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MAN, MACHINE & MUSIC:-A QUALITATIVE APPROACH FOR EMOTIONAL MACHINE LEARNING

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Abstract: Machine learning can be comes from the music. We as well as machine can have ability to learn from music. Music is all around us. We have music everywhere in our life. Music can be a beneficial in learning process. Our machine should be intelligent. Machine learning is a rising field in artificial intelligence. So many researches show how quick a machine can learn from experiences and knowledge. Research shows music is also a powerful tool in machine learning. Music is also working as a therapy in medical field. This paper presents qualitative approach of machine learning through music.

Keywords: Artificial intelligence, Emotion, Emotion recognition, Machine learning, Pattern recognition.

RELATED WORK

No doubt, music is everywhere in our day to day life. We have to give this music, as a training to our machine to become machine more intelligence. One explanation for the impact of music on emotions is that music creates awareness of our current emotional state (Baumgartner, Esslen, & Jancke, 2006; Krumhansl, 1997). People listen to music because it can make them feel comfortable, relaxed, or happy (DeNora, 2000; Juslin & Laukka, 2004; Juslin & Sloboda, 2010) [1]. Now a day's time is of machine era, almost everywhere in world autonomous system is rising rapidly. Whether it is home or industry, schools, organizations etc. This is current scenario of our daily life.

We simply use and saw various autonomous system. Even we are also a part of autonomous system. Getting continuously work human get tired/bore, so for their relaxing he/she want some refreshment, enjoy, entertain. Music is one of the powerful tool. Emotions are processes directed towards a specific internal or external event or object, which result in changes in both behaviour and bodily state (i.e., physiological change; Ekman & Davidson, 1994; Scherer, 2004) [2]. Apart of this introductory information various other facts are came up in last few years. There is active research area of emotional machine learning through music.

INTRODUCTION

The concept of Machine learning support to artificial intelligence. There will be nothing wrong if we think music is a teacher. Yes, it is true. The ability is depends on us we are able to learn from music or not? The same phenomena we can also apply on machine. So let we take some basic history /concept about music. Music is nothing but a sound. Sound has some properties. This sound has some kind of medium to transfer from place to another. This sound may have transformation in gas, liquid, and some solids items. The special quality of regarding sound is that it must have some kind of medium when it passes or transform. There are various methods to represent music into symbolic form. One of the form how to representation of music can be done is shown in Fig. (1) [8]. This sound is not able to transform in the absence of these medium. Sound is also not capable to pass in vacuum. Normally for human audible range of frequencies is 20 Hz (Cycle per second) to 20 KHz (20,000 Hz) [3]. This range of audio shrinks during numerous phases of daily life. There is one more interesting factor about hearing is gender of human. Science shows that, "women have higher sensitivity to higher frequencies to men" [4]. .

This music can be categories into various forms. It also depends on Time and location. But in general we can divide it into three main types *low*, *medium* and *high*. Every kind of music has at least two major components i.e. sounds & wordings (if it exists). It is briefly described as followings:-

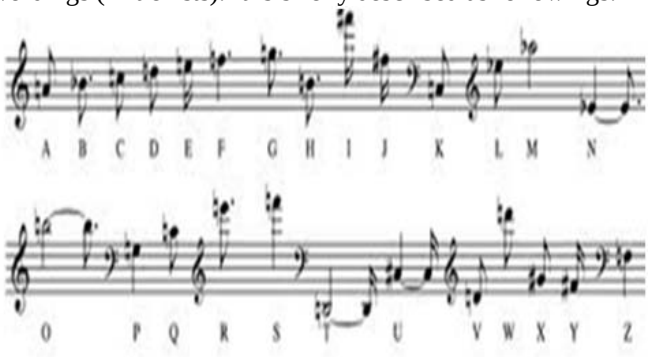

Fig. (1) Symbolic representation of English alphabets [8]

Low music:

Low music consists of low pitch of sounds and low frequency words. This music is also consisting of low rate of speech. So the ultimately this kind of music has low intensity. In general a human like this type of music when he/she move to sadness or in loneliness moments. This is in general. Besides this other factors can causes for low music. It can be include any sad news in life, any death news, any

failure, any miss happening, unexpected event, any negative response, etc. A human when he/she feels he is like alone in the world they want to listen this low music. Low music has its own benefits. Mainly it provides two major benefits:-

I) mental power and
II) physical power

This kind of music also helpful for human life for continuous growth and development of human body and human life. Sometimes it reduce/remove the stress/tension of mind. This kind of music releases the stress under any depression stage. In medical sciences it is works like a medicine. It provides moral support. Some of the low musical instruments are Guitar, piano, pipe etc.

