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Invisible Scars

Immersive experience about PTSD

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INVISIBLE SCARS

Single user immersive experience in a dark room only with audio and visual stimuli, simulating the story of a soldier who came home with PTSD. Students, friends and family of the person who has the disorder and looking to understand what it's like to have PTSD, will be put as close as possible to the reality of having this trauma, to help them understand the behaviors of someone with this condition, to create awareness and to make people contribute consciously and positively to this problem.

1. Introduction

This report provides information regarding the development of the digital narrative entitled “Invisible Scars”, developed as the first project of the course *Media Lab*. The project consists of a stimuli experience, strongly focused on visual and audio, of a simulation of what it feels like to live with PTSD.

This project was also part of a collaborative laboratory project, in which each group had to develop a digital narrative with a commun theme, “War”, and an individual theme, which in the present group was “Inside War”.

Starting from this point, it was decided that with the theme “Inside War” would be interesting to create an experience to help people with PTSD to be better understood and also to provide better comprehension for those who wish to learn more about this issue. Though there are many causes for PTSD, since the main theme was “War”, the project was developed based on a story about a soldier who suffers from this condition after returning from war.

Throughout this report, there’ll be a description on all the important topics from the development to the final prototype. The fundamental background is a short description of the knowledge needed to create every single step of the project. On the development it’s explained the methodology approach, the user experience, the project publicity and the construction of the heartbeat sensor.

2. Fundamental Background

In general, we had a background on filming, sound design, editing, programming and designing. We had a bit of knowledge in terms of the materials, softwares and techniques that were going to be used to create a first-person audiovisual experience and tracking the heartbeat of the user to understand more about PTSD.

We analyzed what type of mechanics we would need to make this project work: first we needed to know how to film in first person by using a GoPro, a camera that can capture different perspectives; second, after finishing filming, to edit the main video we used Adobe Premiere Pro, a video editor. We used Adobe After Effects, a digital visual effects, motion graphics and compositing application to create the logo animation. For the marketing contents we used Adobe Illustrator for all the design creation, Adobe Photoshop for the mockups and Premiere Pro for the teaser.

Now, to gather the heartbeat of the user we would need to create a device that could track heartbeat in real time. We used Arduino, a cross-platform application (for Windows, macOS and Linux) that is written in the programming language Java.

At last, we needed a website that could display our project in a simple and elegant way. We knew how to use materialUI, a framework that incorporates ReactJs components and can be used as a base in the development of single-page or mobile applications. In the end we hosted the website through GitHub, a platform we all knew how to use as a collaborative programming platform but also to host web pages.

3. Development

3.1. Goals

The main goal with this project was to create awareness of war related PTSD and encourage people to help in any way they can. The project is mainly directed for friends and family of those in this situation, and aims to help them help their loved ones. We realise it is hard to help someone when we don't know what they are going through, and specially in this situation, it is not very frequent that we have also been through war and suffered the psychological impacts of it. With this thought in mind, we tried to put the person who wants to help in this situation. We also wanted to show that this problem not only has a psychological impact but also a biological one, therefore we added the heart rate measurer and it's visualization.

3.2. Methodology (Double Diamond Process)

3.2.1. Discover

In the beginning of this stage we discussed, as a lab group, about several topics of which we could extract narratives. Many topics were in discussion and it wasn't easy to choose one. Eventually, everyone started to lean towards War and that was the winner. After choosing the main topic, each group within the lab discussed and came up with one or many subtopics. In the end, each group chose a subtopic from the ones mentioned. Our group chose Inside War.

3.2.2. Define

Having the topic chosen, we moved on to defining our idea and story. We discussed both between each other and with the teachers and researched many references online. Having decided to approach the theme of PTSD and using the story of the daily life of a soldier, we moved on to concretely defining how we would present the project. Quickly, we decided to create an immersive experience and after this, we researched again about how we could connect the user to the story, ending up with a first person video and a heart rate measurer and it's visual representation.

