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Emotion Based Music Recommendation System

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ABSTRACT*:* Recently, many methods and systems for automated recognition of human emotional states were proposed. Most of them are trying to recognize emotions based on physiological signals such as galvanic skin response (GSR), electrocardiogram (ECG), electroencephalogram (EEG), electromyogram (EMG), photoplethysmogram (PPG), respiration, skin temperature etc.
In this project, we decided to acquire and analyse only GSR and PPG signals because of its suitability for implementation and can collect signals from a person without compromising comfort and privacy. Also based on the input signals video song is been recommended. We use java based web services for song recommendation.

KEYWORDS*:* Emotion Recognition, Galvanic Skin Response, Photo Plethysmography, Physiological Signals.

I. INTRODUCTION

Smart device computing is the study or practice of inventing, designing, building or using body-worn computational and sensory devices that leverages a new type of human-computer interaction with a body-attached component that is always up and running. There are number of wearable computing device users are growing every year, their areas of utilization are also rapidly increasing. Which influenced medical care, fitness, aging, disabilities, education, transportation, finance, gaming, and music industries.People can have difficulties when trying to express their own emotions; the degree of own emotional state can't be measured accurately. Now, one of the most interesting challenges is the recognition of human emotions using commercial sensors. This topic has been extensively researched in the past, but it is still not defined precisely enough to be used commercially. Human emotion recognition systemhas been used commercially in the face recognition system, can be tricked easily, so it can't be used as trustworthy source of information. Human Emotion recognition system based on sensors can provide a more objective way to measure emotions. It is very easy to put a smile on the face and try to express joy. Physiological measures are much harder to conceal, they are more difficult to manipulate when compared with facial gesture or strained voice. The information sources (and some others), can be used to understand what person feels at the particular moment. This is the reason in our research we decided to use sensors to detect emotions. Our aim is to develop a universal human emotion recognition system, which will be compact, simple to use, and precise enough to produce valid results. Big challenge in emotion recognition system is the fact that every human being is unique and that different human brains will show emotions in different ways. So, the question is if humanemotion recognition system could be used universally - one system for all people. However, there could be a universal system, but it should be trained individually. In our research, we showed this issue by building a single-user and multi-user emotion classification models to compare the results. Sensors in emotion recognition systems are used to communicate with the person on subconscious level. They receive the feedback from a person about something he feels, sees, hears without person being conscious of it. Earlier researchers showed that galvanic skin response (GSR) and photoplethysmogram (PPG) are the most indicative way to evaluate the emotion. Beside the GSR and the PPG signals another bio-signals such as electrocardiogram (ECG),

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electroencephalogram (EEG), electromyogram (EMG), respiration, skin temperature etc., have been used into emotion recognition research. [1], [2].

II. RELATED WORK

Ekman et al. have stated that facial expressions can be categorized into seven main categories including angry, disgust, happy, fearful, surprise, sad and neutral [3]. In other words, these facial expressions were globally same for all races, social strata and age brackets and were recognized same among distinct cultures. However, in case of human beings prefer to camouflage their expressions, using only facial expression signals many not be enough to detect emotions reliably. Compared with facial expressions, using physiological signals is a more reliable method to tract and recognize emotions and internal cognitive process of people. Physiological signals, including respiration, heart rate, galvanic skin response / conductivity etc have been used [4], to overcome this disadvantage in emotion recognition and tracking tasks. Traditional recommendation engines use content - based or collaborative filtering methods and do not consider user emotion state [5].However, using human emotion state with recommendation engines may increase recommendation engines performance. Shin et al., presented an automatic stress-relieving music recommendation system. System used wireless and portable finger-type PPG sensor. Nirjon et al., proposed a contex-aware, biosensor – based, music recommender system for mobile phones [6].

We proposed a music recommendation system which considers user's emotional state in its recommendations. System's recommendations are mostly based on two factors user's past preferences, and the possible effects of recommended song's on the user emotion. The system detects user emotions and evaluates the emotional effect's feedback before and after a song is recommended. The framework uses the GSR and the PPG to continuously track user's emotional state changes. Before current work, we have proposed an emotion recognition system based on only GSR signals [7]. Our proposed framework aims to enhance video music recommendation engines performance by considering users emotion states.

