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Design and Implementation of Emotional State Recognition via Text Algorithm (E.S.R.T.A)

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ABSTRACT: Language is used as a mode of communication by human beings. Through language we can directly express our various mental and emotional sates. In this paper, E.S.R.T.A. tries to detect the emotional state of a user through text and respond by displaying web pages and multimedia to improve or support the mood of a user. It also tries to give a brief introduction to a new idea called SMART technology. This can help to improve human-computer interaction.

Keywords: Emotional State Recognition, Text Based Recognition Methods, Keyword Spotting Technique, S.M.A.R.T.

I. INTRODUCTION

The Emotional State Recognition via Text Algorithm (E.S.R.T.A.) is based on the area of Text Based Emotion Recognition from the vast field of Affecting Computing. Till now we have directly instructed computers and other digitized machines to perform a task but with the help of affective computing techniques we develop advance systems that can understand human beings and his various mental states and perform task that will be a helping hand for human beings for completing his daily activities. With this philosophy this paper tries to implement E.S.R.T.A in a system and along that explain its wide scope and as well introduce to a new idea related to it called as S.M.A.R.T.

II. BACKGROUND STUDY

2.1. Text Based Recognition Methods:

Methods used for text based emotion recognition system are as follows:

- **Keyword Spotting Technique:** The keyword pattern matching problem can be described as the problem of finding occurrences of keywords from a given set as substrings in a given string. This problem has been studied in the past and algorithms have been suggested for solving it. In the context of emotion detection this method is based on certain predefined keywords. These words are classified into categories such as disgusted, sad, happy, angry, fearful, surprised etc. Keyword spotting technique for emotion recognition consists of five steps where a text document is taken as input and output is generated as an emotion class. At the very first step text data is converted into tokens, from these tokens emotion words are identified and detected. Initially this technique will take some text as input and in next step we perform tokenization to the input text. Words related to emotions will be identified in the next step afterwards analysis of the intensity of emotion words will be performed. Sentence is checked whether negation is involved in it or not then finally an emotion class will be found as the required output [1].

- **Lexical Affinity Method:** Detecting emotions based on related keywords is an easy to use and straightforward method. Lexical Affinity approach is an extension of keyword spotting technique; it assigns a probabilistic "affinity" for a particular emotion to arbitrary words apart from picking up emotional keywords. These probabilities are often part of linguistic corpora, but have disadvantages; firstly the assigned probabilities are biased toward corpus-specific genre of texts, secondly it misses

out emotional content that resides deeper than the word-level on which this technique operates. For example the word „accident", having been assigned a high probability of indicating a negative emotion, would not contribute correctly to the emotional assessment of phrases like "I avoided an accident?" Or "I met my girlfriend by accident?" [1]

- **Learning-based Methods:** Learning-based methods are being used to formulate the problem differently. Originally the problem was to determine emotions from input texts but now the problem is to classify the input texts into different emotions. Unlike keyword-based detection methods, learning-based methods try to detect emotions based on a previously trained classifier, which apply various theories of machine learning such as support vector machines and conditional random fields; to determine which emotion category should the input text belongs [1].

- **Hybrid Methods:** Since keyword-based methods with thesaurus and naïve learning-based methods could not acquire satisfactory results, some systems use hybrid approach by combining both keyword spotting technique and learning based method, which help to improve accuracy. The most significant hybrid system so far is the work of Wu, Chuang and Lin, that utilizes a rule-based approach to extract semantics related to specific emotions and Chinese lexicon ontology to extract attributes. These semantics and attributes are associated with emotions in the form of emotion association rules. As a result, these emotion association rules, replacing original emotion keywords, serve as the training features of their learning module based on separable mixture models. This method outperforms previous approaches, but categories of emotions are still limited [1].

2.2. Introduction to Affective Computing:

Affective Computing is human-computer interaction in which a device has the ability to detect and appropriately respond to its user's emotions. A computer device with this capacity could gather cues to user emotions from variety of sources.

