Control and Prevention of Personal Stress

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***Abstract*— Stress is or could be one of the most talked-about and recurring things in recent years, because of the world that we live. Stress is our body's response to a pressure thing or situation in our life. In this way, countless things have a stressful impact on our lives. On the other hand, stress is usually due to something new or unexpected, that somehow is beyond our control. The effects on our body are evident, inevitably having symptoms. When we are exposed to stress, certain hormones are released in our body, and the immune system is working on self-defence. During this, breathing becomes faster, heart rate increases, muscles contract and blood pressure also increases. Thus, the organism is ready to act to protect itself. It is where our project comes in, because, with these symptoms of our body, they allow stress to be identified. This paper is focused on precisely that, because, by reading the person's vital data, we can establish standards of normality, which, when they suffer variation, may indicate to us in advance that the person is stressed and help him to control himself so that there is no more significant damage. With this, we hope to obtain positive results in people's lives and routine, causing the stress rate to drop worldwide.**

Keywords*— *Muscles, Sensors, Mobile devices, Stress, Health.

I. Introduction

Nowadays, stress is something that is present in every day of our life and always tends to increase both at the professional level and in the emotional life of each individual [1], [2]. Since beyond a certain level, this is no longer useful, and it begins to seriously damage health, alter mood, productivity, relationships and quality of life in general [3], [4].

There are only a few mobile applications that try to solve the problem of stress. Still, in our understanding, our project will present a better and more efficient response in terms of regulating and detecting the stress of an individual, among other things [1], [2], [5]–[9].

The sensors that we have as a basis for our project are the ECG for the heart rate reading [10], the EDA that will transmit information regarding skin and sweat [11], the ACC that through movement and tremors we will have reliable readings [12], [13], and the TMP sensor [14], [15] to measure the body temperature can indicate or help to identify stress more efficiently, by the temperature deregulation.

This study aims at precisely the fact that it is increasingly possible to connect the sensors to read data from the human body, and with this data, it is possible to combat problems such as stress, which is our theme. As our scope, help to improve the quality of life of people worldwide. With this project, we aim to improve the people lives, their mental health as well as physical health as efficiently as possible.

The introduction ends with this paragraph, and the other sections of this article are structured in this way: Section II presents the description of the structure and methodology for recognizing people with stress, or at least some symptoms or warning signs. Section III lists and explains the sensors proposed to be used in the preparation of our project. Section IV describes the mobile application that is proposed to be developed. Finally, this article ends with the discussion and conclusions in Section V.

II. Overview

The way we decided to use to detect variations in stress levels, is schematically explained in fig. 1.

In this way, the figure represents the reading and acquisition of data, its processing and manipulation of the same data. The reading of the data is done using a BITalino [16] that contains several sensors, including audio sensors [19][20] , as you can see in fig. 2. With the processing and manipulation of the data after its collection, we achieve the variation and oscillation of the values and detect the person's state of stress.

The main goal of the proposed system will be for helping the people as represented in fig. 3.

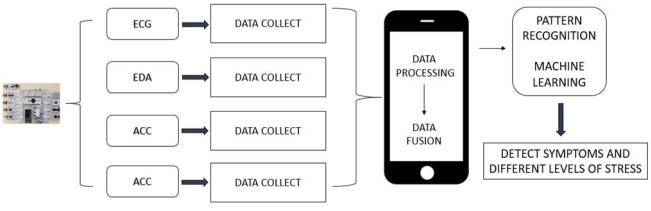

Fig. 1. Process to detect stress levels.

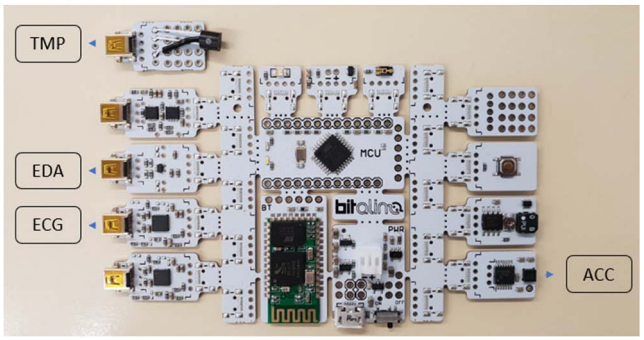

Fig. 2. BITalino device.