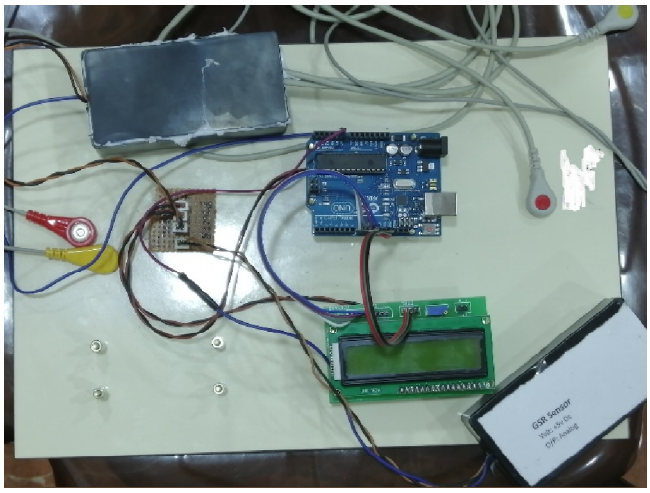

Figure2.1: Hardware Structure

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III. EXISTING SYSTEM

Existing systems are highly complex in terms of time and storage for recognizing user behavior. Existing system doesn't invoke sensor based emotion recognition of the users. Existing system doesn't focus on user mood based song recommendation.

IV. PROPOSED SYSTEM

In our project, we propose to acquire and analyse only GSR and PPG signals because of its suitability for implementation and can collect signals from a person without compromising comfort and privacy. Also based on the input signals video song is been recommended. We use java based web services for song recommendation.
Our motivation in this work is to use emotion recognition techniques with wearable computing devices to generate additional inputs for music recommender system's algorithm, and to enhance the accuracy of the resulting music recommendations.

V. MATERIALS AND METHODS

1.SENSORS

GSR:GSR, which is also known as electro dermal activity (EDA) is a resistance / conductance based, easily captured, low cost physiological signal technique. Experiencing emotions like stress or surprise causes changes in skin resistance. GSR is used to capture physiological reactions that generate excitement. When people get excited, body sweats, the amount of salt on the skin and skin's electrical conductance changes.

Figure5.1: Galvanic Skin Response

Photo Plethysmography: Photo Plethysmography is a measurement technique that can be used to measure the volume changes in different parts of the body. Heart rate variability (HRV) and inter-beat periods measurements also can be done using PPG sensors. Since emotions like stress may increase blood pressure, emotions have correlation with HRV and blood pressure.

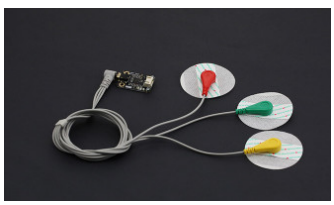

Figure5.2:Photo Plethysmography

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2.PROGRAMMING MICROCONTROLLER

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet), UNO is the version of Arduino. It contains everything what needed to support the microcontroller, simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it doesn't use the FTDI USB-to-serial driver chip. Instead of, it features the Atmega8U2 programmed as a USB-to-serial converter.Uno means one in Italian and another is named to mark the upcoming release of Arduino 1.0. The Uno & version 1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest series of USB Arduino boards, and the reference model for the Arduino platform; for a comparison with previous versions, see the index of Arduino boards.