3.2.3. Develop

In the developing fase we split tasks according to each group member's abilities and background knowledge. After splitting tasks and defining deadlines to have each part of the project ready, we spent our time building and creating what we were assigned to build or create. Finally, we fused all the parts of the project and tested them, made the necessary adjustments and ended up with the final prototype.

3.2.4. Deliver

After having the prototype ready, we went to take care of the logistical parts (the room, the projector, any needed hardware, etc.). We also tested the full experience and made any necessary adjustments. Finally, we discussed our presentation and

how it would work. We also gathered all the other requirements of the project created and published them online (website, report, marketing contents, etc.).

3.3. Spectrum of User Experience

3.3.1. The Product

Our product is an immersive audiovisual experience with a biometrical component that tries to place the user in the shoes of someone with war related PTSD.

The video is a first person video that goes through a day in the life of an ex-soldier with PTSD and shows all his problems and stresses throughout the day and how different it is for him to do the mundane things we, non PTSD patients, are used to do.

The biometrical component is a heart rate measurer that measures the user's heart rate throughout the experience. The aim of the experience is to increase the user's heart rate or better yet, make it similar to what the heart rate of the ex-soldier would be, the measurer controls the color of a led light tape that is green if the heart rate is low, yellow as it increases and red when it's high.

3.3.2. The Interfaces

Our project has two main interface components: the heart rate measurer and the audiovisual component.

To interact with the heart rate measurer the user places it's finger on the sensor which will activate the led light, depending on the user's heart rate, the light will have different colors. If it's low, it will be green and as it rises the color turns yellow and then red. We choose these specific colors due to the social convention created around them, green is usually associated with correct, calm and non disturbing, however red is associated with blood, bad and distress.

Our audiovisual component is projected on the wall in front of the user and it shows a first person video. This type of video allows the user to feel like he/she is the character, which was precisely the feeling we were looking to achieve. The sound in the room is loud and surrounds the user, this has the purpose of emerging the user in the experience.

The video was shot by us, with a GoPro Camera, except the flashbacks, which we found online. It was edited in Adobe Premiere Pro in a way that would simulate the character's thoughts and visions.