Medium music:

This category is in between Low and High music. This is the middle stage of any music. The range of pitch is not so low as well so high. The intensity of medium music is of nominal range i.e. 20 KHz. Human ears are comfortable with this kind of music. This kind of music generally helps to make mood interesting, romantic, and joyful. Some time it helps for brain to think creative ideas.

High music:

High music is different type of music. This includes the high range of pitch as well as high frequencies' words. Generally it provides a very high volume of sound. Sometimes human's ears are not capable to listen this kind of music. Sometimes this music can be harmful. In old age and childhood age this can be very near to any serious situation. Inside of human's ear a very thin film is situated, this membrane is very thin and sensitive. It cannot bear more than 20 KHz. Usually this kind of music is used in parties, marriages, ceremony, in industries, rocket/missile launching, etc. Some of the high musical instruments are Drum, Bass Drum, etc.

ROLE OF MUSIC:

The universal truth about music is that it is magical tool for human life in various moments. In medical field the musical therapy is also an active field. Music is multidimensional in the world. Without music life for living being is incomplete. Beside human animals are also has some special music between them. Music can be a mediator in between animals. They communicate via music and their special types of tones.

We can use this music concept in machine learning. The same concept i.e. used in human life can be applied for machine. For this purpose we should have a need of multidimensional database that can store different kinds of music. In current time the research is going on this multidimensional database. Now again the concept of three music categories (*low, high, medium*) will apply to learn for machine.

EMOTIONAL LEARNING THROUGH MUSIC

The learning will be depending on the category of music. There are many preconditions to learn from music. The language of music is also again the major factor. Language will decide which kind of music is it and what is the message behind the music. Our machine's database will be through music then we see, music is directly contact to the inner part of brain. This concept is fast as compare to other learning process like study and watching from any knowledge source. The human brain has some specific structure when it moves into some emotional situation. Fig. (2a) shows the normal structure of brain at normal conditions/situation and Fig. (2b) Shows some emotional state (sad situation). As the figure shows the difference between brain structures in both situations. We simply find the second situation is more complex, it will take more attributes (training set) to represent this emotional state. Minsky argues that emotions are different ways to think that our mind uses to increase our intelligence (Marvin Lee Minsky August 9, 1927) [5].

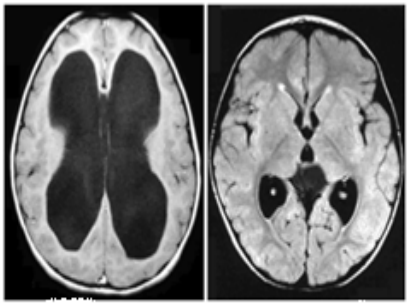

Fig. (2a) Fig. (2b)

Fig. (2) CT Scan of Brain in normal and non-normal situation [7]

PROPOSED APPROACH

"The scientific fact behind emotional learning is that category of music. We will decide some specific range of remark point for each category, if the input stream of music is match by the predefined remark point for any particular music, that music will be classified on the basis of predefined remark under some music"**.**

Proposed approach is based on this phenomenon. Again the idea behind find and learn an action by a machine will be depend On music. Each time machine will learn new things in same environment. Learning object will be change each time that will be depends on music. There can be various forms of emotions. Emotion may have in the form love, angriness, happy, sadness, etc. Every music has a some kind of message. Artificial Intelligence is the major platform in computer industry. It can be defined differently. Several aspects are there for Artificial Intelligence [6]. Let we take an example of sad music. We will try to find out the difference between the ordinary state of mind and after listening the sad music. We will also try to plot the graph for both state of mind. The difference between both states will show us the emotional learning by machine.

For this example we have to take some attribute for an ordinary state (OS) and an emotional state of Learning (EM). Suppose we are taking only three attributes for both states i.e. Intensity of sound (I), scan of brain(S), facial expression (F). In the last we will show there will be one more special attribute (E) that will be only occur after listening the sad music. This will be a part of Emotional learning (emotional state). This special attribute will be absent in the before listening the music of the state of mind

(i.e. before listening the music). There is no other possibility to occur such attribute. To confirm whether this attribute is really an emotional attribute or not we will decide a histogram value for this special attribute of sad emotion. We will compare both the parameter if they match then we will get an extra attribute in our experiment. This comparison will authenticate our assumption.

