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An Open Source Assistant for Human Emotion Analytics and Control for Incidental Investigations

(Using JSON Representation and Elastic Search)

S.Sikappi
Department of Computing, Coimbatore Institute of Technology, Coimbatore, India. sikappi_cit@yahoo.co.in,

Dr. S. Vasantha,
Department of Physics, Coimbatore Institute of Technology, Coimbatore, India. vasanthicit@yahoo.com.

***Abstract*—** This article shows a new approach for developing a system which assists to analyze the human emotions based on the history and practice on emotional attitudes, moods and type. The history of human behaviors and practice recorded from the incidental investigations and which is represented open source as JSON text data files in various nodes is searched using an elastic search algorithm with parameters defined by a rule based engine for human emotion recognition. The system gives assistance or suggestions for investigation, based on statistical and predictive metrics generated from the search results. The paper also elucidates the various possible applications where the system can be implemented.

Keywords-*Emotions; Behavior Analysis; JSON Database; Elastic Search.*

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I. INTRODUCTION

Emotions play an important role in human behavior by changing their psychological or physical activities. Persons of normal behavior show an advertent change in attitude either by facial expressions or increased voice intensity, show change behavior by actions like beating, biting, kicking etc. or experience physiological activities like chemical change, blood pressure, insanity etc. Such changes may bring positive or negative outcomes in the society. Since our social lives are influenced by emotional attributes, one need to have Emotional Intelligence (EI)[1] – the ability to monitor one's own and other people's emotions. People with high EI will perform well in their jobs with adequate mental health and leadership skills. They are cognitive in interpreting the events. Emotional information on different emotions can be used to guide thinking and behavior. A field of science called "Emotional Analytics" has evolved to identify and analyze the human emotions and personality. The field contains attitude analysis, mood analysis and type analysis. Such analysis in the past when exists as incidental emotional profiles, can give a solution to emotional aspects of similar incidents in the near future or for incidents under investigations on emotional aspects when such investigations are heuristic based analysis.

II. EMOTION ANALYTICS LITERATURE REVIEW

Emotions are historically variable and open to changes from past to present and from present to future. A person's angry emotions may change to happy after the successful accomplishment of a task. Recognizing such emotional feelings of a person is difficult and is dependent on many facts. Emotions are incidental too. A person is subject to emotions when he sees, feels or hears something before him and he is sometimes reactive to such emotions. Various techniques are available to identify human emotions.

- The Facial Expressions which has a change in the muscular position. Research on facial expression began with Darwin's The Expression of Emotions in Man and Animals (1872/1978). Expressions shown in face for emotions like happy, sad, fearful, angry, surprised, disgusted and combinational emotions [2] like happily disgusted, sadly fearful, sadly angry, sadly surprised, fearfully angry etc. are detected.

- Voice frequency and intensity. It is not, what you say? But, how you say? Level of intensity carries emotion. Little intensity shows a relaxed, neutral behavior and it may also reflect acceptance, a good comfort level, or a lack of caring. A high level of intensity shows a great deal of feeling; this level of intensity reflects strong feeling, either positive or negative [3]

- Body Language. What people do when expressing different emotions? With careful observation, emotions may be detected from non-verbal signs and they are merely indicators and not certain guarantees. E.g. Neck and/or face is red or flushed, Baring of teeth and snarling and Clenched fists [4].

- Physiological changes associated with emotions. E.g. increases or decreases in heart rate, cutaneous blood flow (blushing or turning pale), sweating, and gastrointestinal motility can all accompany various emotions [5].

- The verbal Communication. This includes verbal description of emotional states. e.g. "My subordinate showed disrespect to me", "I am not feeling well". This is a conversational analytics.

- Language Agnostic which is the use of words with emotions, e.g. “stupid”, “shut up”, “get lost” etc.

The emotions can be active, passive, positive or negative emotions. The analytics considers the types of emotions which has a significant impact on the social behaviour of emotional people.

III. OVER ALL SYSTEM

. People who have experience are preferred mostly for complex leadership jobs. They know well to handle different situations and conditions in the business by their experience and obviously will have the knowledge to manage the condition if new delicate situation arises. Hence using historical records as guides for taking decision is the clever management. History of emotions can help anyone to understand the various emotional attitudes, whether emotions are good or bad and if bad how to control it. The analytics works on history of emotions by referring to the various emotional profiles (*to address an important attribute i.e., emotions/feelings)* generated automatically or by referring to the stored emotional profiles. The profiles are searched using an elastic search technique of text documents. The search is a dynamic parameterized search, where the parameters are derived from the output of a rule based engine.

