

AUXI Affective Computing

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Abstract

AUXI is an interaction design project focused on Affective Computing, more specifically on emotional design. Nowadays, society is regularly exposed to stress and anxiety, therefore, our project focuses on panic attacks, a condition that affects a large part of the world population. AUXI aims to help users coping with and avoiding this condition related to mental health, so that they are not limited by these attacks and are able to achieve a better quality of life.

Keywords: Affective Computing, Emotional Design, Panic Attacks, Anxiety, Stress

1 - Affective Computing

The word emotion cannot be defined in a clear and objective way. There are several scholars who defend different perspectives regarding its meaning and most of these concepts define emotion in a human perspective, directly linked to cognitive and physiological functions. However, since the focus of the project is Affective Computing, we will highlight the vision of renowned personalities who dedicate themselves to the study of emotions related to technologies, such as Rosalind Picard, founder and director of the Affective Computing Research Group at MIT Media Lab, and Donald Norman, author and professor in the areas of design, usability engineering and cognitive science, among others. Numerous implications arise when discussing Affective Computing, such as the dilemma regarding a computer's ability to analyze a person's emotions, seeing as they have a large cognitive component. However, as William James argues, emotions are linked to its body symptoms:

"If we imagine a strong emotion, and then try to abstract from the awareness that we have of it all the feelings of its bodily symptoms, we will see that there is nothing left" ¹

For example, fear is directly linked to the acceleration of the heart rate, the trembling of the lip, the weakened legs, the goosebumps and the tightness in the stomach. Can we imagine what would be left without these symptoms? Reinforcing this idea, Donald Norma says:

"Facial expressions and body language are automatic, indirect results of our affective state, in part because affect is closely tied to behavior." ²

After clarifying that emotions are not only related to their cognitive component but also to physical manifestations, what would prevent a computer from recognizing and analysing human emotions?

*“Professor Rosalind Picard at the MIT Media Laboratory leads a research effort entitled “Affective Computing,” an attempt to develop machines that can sense the emotions of the people with whom they are interacting, and then respond accordingly. Her research group has made considerable progress in developing measuring devices to sense fear and anxiety, unhappiness and distress. And, of course, satisfaction.”*²

Accordingly, we can define Affective Computing as an aspect that seeks to improve human-computer interaction, introducing emotion to appropriate mechanisms to deal with affective information, which allows the natural adaptation of the device to its user. At this point another dilemma arises: can we mask our own emotions so that the computer cannot detect them? Rosalind Picard questions: *“The level of control involved in perfecting one’s “poker face” is praised by society. But, can we perfect a “poker body?”*³

Donald Norman answers this question by stating: *“The body displays its emotional state in a variety of ways. There are, of course, facial expressions and body language. Can people control their expressions? Well, yes, but the visceral layer works automatically, and although the behavioral and reflective levels can try to inhibit visceral reaction, complete suppression does not appear to be possible. Even the most controlled person, the so-called poker-face who keeps a neutral display of emotional responses no matter what the situation, still has micro- expressions—short, fleeting expressions that can be detected by trained observers. In addition to the responses of one’s musculature, there are many physiological responses. For example, although the size of the eye’s pupil is affected by light intensity, it is also an indicator of emotional arousal. Become interested or emotionally aroused, and the pupil widens. Work hard on a problem, and it widens. These responses are involuntary, so it is difficult—probably impossible—for a person to control them. (...).”*²

In the field of Affective Computing we find different ways of associating emotion with computers: “Emotion Recognition Machines”, that is, computers with the ability to recognize emotions and act according to the information collected; “Machines with Emotion”, that is, computers capable of interpreting the user’s emotions and express their own emotions in response; and “Emotion Inducing Machines” that deal with emotions as a consequence of interaction with the computer.

Previously we addressed what is classified as “Emotion Recognition Machines”, this being the direction taken in the development of this project, that is, the creation of a tool that promotes the well-being of its users by detecting and monitoring their emotions.

2 - Auxi

2.1 - Problem Statement

A panic attack is a sudden and intense episode of fear that triggers a set of physical reactions that can resemble a heart attack or generate a feeling of impending death. It starts suddenly, without previous warning, and can occur at any time, for example while walking, driving, sleeping or working. Therefore, one of the most difficult aspects of panic attacks is the intense fear that they will reoccur, leading the person to avoid situations in which they may occur (agoraphobia) or even avoiding leaving the house because nowhere seems safe.

Without treatment, panic attacks end up affecting all aspects of life, whether personal or professional, and can lead to the development of various forms of phobia, withdrawal from social life, problems at work or school, depression, suicidal tendencies, alcohol or drugs abuse and financial problems.