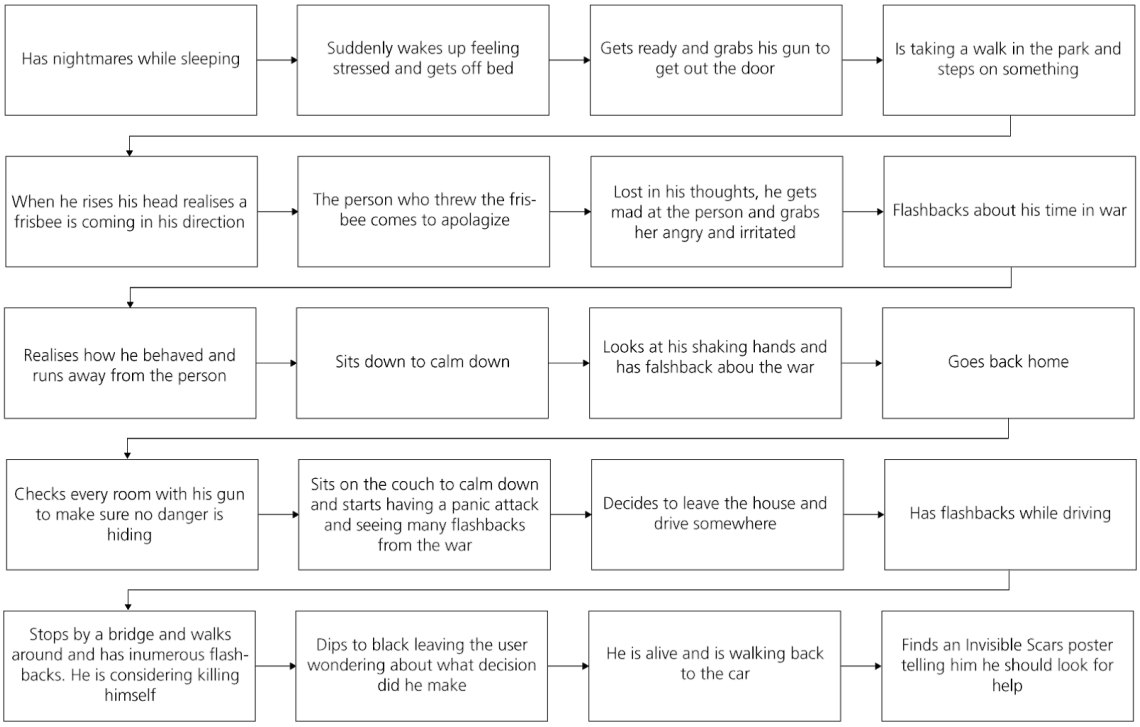

Fig. 1 - Graphical Representation of the audiovisual component's flow/story

3.3.3. The Communication

In terms of communication, we created: website, teaser, social media, physical publicity and merchandising.

The website is the main communication platform, it includes all the information about the project and all the other communication components.

The teaser is a component that would be shared in all created media to supply the user with a preview of the experience. Since our project is an 'on site' project, the teaser is fundamental because not everyone can be on that site whenever they want. It also aims to increase interest in the project.

The social media platforms are, probably, the platforms that would reach the biggest number of people to experiment with our immersive experience. We didn't create the actual accounts, just to avoid any complication, however, we created mockups of the social media we would have: a facebook page and an instagram account. The purpose of having these media would be to, of course, share that our project exists and show all it's components (other media, merch, publicity), it's goals, it's eventual partners, the locations were it would be possible to experiment the project and helpful information to any PTSD patient and/or it's family members and friends.

The physical publicity and merchandising would be spread in the locations that the project occurred and in any partner associations. It also plays a key role in the audiovisual component of the immersive experience.