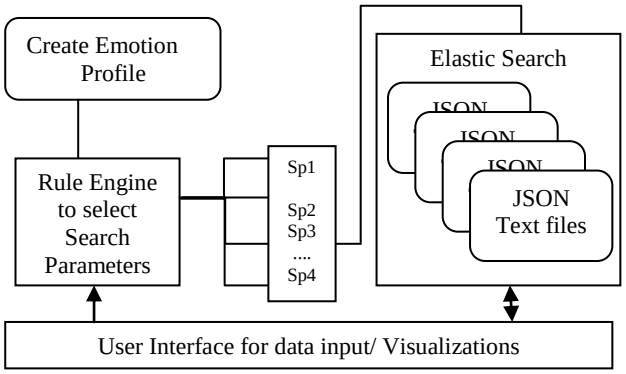

Figure 1: Human Emotion Analytics and Control Assistant System

The Figure 1: shows how the generated profile is matched with the existing profile’s data using an elastic search with parameters generated by the rule engine. The profiles are stored in the text files at different repositories of different fields. The text file contains emotion profiles of different incidents and the structure and notation being the JSON objects.

A. Emotion Profile

The emotion profile hold information on the incident such as the field of the incident, the persons involved, their details like age, profession, living class, behaviour etc., the location of the incident, the reasons, the actions, the action types as active, passive, positive, negative etc., social benefits, social responses and the emotional feelings of the persons involved. People who have experience are preferred mostly for complex leadership jobs. They know well to handle different situations and conditions in the business by their experience and obviously will have the knowledge to manage the condition if new delicate situation arises. Hence using historical records as guides for taking decision is the clever management. History of emotions can help anyone to understand the various emotional attitudes, whether emotions are good or bad and if bad how to control it.

In situations where the references and analysis on the past happenings may give any understanding or solution to problems in near future, that is done only if such past happenings have been recorded as complete data and some understandable form as either used to an extent needed by the later referrer or full. Such recorded data are called ‘Emotional Profiles’. The emotional profile helps the referrers to understand the past emotional experiences, the way such emotions has been analyzed and further the attitude of the general public on such emotional incidents, like whether it is controllable or un controllable emotional aspect. Even the methods of analyzing the emotions on such incidents and the result of such analysis can also be recorded for reference.

B. Knowledge Representation and Reasoning:

Knowledge Representation and Reasoning in computer field is a technique which helps the Artificial Intelligent Agents to take decision based on the facts known to it. At the initial stage of investigations the known facts are collected and an emotional profile is created with few facts what has been known true or untrue. Later the historical data in the existing profiles are used for reasoning the facts to be known by a logical Intelligent search with several search parameters relevant to the investigations.

C. Rule Engine:

The Rule Engine acts as a Case Based Reasoning (CBR) system[7], is the process of solving new problems based on the solutions of similar past problems, e.g. “An auto mechanic who fixes an engine by recalling another car”. It has been argued that case-based reasoning is not only a powerful method for computer reasoning, but also a pervasive behavior in everyday human problem solving; or, more radically, that all reasoning is based on past cases personally experienced.

During investigations the investigator starts with very few known facts like the name of the person whom he investigates his gender, his economic status, his profession, the reason he has been investigated etc. The purpose of investigation is to find more facts by testing his emotions by various methods like facial expressions, the words used while answering, the verbal responses for the questions, his actions etc. Hence the rule engine fixes the initial factors. The search response as to the initial factor is as given in the Table 1:

Table 1: the search result with the initial factor as 'sex'

SP/Incident	Crime	Theft	Burglary	Fight
Male	90%	50%	80%	40%
Female	10%	50%	20%	60%

The rule engine next decides on the next parameters as based on the initial factor.

If (sex) then …… (age group),

If (economic status) then…….. (spending attitude)

If (actions) then ……. (expression)

If (expression) then (reaction)

If (reaction) then ……. (attitude)

If (dependant) then…… (relationship)

If (relationship) then …….. (behaviour)

The probability is calculated differently for dependant and independent factors.

