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Switching Music by Analysing User Mentality through Sensors

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Abstract. In this fast-moving world the analysis of stress levels for humans and the automation in understanding the mental progress and providing the service according to their needs. Here in this paper the methods and the techniques are discussed to provide the exact music or the playlist according to the user's mindset automatically without changing the song or the playlist manually. This concept can be executed with the help of some advanced sensors like PPG sensors, EDA sensors, HRM (Heart Rate Monitor), Oximetry sensors, etc. As automatic deduction sensors are the most essential and booming technology nowadays because modern people prefer to have their work completed without their involvement, and this is where automatic technologies began. Keywords: Stress level deduction, HRM (Heart Rate Monitor) Sensors, Oximetry sensors, PPG sensors, EDA sensors, Blood pressure, Music and playlists

1. Introduction

Music is the most inevitable part of everyone's life. Peoples love to listen to music according to their thought process but here only the human knows how his mood was, if he/she wants to listen to some music then that particular user has to change the songs or the playlists that he/she is willing to listen to, in this tech booming world how it would be! of changing the songs or the playlist automatically according to the user's mood instead of changing it manually. Yes, it is possible by deducting the level of stress that he/she has. Using this method, we can find the frame of mind and can provide the actual stuff that the user requires

2. Implementation

Every Physiological and Physiological activity of the human being can be tracked by using powerful advanced sensors. The level of stress can be deducted using the Heartbeat rate, Blood pressure, Oxygen level and sweat level on the skin and all these criteria can be measured using some sensors.
There are several types of music listeners they are discussed in part of the paper in the following

3. Types of Listeners

There are majorly two types of listeners are there

- One who listens to the music to switch his/her mood; in some hard situations they use the music as their tool to renovate their happy minds
- But, in another case, some people use music to maintain their mood. They'll start listening to the same kind of music in accordance with their situation. Some of the sensors are used here to measure the state of mind and they are mentioned below.

Sensors used:

- Heart Rate Monitor
- Oximetry sensor
- EDA sensor
- PPG sensor
- Blood Pressure Monitor

4. Methodology

First of all knowledge about the user is very much important to provide the services that are automated, As before mentioned there are majorly two types of Music listeners are there. From the developing side should know what type of listener he/she is and should analyse his/her approach to the listening to the music That is why the sensors like PPG sensors, EDA sensors, HRM (Heart Rate Monitor) and Oximetry sensors are used to deduct the level of stress in the person's mind and analyse the stress level of the person. These sensors are more compact. They are used in smartwatches and smart bands. So that we can measure stress levels even more effectively and compactly. he obtained stress level measurement reading has been given as the input to the application that decides and allocates the correct honour of the music according to the user's mindset.

5. Process Implementation

First of all, the sensors that are present in the Smartwatches will monitor the condition of the Heart rate, Blood pressure, Oxygen level in the blood and by using those readings by taking an average of that reading and calculate the percentage of the stress level that the user has

6. Procedure

The process is splitinto two modules and the functions are listed below

Process 1:

- The smartwatch will keep monitoring all the conditions needed while the watch is worn on the wrist
- These data will be taken as the input and then the percentage of the stress level will be calculated through the above-shown formula
- If the stress level of the user is normal, then the there is no issue the remaining process will not be executed
- Whereas as the level of stress is abnormal then the notification will be raised to the user that "Are you willing to listen to a song"
- If the user says "YES" then the control will be passed to the smartphone where the all remaining work will be done
- This process is shown as picture in the (Figure 1) that fallows

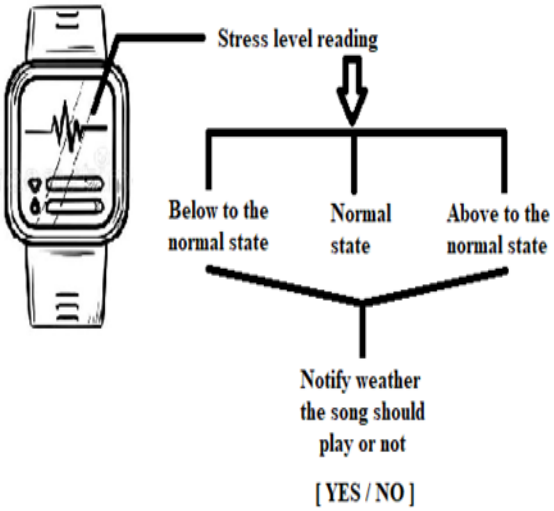

FIGURE 1. Process 1 done in the Smart watch

Process 2:

- After the signal has arrived at the mobile application
- The application already knows how the user will listen to the music at the time of stress
- According to the user's taste the song or the Playlist will be chosen automatically
- Finally the song will be played by the application.