3.4. Experience Mapping

3.4.1. Intended

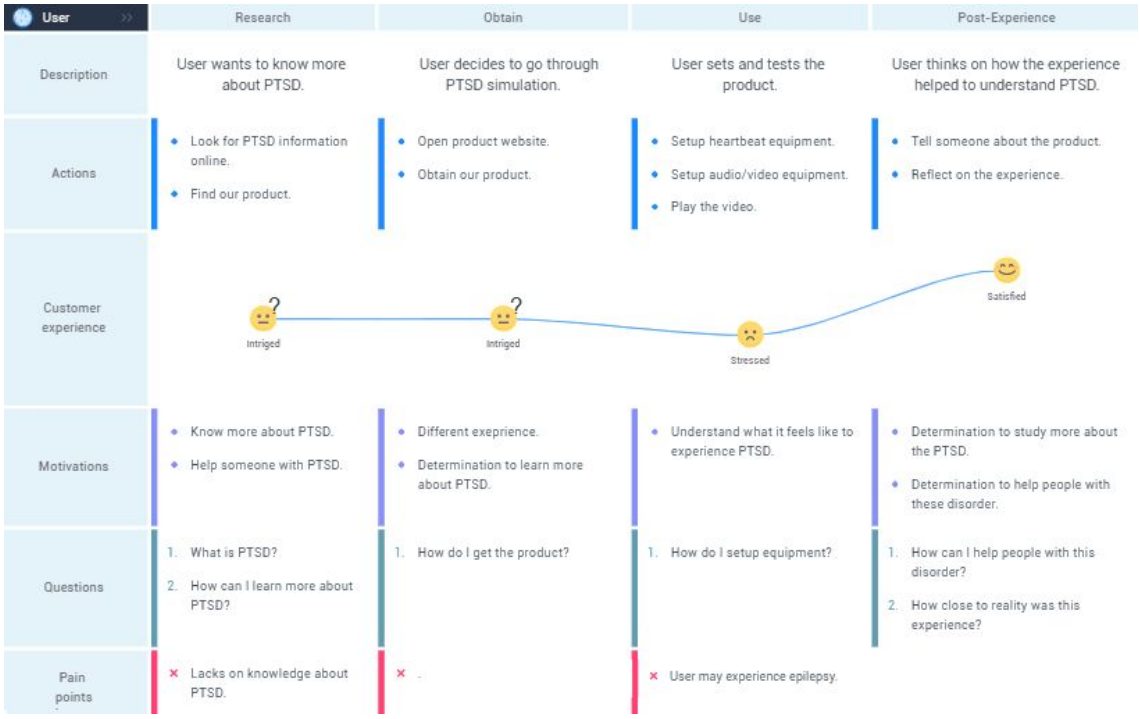

Fig. 2 - UX Mapping

3.4.2. Real

The user experience starts with the user, after finding out about our project, entering the dark room. In this dark room the user will be instructed to place his/her finger on the heart rate measurer and the video will start playing.

As the video progresses the user will get more uncomfortable and stressed and his/her heart rate will rise. This will cause the led light to change its color to red. The red color will disturb even more the user, it's an exponential growth of stress.

When the video is over the user will be informed about the project and it's remaining parts (social media, website, etc.). Likely, he/she will share the experience with others.

The real experience ended up being very close to the intended experience.

3.5. Project description

3.5.1. Contents

We created an immersive and personalized audiovisual experience about post traumatic stress disorder. The contents include: a first person video, the audiovisual component, that aims to impact the user both mentally and physically; a heart rate

measurer, the biometrical component that measures the user heartbeat and controls the color of a led light, the only light in the room, and communication materials (website, social media, teaser, posters, merchandising, etc.).

3.5.2. Visual Designs

We created a visual identity with specific rules that we used throughout the entire project whenever we had a visual component. Mainly it was used in the communication components and in the vídeo.

Fig. 3 - Visual Identity rules

Our idea was to make something simple that, when someone looked at it, it would immediately remind them of war. Therefore, we used natural colors, like in military uniforms and contrasted them with black key assets that refer to the war (soldier, helmet, tags, etc.). The logo simply says the name of the project, however, the word SCARS has a scar, a visual component that literally translates what the title says.

In the video we simply used the typeface chosen in the visual identity and in the remaining video we kept it's visual aspect pretty raw and simple. In the communication components, the visual identity is fully applied.

3.5.3. Sound Design

The audio component was a very important part of our work, so that the user experience could be maximized, therefore we invested in three main components of audio for video: Foley, Sound FX and Music.

Foleys

This component is more oriented to the sound that occurs in the main action, and is also responsible for situating the listener in the space of the action i.e: footsteps, keys, breath, the kind of environment (city, forest).

We've used mainly the audio of the initial individual footage overdubbed with some sounds downloaded from the open source FreeSound library to give emphasis to some of the details of the action. Only in the second act, the anger attack in the park, the foley sounds had to be entirely replaced in post production, due to some technical problems.

Sound FX

Hard Sound FX

Here, as the name says, is where the heavily processed sounds take place, like explosions, gun shots, screams, and so on.

These kinds of sound effects are mainly recorded in studios, or outdoors with special conditions so that the final result is optimal. Although the FreeSound library is very complete in this area, it was combined with another great library that has more clean and treated sounds, the Splice Library.

Ambient FX

This component is also included in the processed sound effects, but has the rule to complete some of the foley's empty spaces. Its function is to add some dramatic value to the main narrative.

Music

For the main musical work, we took inspiration from the "The Last of Us" game soundtrack to make our's. The music is mainly some fairly simple remarks of an acoustic Spanish style guitar, that combined with the Sound FX, adds the necessary drama to the action. The minor scale adds this mysterious dramatic feeling to the narrative, but in the end it resolves in the major scale, also known as the "Picardy Third" Cadence, which aims to give the feeling of hope and optimism.