Facial expression, postures, gestures, speech, the force or rhythm of key strokes and the temperature changes of the hand on a mouse can all signify changes in the user's emotional state and these can be all detected and interpreted by a computer.

Speech recognition and gestures recognition are the other technologies being explored for affective computing applications. Algorithms are used to process the data to yield meaningful information.

Application of Affective Computing

- **E-learning**: System can detect user state in understanding something and offer guide in learning the topic.
- **E-therapy**: Psychological health services, such as counselling, delivered online.

Affective Computing originated from the field of psychology where its name came from psychology in which "affect" basically a synonyms from "emotions" [2].

III. EXISTING SYSTEM

1. One of the existing software is "Receptivity". Backed by decades of language-psychology research the Receptivity (a Natural Language Personality Analytics API). It uses a process of target words and emotive categories to derive emotion and personality from texts. Their Linguistic Inquiry and Word Count (LIWC) text analysis process is even used by IBM Watson.
2. Another existing system is "Mood Patrol" by Soul Hackers Labs is a simple API that extracts emotion from text. Useful for analysing small section of text for cues, and responding with fine grained adjectives that describe the emotional tone based on "Plutchik's 8 Basic Emotions" Basic Emotions.

Existing problems in Systems:

The above mentioned systems do not display various multimedia like movies, songs, games etc. as output after they have detected the emotions.

IV. INTRODUCTION TO S.M.A.R.T.

In today's world humans give direct instruction to machines to perform a task. The time has come when computers have abilities to detect the different states of human beings and automatically execute processes to give satisfaction to the user. S.M.A.R.T. stands for Sensible Machines Acknowledging Reasonable Tasks. It is a new type of technology combining affective computing and automatic responses to give efficient output before the user can even anticipate it. In this E.S.R.T.A, applied the philosophy about S.M.A.R.T where after detection of emotion will play music/movies/suggest games to played. So the definition of S.M.A.R.T. is given below.

S.M.A.R.T. includes all the software, systems and machines that can detect the various states of the user and run necessary processes before the user gives a direct input to run the processes in order to satisfy his needs.

For example: If your computer is connected to your electronic home appliances and you come home from outside where it was extremely hot so you write in the computer "It is a very hot day outside!!!!"

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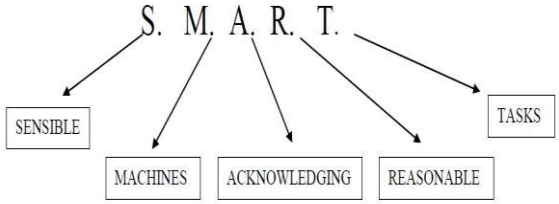
The computer will detect that the user state is hot and unpleasant mood so it will read and execute the instructions corresponding to the situation when the user is feeling hot. So if the instruction corresponding to the situation of hot and unpleasant is "on the A.C or switch on the fan" then the computer will on the A.C. and start the fan which are connected to it.



V. PROPOSED SYSTEM

Before designing and implementing E.S.R.T.A, lots of questions and complications came up like deciding what would be the standard fundamental emotional states that can be taken under consideration. So we decided to take the following 4 emotional states and 1 mental state:

- Positive (happiness)
- Sad (sadness)
- Surprise
- Disgust
- Anger
- Bored (the only mental state taken under.)

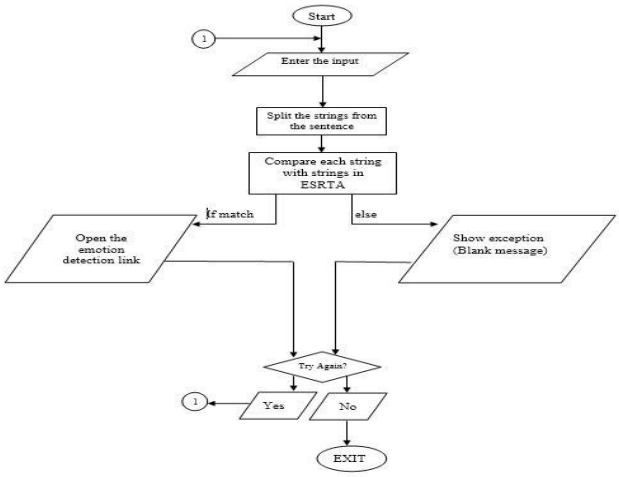
Besides that deciding what type of response would suit best as outputs?