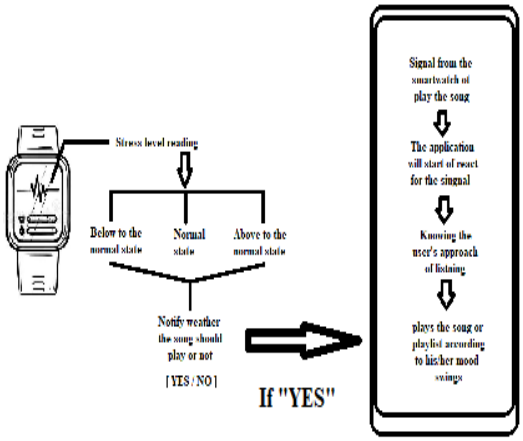

FIGURE 2. process 2 (The control moves to the Smartphone if neeed)

- The average stress level should be between (78.66 - 100)

- If the level is above 100% or below the 78.66% the user is in the abnormal state
- The following table shows the actual reading of the stress level of the user
- According to this reading the algorithm will be started and decided whethera notification will be sent or not.

TABLE 1. Stress level calculation

	HRM	BPM	OXYMETRIC	PERSENTAGE	STRESS LEVEL
Test 1	76	98	82	85.3	Normal
Test 2	67	82	67	72	Below
Test 3	110	98	109	105	Above

7. PSEUDO-CODE

Process 1 (smartwatch)

```
class watch {
    void StressLevel (value) {
    //Stress level above or below then the notification is sent if needed
        if (value<normal || value>normal) {
        asking the user that he/she needs to play a song;
                decision = ["YES"or"NO"];
                if (decision == "YES") {
Sending the signal to the smartphone application to play the appropriate music;
}
else {
        return;
}
}
else {
return;
}
}
}
```

Process 2 (smartphone application)

```
class PhoneApp {
//At the time of app installation
get (User_Listning_Type)
//While watch notify the app to play the appropriate song
void play (User_Listning_Typt) {
          if (User_Listning_Type == Type1) {
                  Play Type1 related music or playlist
                }
                else {
                Play Type2 related music or playlist
                }
        }
}
```

Thus the above given is the pseudo-code for the concept of switching the music or playlist by analysing the user's stress level through sensors

8. About The Sensors

Heart rate monitor: The heart rate of humans can be measured using the HRM (Heart Rate monitor) where the normal range of the heart rate of an adult is between 60 - 100 (bpm) Beats per minute. A person who has a heart rate between 60 – 100 bpm is considered to be relaxed if the rate of the heartbeat goes higher than the range of 100 bpm then it seems abnormal and considered that the person is stressed or in the bad mood