3.5.4. Technological Developments

As mentioned previously, our main technological development was the heart rate sensor. Its objective was to read the user's heart rate and display it through a LED strip, meaning the intensity of the lights would increase according to the pulse and the color of the strip would change based on the following rates in beats per minute (BPM):

- Green: < 75 BPM
- Yellow: 75 BPM - 95 BPM
- Red: > 95 BPM

Due to the limitations of the materials available, the circuit was placed inside a box and powered both the LED strip around it and the sensor, as shown in the figure below.

Fig. 4 - Heart beat sensor and light system

For the development of the circuit, the following components were required:

- Arduino UNO;
- 9v battery;
- 5v RGB LED strip;
- VMA340 sensor.

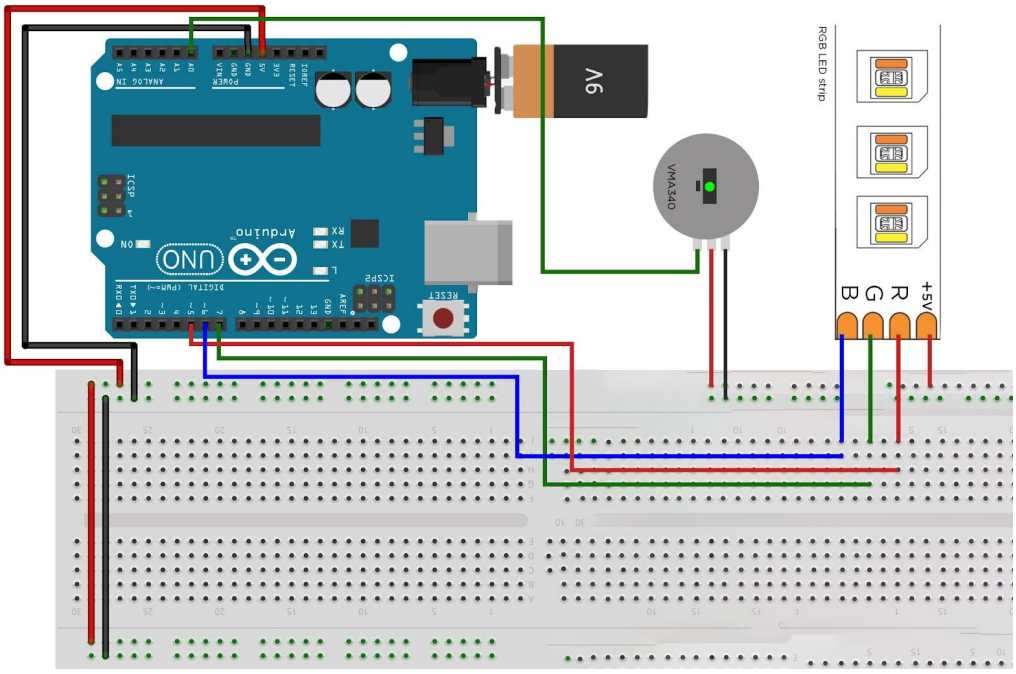

Fig. 5 - Heart rate sensor circuit

The program to get the BPMs and control the lights was coded in Arduino IDE and was based on the existing library *PulseSensorPlayground* [1]. The code can be seen in the Appendices.

4. Conclusions

In conclusion, we wanted to allow people to experience having PTSD, and by creating this audiovisual immersive experience we think we achieved that. The heart rate measurer was a key component that helped visualize the physical impact of the disease. The result of the project itself, was satisfactory and fulfilled the goals. With all this we created a digital narrative that people could embrace.

In terms of the team and our knowledge, it was also enhanced in many levels such as technologically and interpersonally. It allowed us to have a glimpse of the main aspects of a project that includes different elements and incorporates people from different backgrounds. It also allowed us to learn to translate a problem to a solution, and in this specific case, to a story.

In the future, this project could have many other incorporations regarding the biometrical technology, meaning people could experiment with different sensors and different ways of interacting making it more immersive. Other than that, there are also a couple mistakes and things that we could correct or make better, regarding the audiovisual component, the bometrical component and the marketing contents.