Even though panic attacks occur in the absence of real danger, they affect the quality of life of about 33.7% of the population annually. It is also estimated that 90% of the population will, at some point in their lives, go through this type of experience. However, the explanations, treatments and means of accompanying individuals suffering from panic attacks, unfortunately, do not yet follow this frequency. Although panic attacks significantly affect quality of life, it is possible to prevent and treat them effectively.

2.2 - Goals

Our interaction design project aims to improve the quality of life of individuals who suffer from panic attacks. We intend to do so by creating a tool capable of detecting physiological stimuli and effectively intervening in the occurrence of these episodes. Auxi will allow users to monitor the development and frequency of panic attacks, so that their detection and identification is as accurate as

possible, by sharing and teaching skills that help prevent and manage this condition.

The main goal of the project, in terms of social impact, is to reduce the stigma associated with panic attacks and to contribute to the social inclusion of those affected by this condition. We emphasize the need of adopting healthy habits that promote well-being and a positive mindset.

2.3 - Benchmarking

Before the project started, a benchmarking research was developed, a strategic analysis based on the study of the competition, in order to identify references, trends and successful practices. We were inspired by several projects within the theme of Affective Computing, and we will highlight those that most influenced our approach.

2.3.1 - AI Smart Watch That Detects Seizures – Rosalind Picard
At the MIT Media Lab, Rosalind Picard, a researcher specialized in the field of Affective Computing, developed sensors that collect data on physical stimuli related to stress. The project had as its initial goal the monitoring of these stimuli during daily activity, however, it took a quite different course when, accidentally, it discovered that through this bracelet it was possible to detect stimuli previous to a seizure.

This discovery allowed the creation of a bracelet that through data collection, artificial intelligence and machine learning helps in the study and prevention of SUDEP (Sudden Death from Epilepsy). This smartwatch is nowadays marketed by the startup Empatica.



Figure 1: E4 Wristband, Empatica



Figure 2: Calm App

2.3.2 - Calm - The #1 App for Meditation and Sleep

Calm is a meditation app that lets users know about the benefits of mindfulness. It does this by sharing different contents, for instance audios that promote relaxation and concentration, stories that make it easier to fall asleep and teach users how to meditate and strengthen mental fitness, in order to face some of the biggest mental health challenges today: stress, anxiety, insomnia and depression.

2.4 - Project

Auxi is a project that focuses on the issue of panic attacks, which despite being very common these days, are the focus of only a small number of projects. Therefore, this project aims to empower people who suffer from this condition by helping them to deal with it and showing how they can manage and prevent its occurrence. AUXI has two components that have complementary functions, an app and a smartwatch. The smartwatch detects physical stimuli associated with panic attacks through sensors and sends that information to the app where it will be stored and analyzed. The app is divided into four sections: Prevention

Techniques, Emotional Diary, Support Group, and Panic Attacks.

At Prevention Techniques we provide users numerous strategies to prevent these attacks, which may include meditation, yoga exercises, nutrition guidelines, among others. We believe that this section of the app is relevant because the best way to deal with this condition is to prevent its occurrence, which can be done through daily habits that can reduce stress and anxiety, improving the users' health.

The Emotional Diary is the section of the app that is used to store and analyze the user's emotions. These emotions begin as sets of physical stimuli collected by the smartwatch which are analyzed and translated into emotions, using the classification of *The Ekman's Atlas of Emotions*. We considered that it would be important for the users to have an overview of their emotional map in order to understand the oscillation of their emotions throughout the day and its relation to the panic attacks.

The Support Group consists of a forum where users can share their experiences, and a chat where they can exchange private messages with more restricted groups or even with their doctor. In the research carried out for the development of this project, we realized that sharing experiences had a fundamental role in the process of accepting this condition and as well as in the perception that they are not fighting it alone. Thus, we thought that it was essential to include a sharing space in the app.

All the components previously described were thought of, however, Panic Attacks was the only one we developed on a deeper level. This is the section of the app where the data recorded in the users' day-to-day life is stored, such as hours of sleep, hours of sunlight exposure, number of steps, body temperature, heart and respiratory rate.

This information is collected by the watch, regardless of whether a panic attack occurs. However, when these happen, data such as the location at the time of the attack, the symptoms and the duration are added. There is also the possibility to access the data from previous days, which allows the user to establish comparisons between the days when he suffered or not a panic attack, and to withdraw important information regarding his evolution.

Acknowledgments

Once again, we would like to shine a light on our main goal which is to improve the quality of life of AUXI's users. While developing our project, we carried out user testing sessions with individuals from our target group, which allowed users to test our prototype. The feedback from these sessions was very positive, with every user considering our tool beneficial and useful in helping to manage and live with this condition. We believe that if it were to be implemented, AUXI would have a very positive and significant impact, not only on the users' personal lives, but also on their social engagement within a society where there are still many stigmas associated with mental illnesses.

References

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