After several hours of thinking and imagination we thought that to take the help of some media entertainment and as well our few innovations in the past which includes two interactive games, those are "Face Buster" and "One Pic and One Word" and an application called "Chocolate", a digital diary for storing personal feelings.

The main objectives of the proposed system are:

- To make an algorithm that detects the emotional state (anger, happiness, sadness, surprise, etc.) of a human being in English language.
- To implement this algorithm using java and basic web technology.
- To give a small introduction to a new idea called S.M.A.R.T. technology.

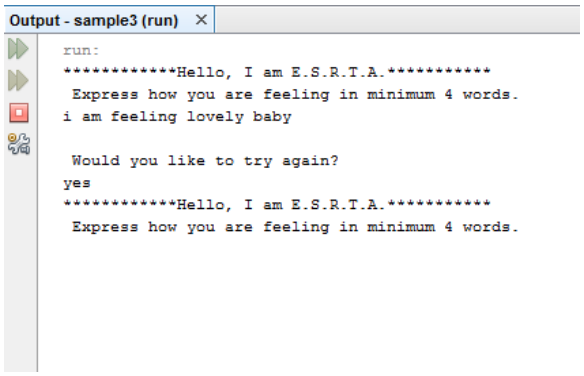
5.1. Proposed System flow chart:



5.2. Implementation:

The "Emotional State Recognition via Text Algorithm (E.S.R.T.A.)" is just a rudimentary effort to develop few steps towards machine-human relationship using java and basic web technologies. These are the following features of E.S.R.T.A:

- It is case-independent that means the user can input his sentence in any case he/she desires ranging from higher case to mixed case and lower case.
- The user must enter minimum four words otherwise it will take the reply as an exception.
- It detects 5 emotional states and 1 mental state.
- It uses Hypertext Application for responding to the user when it detects any emotional state.
- For checking the emotional state expressed in the sentence the program splits each word in the sentence and compares with the words stored in different sets of array.
- The E.S.R.T.A program may show exception when full stops or commas are added in the sentence.



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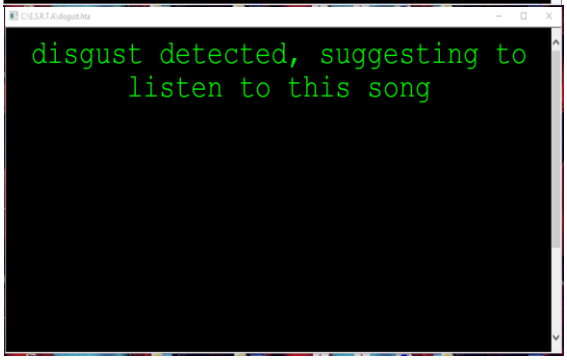

VI. CONCLUSION

Emotion detection is one of the most engaging topics in the technology world. Many systems have been developed to detect emotions from camera and some audio devices but in the domain of text based emotion recognition very few applications have been developed although it has wide scope for implementation in the technology world. So I decided to take this road less travelled so that it can serve as a new learning path for me.

We have been ambitiously waiting to work on this project and it has given us a great amount of pride and happiness after seeing our final system working just according to our expectation. We have used Java language, html, and Visual Basic.Net to implement the E.S.R.T.A. program. We have chosen this topic because of its wide scope in current technology industry. Although this project is quite basic but we have learned a lot of things while doing this project, in future if we get any chance to take this topic forward we would happily like to improve our work in order to contribute to our society.

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The completion of this project has given me a great amount of happiness. I had been ambitiously waiting for working on this project and now after it is complete I would like to say that it would not have successful without the blessing of God and the constant guidance of Sir Sanjib Das who has supported since the inception of this project.

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