For independent factors the probability is calculated as follows:

1/n where n is the number of possible values for the factor. An elastic search is applied for the factor and the factor result is multiplied with the probability. If the result is 70%, then the factor value is

FP = 0.70 * 1/n;

FV = FP – (1/n) if Greater than (1/n)

FV = (1/n) – FP if Less than (1/n)

Finally the Initial Factor is added with the probability of greater value and subtracted from with the probability of lesser value.

IF = IF +/- (FV)

For dependant factors the Initial Factor is calculated as follows:

IF = IF * (FV)

The inference on the emotional profile is based on the final value of the IF, which is either nearest to zero or nearest to 1.

D JSON Representation

JSON is a language-independent data format, an open and text-based data exchange and storage format. The data is stored in text files as serialized persistent objects. Its data is stored as name value pairs either as separate or as nested values. It can hold data types like string, number, Boolean, array or an object. An object can contain further more objects as nested. It is an alternate data representation format for SQL. The data can be stored in the text files after validating the structure of the data as persistent data objects. Later the data is parsed by a JSON parser using JQuery. One of latest model to extract data from JSON text file is the elastic search.

The following is the content of the JSON text file which is a simple java object which lists out the emotion profile of an incident by an investigato,

```
emotion-profile {
  Incident: "Crime Attempt",
  Investigator: "Rojer Patrick",
  Name: "John Smith",
  Age-group:"Youth",
  Date-Time:"1009201402:40:10",
  Profession: "Unemployed",
  Economic-status: "Rich",
  Emotion-attribute:{ ["angry", "fear"],
  Methods: [{technique:"face-forward", result: 23.5,
  expression: "angry"},
  {technique: "voice-tone", decibel: 30,
  Frequency: 12, EP:"fear",
  reaction:"reluctant"}]}
  Relationship: {"known", "no blood relation", "3 years"},
  Action: { type:"stabbing", place:"public road",
  Arms: {object:"knife", make:"ASD", usage:"3 years"},
  Position: [ "right-arm", "chest", "thigh"],
  Blood-loss: {time: 30:20, amount:"60onz"},
  Attitude:"positive"}
}
```

The sample emotion profile can be parsed and extracted for required data from it. Whenever investigations are over the data can be stored in the above format for future reference or it is to be sent through the network. The data can be easily altered as it is simple text file. The parser can be used to extract the entire file or specific data object from the file. The text files are stored with ".json" extension so it can be identified as a text data file. JSON files can hold complex data structures which multiple values can be listed using arrays and data can be nested using object notations.

E Elastic Search for Extracting data

Elastic Search is to analyse the information with real-time search results and when we have huge data stored. It was Shay Banon released the first version of Elastic search in February 2010[9].A distributed search can be performed with elastic search with many nodes retrieved.

It has been developed in java and can be used to search all kind of documents. The main features of elastic search which supports the system are as follows

- It is flexible search and gives ability to move easily beyond full text search
- It uses the schema free JSON documents as data store and for search.
- It has been developed in java and is open source
- Its main feature is, it supports faceting and percolating.

Faceting is one of the ways of navigation search technique for accessing information organized under facetted classification system which classifies each information element along multiple explicit dimensions, called facets, enabling the classification to be accessed in multiple ways. Facets are the properties of the information elements [10]. *Percolating* is the reverse technique of database management. Instead of defining structure, data and writing queries to alter structure and retrieve data we store queries into an index and documents are designed to percolate these queries for information retrieval [11]. The system uses the method of faceting to store information in the JSON documents. The documents are designed based on the indexing procedure. The search parameters are derived by the rule engine for every search. The conflicts arising are solved by the rule engine. The search results are evaluated for every search and the final Initial factor is derived to give solution for the assistance.

IV CONCLUSSION

The actions, reactions, behaviour and mind health are several factors which has emotion as the basic cause for it. The feature of such emotions and the reason for cause of such emotions, when analysed well the better expectation in the control of human behaviour can be achieved. The complexity of the system lies in the number of facts, the systematic recording of the JSON data and efficiency of the predicate logic used to find the search parameters. There can be incidents whose investigation cannot proceed just because facts are not available. In such cases the system finds the way to reach the facts since it is a heuristic analysis. The results can either be final or intermediate depending on the complete set of parameters or using few search parameters and stopped to analyze. The statistical approaches can be followed to produce intermediary search results. Data visualizations can be used to view the intermediary results of the search. The system can be used by the investigators for any police investigations on any incidents, by psychiatrist on any clinical investigations and by the government on emotion investigations to the general public during situations like hike in prices, change in government policies and introduction of new legal procedures.

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