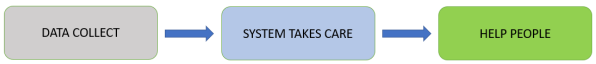

Fig. 3. Our goal idea.

III. Sensons

There are several recent discussions about the concept of sensors and their importance for everyday life involving the internet of things (IoT) [17], [18]. We have that IoT is a technology capable of monitoring all types of situations through the capture of data through sensors. IoT applications can be the most varied, depending on the creativity of managers. Approaches like [21] demonstrate that it is feasible to use custom-made electronic devises to collect and analyze sensory data in an affordable and reliable way.

BITalino devices are low-cost kits that have a wide range of easy-to-use software and development tools that allow anyone to create projects and learn to use their body's signals for the most varied applications [16]. The base kit has sensors to measure signals from the heart, muscles, nervous system, movement and ambient light, including a microcontroller, Bluetooth, a charging module and all the necessary accessories to start working.

There are the pieces of hardware that do the critical work of the monitoring, measurement and data collection processes. Sensors are sophisticated devices that are often used to detect and respond to electrical or optical signals. A sensor converts the physical parameter (e.g., temperature, blood pressure, humidity, speed, etc.) into a signal that can be measured electrically.

Regarding the sensors that we will use to detect stress and other anomalies, we will use sensors such as:

- ECG that performs a test that records the frequency and intensity of the electrical impulses that make the heartbeat, and then analyze the atrial fibrillation (FibA) records to see if there is an irregular heart rhythm.
- We will also use EDA, which is the property of the human body that causes continuous variation in the electrical characteristics of the skin. The traditional theory of EDA states that skin resistance varies with the state of the skin's sweat glands. Sweating is controlled by the nervous system, which is why it is essential for stress analysis.
- We will also use the ACC sensor, which measures the vibration or acceleration of the movement of a structure. The force caused by a vibration or movement change (acceleration) causes the mass to "squeeze" the piezoelectric material, producing an electric charge proportional to the pressure exerted on it. Since the load is proportional to the force and the mass is a constant, the burden is also proportional to the acceleration.
- Finally, we will use the TMP sensor, which is a device that uses physical characteristics such as electrical resistance, electromagnetic field or thermal radiation to measure temperature. There is a wide range of these types of sensors, which can be divided into passive or active. Liabilities need an external voltage to function, whereas assets generate a tension with the functioning itself.

IV. Mobile Application

This application, through the operation of the algorithm and the interpretation of the sensor values, will make it possible to manage the person's stress as presented in fig. 4.

This algorithm will allow for better stress management and control in an increasingly stressful world.

The data read from the ECG sensor will allow to detect the oscillation about other previous readings, and to find a typical pattern for each user, thus allowing to see the cardiac variation. Through the EDA and TMP sensors, we can interpret the different sweat movements and temperature, respectively, using standard values.

Finally, with the ACC sensor, in addition to detecting the person's shaking and agitation, it will also help in case of seeing an attack or even a fall. These types of additional may be input to the machine learning modes, and in such cases, the nominal data needs to be transformed into numeric, before it is fused and used together with the sensory data [22][23].

With this algorithm, the more people using the system, it will be possible to obtain more comprehensive statistical data, such as detecting the locations of the country and the world that are more likely to be stressful, the reasons or reasons that most stress people, among other types of estimates that will help to improve this situation in the future. To analyze these types of data, one might need to use Big Data approaches to obtain meaningful insights [24].

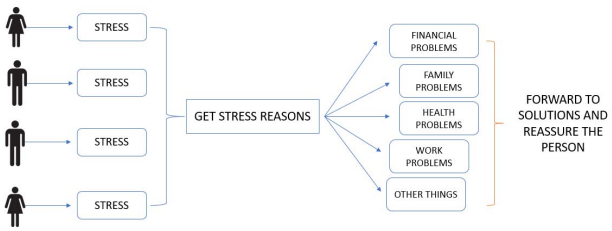

Fig. 4. Our process to help people.

V. Discussion and Conclusions

We consider this project to be of great relevance, since the world is increasingly agitated and stressful. When developing this project, it became possible to understand and demonstrate the importance of sensors connected to mobile applications and what they can contribute to facilitate or help us in our lives. Also in this topic, health is increasingly more intelligent using technology, which makes our project even more relevant and valid, as the algorithm will be able to prevent, in addition to stress, successor problems to stress, such as physical problems and mental, in this way our idea will contribute positively to society.

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