Attributes for before listening the music, the ordinary state (OS) are as followings-

Intensities of sound (I) = $I_1 + I_2 + I_3 + \ldots\ldots\ldots\ldots\ldots + I_k$

Scan of brain (S) = $S_1 + S_2 + S_3 + \ldots\ldots\ldots\ldots\ldots + S_k$

Facial expression of face (F) = $F_1 + F_2 + F_3 + \ldots\ldots\ldots + F_k$

So the overall attributes for the ordinary state of mind (OS) will be the summation of all the individual attributes, i.e.

Attributes of ordinary state:-

$$OS = \sum_{i=1}^{k} (I + S + F)$$

$$OS = \sum_{i=1}^{k} [\ \{I_1 + I_2 + I_3 + \ldots\ldots\ldots\ldots\ldots + I_k\} + \{S_1 + S_2 + S_3 + \ldots\ldots\ldots\ldots\ldots + S_k\} + \{F_1 + F_2 + F_3 + \ldots\ldots\ldots\ldots\ldots + F_k\}\ ]$$

Attributes for after listening the music, the emotional state of machine (EM) are as followings-

Intensities of sound (I) = $I_1 + I_2 + I_3 + \ldots\ldots\ldots\ldots\ldots + I_k$

Scan of brain (S) = $S_1 + S_2 + S_3 + \ldots\ldots\ldots\ldots\ldots + S_k$

Facial expression of face (F) = $F_1 + F_2 + F_3 + \ldots\ldots\ldots\ldots + F_k$

Emotional expressions (E) = $E_1 + E_2 + E_3 + \ldots\ldots\ldots\ldots + E_k$

So the overall attributes for the emotional state of machine (EM) will be the summation of all the individual attributes, i.e.

Attributes of Emotional State of machine:-

$$EM = \sum_{i=1}^{k} (I + S + F + E)$$

$$EM = \sum_{i=1}^{k} [\ \{I_1 + I_2 + I_3 + \ldots\ldots\ldots\ldots\ldots + I_k\} + \{S_1 + S_2 + S_3 + \ldots\ldots\ldots\ldots\ldots + S_k\} + \{F_1 + F_2 + F_3 + \ldots\ldots\ldots\ldots\ldots + F_k\} + \{E_1 + E_2 + E_3 + \ldots\ldots\ldots\ldots\ldots + E_k\}\ ]$$

Emotional learning by machine can be computed by taking the difference between the both states of machine. This will provide the following result:-

$$\text{EM-OS} = \sum_{i=1}^{k} (I + S + F + E) - \sum_{i=1}^{k} (I + S + F)$$

$$\text{EM-OS} = \sum_{i=1}^{k} \{E\} = \{E_1 + E_2 + E_3 + \ldots\ldots\ldots\ldots\ldots + E_k\}$$

This emotional attribute is an attribute in our training set. This attribute is has to be now compared with the original attribute in real emotional data set. For this we will take help of Histogram method. That will produce the final result. On the basis of this comparison we can decide what changes we get after and before the music.

RESULTS

Hence our result shows after listening the sad music we get an emotional state attribute (E). This attribute is not having the only single or same kind of attribute; it might be of several types. Actually this attribute is a set of training attributes which have emotional values. These emotional values of can be several types. Finally we can also guess the possible future action or plan of a machine. By this it will help us to predict the behavior of the machine. The result also shows machine can learn new experience through music. Music has some special sound and some message (Text). This can help to machine learn new experiences. Apart of this machine has basically two kinds of music category i.e. Natural and artificial. In natural sound , music consist of environmental issues like human voice, animals and birds sounds etc. on other hand the artificial sound is made by man using with the help of some instruments.

CONCLUSION

In this paper we discussed about machine learning from music. We make clear possible kinds of music. We also clarify about the role of music in human and machine's life. This way we can conclude, a machine can be control by music. It is need to make such kind of data base (multidimensional database) that can hold some music. Music can be in different modes like audio, video, etc. In the end, in our example we conclude that as the Fig. (1a) and Fig. (1b) shows, there is one more special attribute in the presence of music. Finally we get a conclusion that this only possible when our mental status moves into some emotional situation. There is no other possibility of occurrence such kind of emotional attributes.

FUTURE DIRECTION

This is not so easy to tell about the limitations of machine learning without the help of music. Music is powerful mechanism in machine learning. To become emotional machine should have some kind of mechanism to understand the emotional state. We will further try to get some more interesting concepts in emotional learning.

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