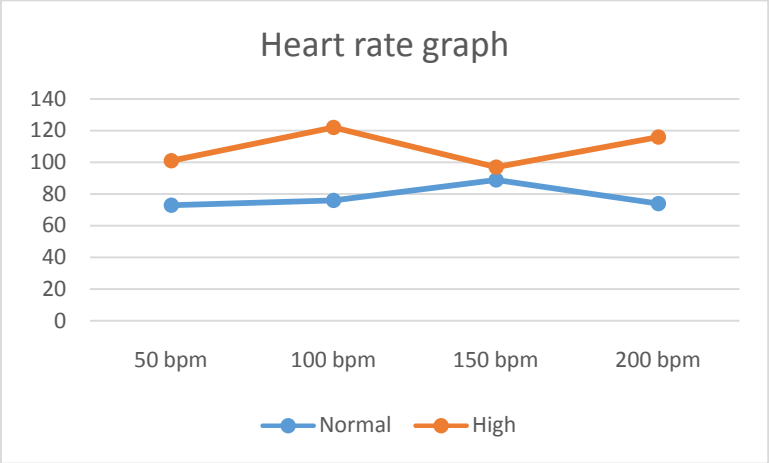

FIGURE 3. (Heart rate readings) Graph 1

Oximetry sensor**:** Stress makes our body tense and then releases the stress hormones at this stage the heartbeat will be increased and then the breathing rate will also be raised in that case the breathing will be shallow and faster than the normal which causes the low oxygen level in the blood The oximetry sensor will measure the oxygen level that presents in the blood (SPO2) which the oxygen level should be between 95 -100 % for the person who is in the normal condition If the person has an oxygen level below 95 or above 100 then it is considered as his/her oxygen level in blood is too low or too high this denotes that the person is not in the normal state

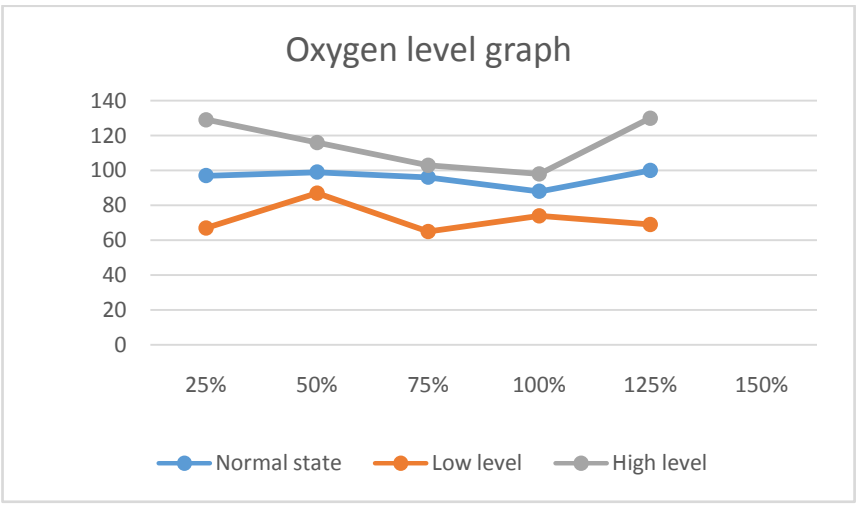

FIGURE 4. (Oximetry sensor readings) Graph 2

EDA sensor: This is the most effective sensor to deduct the stress level of the person using the sweat of the body. It is normal that human beings to lose their normal state and reach an emotional state at that time the condition of the body changes, the skin tissues will automatically change their texture EDA (Electrodermal Activity) sensor will deduct the changes that happen on the skin due to the sweat ejection which gives an accurate reading of the stress level of the human brain. These EDA sensors are used in the wearables like smart watches and smart bands, etc.

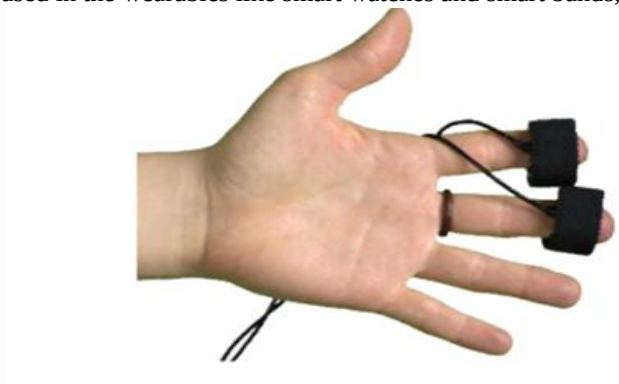

FIGURE 5. (EDA sensor)

PPG (Photoplethysmography) sensor: The PPG (Photoplethysmography) sensor is the most advanced sensor for deducting the stress level. It works with the principle of monitoring the volume of the blood flow, and the PPG – optical sensor which uses the motion tolerance technology where the light has been emitted as a signal that gets reflected by the skin and the bones

The volumes of the blood change every time the person loses his/her good state of mind. The PPG sensor deducts the light signals that reflect and measures the blood volume difference according to the Heart rate pulse.
And also these PPG sensors are used in the wearables such as smartwatches and smart bands.

