

3. Building web application using Django,
   Django is a framework of python which enables us to create Web Apps. We made
   a single page app.

3.3 Flow Diagram

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FlowChart!.png
```

3.4   Functionality of the Project

Chapter 4

Discussion

4.1   Limitations

1. Sometimes the emotion meant isn't what is computed.

2. The API is paid but has a limited free access.

4.2   Future Scope

1. The project can be linked to a operation by spies or covert operation.

2. The emotion detection in audio can be extended to analyze the wave features of voice.

3. Emotion detection from voice has many uses in the feedback industry.

4.3   Conclusion

Bibliography

[1] Henrique Oliveira and Paulo Lobato Correia, *"Supervised Crack Detection and Classification in Images of Road Pavement Flexible Surfaces",Recent Advances in Signal Processing*

[2] Tomoyuki Yamaguchi, *"A Study On Image Processing Method for Crack Inspection of Real Concrete Surfaces",Pure And Applied Physics, Feb.2008*

[3] G. G. Rigatos,*Particle filtering for state estimation in nonlinear industrial systems, IEEE Trans. Instrum.Nov.2009*

[4] https://github.com/sekilab/RoadDamageDetector