Figure 5.3: Arduino Uno

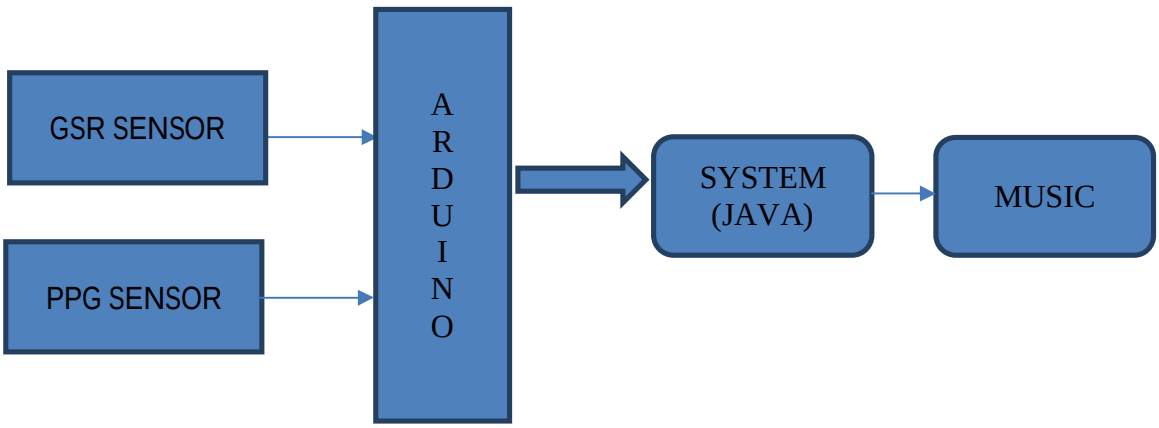

Figure 5.4: Architecture Diagram

3.DATA COLLECTION USING JAVA:

The API by Java developers, it still provides all the necessary functionality for proper serial communications. In order to make the API portable across platforms, the API defines an abstract SerialPort class. The class is then subclassed and platform specific functionality is implemented in the subclassed object.Then this concrete class then interacts with a

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Dynamic Link Library (DLL) file through the Java Native Interface (JNI). Once a SerialPort object has been created, communications through the physical port are conducted through standard InputStream and OutputStream objects. These streams are send and receive information as bytes, integers or arrays of bytes.

4. MUSIC SYSTEM:

In our Music Emotion recognition block, the playlist of a user forms the input. Using the emotion we play the songs. In Music Emotion recognition block, the playlist of a user forms the input and plays according to the user emotions.

VI. RESULT

Fig 6.1 shows the result of the emotion-based music recommendation system. When the fingers of the user are placed over the GSR and PPG Sensor, the values of the heart beat and emotion of the user is recognized, the values are displayed in the LCD display. Then based on the values, music will be played for the user.

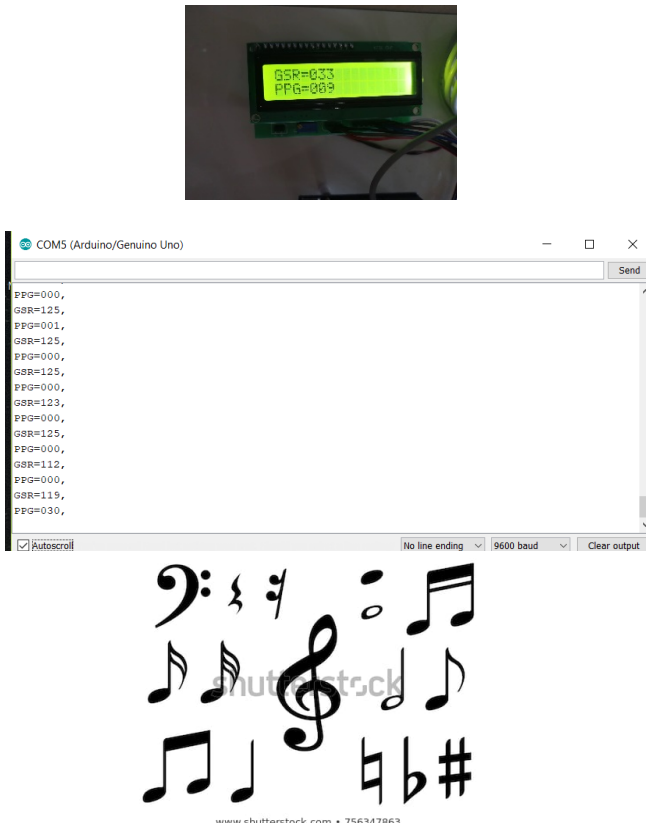

Fig 6.1: Final outcome of the Emotion Based Music Recommendation System

VII. CONCLUSION

In this paper we recognizing values directly from only GSR and PPG signals . We obtain the values and data is collected using java. We have showed that there is relationship between GSR and PPG signals and according to the user emotions music is been recommended.

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