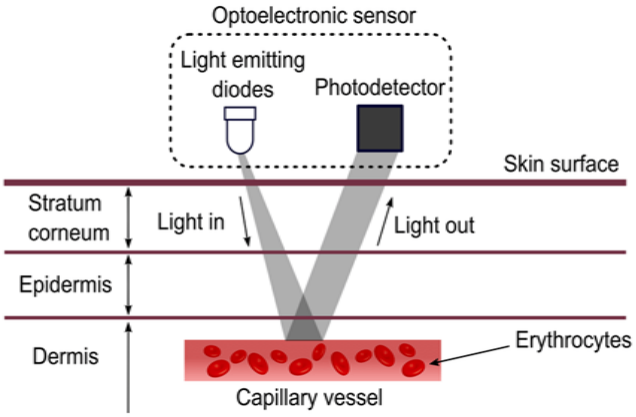

FIGURE 6. (Working mechanism of the PPG sensor)

Thus all these sensors are works together and the measures the level of the stress that human have and then plays the songs or playlist according to the taste of the user

Blood pressure sensor**:** At a time of sadness or in a heart situation the human will be stressed automatically. This stress will also increase the pressure on the person's blood. In some of the wearables, the BP (Blood Pressure) sensor is available The normal rate of the BP (Blood Pressure) for adults is to be below (115 – 120 / 75 -80) mm Hg Where for the person who has hypertension, stress then their BP (Blood Pressure) will be above the (130 - 90) mmHg which will confirm that the particular user is stressed right now

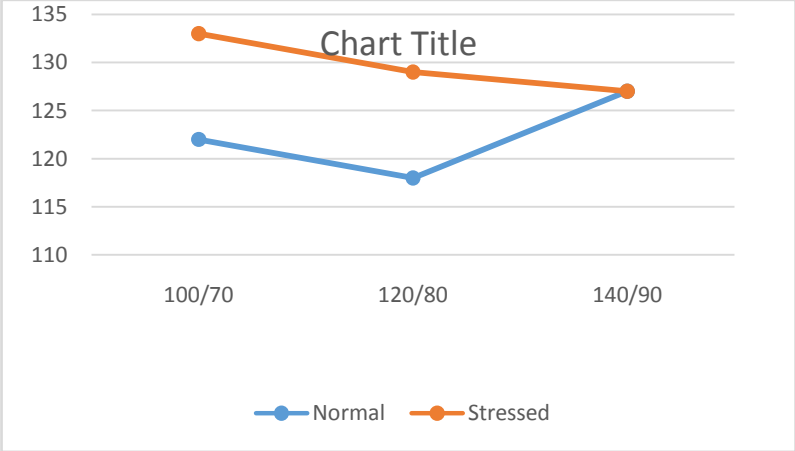

FIGURE 7. (Blood pressure reading) Graph

9. Challenges And Opportunities

There're some of the challenges that present in this method are fallows

- Technology is getting smarter and smarter day by day, but this sometimes leads to over smartness. Where the sensors can deduct the level of the stress but bit cannot analyse the situation. It may play a song in the wrong situation where the song or the playlist is actually not needed.
- These sensors or smartwatches or smart bands are not so easy to afford, Because the sensors like PPG sensor and EDA sensor are costlier than other sensors and they are only available in some of the costly smartwatches and smart bands.
- These sensors are over-sensitive it may also deduct the human body's physical changes (For e.g.: a person who is jacking his/her Heart rate and the sweat is also high) at that time the sensors may react for the physical conduction instead of the mental analysis.
- Even though there are some challenges there are some the good side present to this technology, they are.
- In this automatic world, it is essential to develop the technology that can understand the human brain and then to reacts according to the user
- This technique is more and more useful for the persons who have no time to search and change the playlist physically instead of that here the algorithm automatically calculates the stress level with the help of the advanced sensors in the wearables and the plays the songs or the playlist accordingly.

10. Conclusion

Thus, an understanding of the human mind's stress level and then providing them with the accurate services through the stress deduction concept and by this method user need net to change the song or the playlist it will be automatically organised according to the user requirements

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