References

[1] Getting (Calculating) BPM: (sem data). World Famous Electronics Llc. Obtido 9 de Novembro de 2020, de https://pulsesensor.com/pages/getting-advanced.

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[3] LIVING WITH OCD (OBSESSIVE-COMPULSIVE DISORDER) PL/ENG. (2016, Junho 19). https://www.youtube.com/watch?v=TD-xPiwtyHA.

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[5] Melinda. (sem data). PTSD in Military Veterans—HelpGuide.org. Https://Www.Helpguide.Org. Obtido 9 de Novembro de 2020, de https://www.helpguide.org/articles/ptsd-trauma/ptsd-in-military-veterans.htm.

[6] Leaving the battlefield: Soldier shares story of PTSD. (sem data). Www.Army.Mil. Obtido 9 de Novembro de 2020, de https://www.army.mil/article/78562/leaving_the_battlefield_soldier_shares_story_of_ptsd.

Appendices

A. Heart Rate Measurer Sketch

```
/*  Getting_BPM_to_Monitor prints the BPM to the Serial Monitor, using the least lines of code and PulseSensor Library.

 *  Tutorial Webpage: https://pulsesensor.com/pages/getting-advanced

 *

--------Use This Sketch To----------------------------------------

1) Displays user's live and changing BPM, Beats Per Minute, in Arduino's native Serial Monitor.

2) Print: "♥  A HeartBeat Happened !" when a beat is detected, live.

2) Learn about using a PulseSensor Library "Object".

4) Blinks LED on PIN 13 with user's Heartbeat.

-----------------------------------------------------------------------*/


#define USE_ARDUINO_INTERRUPTS true    // Set-up low-level interrupts for most acurate BPM math.

#include <PulseSensorPlayground.h>     // Includes the PulseSensorPlayground Library.


#include <Adafruit_NeoPixel.h>

#ifdef __AVR__

 #include <avr/power.h> // Required for 16 MHz Adafruit Trinket

#endif


// Which pin on the Arduino is connected to the NeoPixels?

// On a Trinket or Gemma we suggest changing this to 1:



// How many NeoPixels are attached to the Arduino?

#define LED_COUNT 15
```

```
//  Variables

const int PulseWire = 0;       // PulseSensor PURPLE WIRE connected to ANALOG PIN 0

const int LED13 = 13;          // The on-board Arduino LED, close to PIN 13.

int Threshold = 515;           // Determine which Signal to "count as a beat" and which to ignore.

                               // Use the "Gettting Started Project" to fine-tune Threshold Value beyond default
setting.

                           // Otherwise leave the default "550" value.

int Signal;                // holds the incoming raw data. Signal value can range from 0-1024


PulseSensorPlayground pulseSensor;  // Creates an instance of the PulseSensorPlayground object called
"pulseSensor"


void setup() {


  Serial.begin(9600);          // For Serial Monitor


  // Configure the PulseSensor object, by assigning our variables to it.

  pulseSensor.analogInput(PulseWire);

  pulseSensor.blinkOnPulse(LED13);       //auto-magically blink Arduino's LED with heartbeat.

  pulseSensor.setThreshold(Threshold);


  #if defined(__AVR_ATtiny85__) && (F_CPU == 16000000)

  clock_prescale_set(clock_div_1);

  #endif

  // END of Trinket-specific code.




  // Double-check the "pulseSensor" object was created and "began" seeing a signal.
```

```
  if (pulseSensor.begin()) {

    Serial.println("We created a pulseSensor Object !");  //This prints one time at Arduino power-up,  or on Arduino reset.

  }


  pinMode(7, OUTPUT);

  pinMode(6, OUTPUT);

  pinMode(5, OUTPUT);

}


void loop() {

  int myBPM = pulseSensor.getBeatsPerMinute();   // Calls function on our pulseSensor object that returns BPM as an "int".

                                        // "myBPM" hold this BPM value now.

  Signal = analogRead(PulseWire);

if (pulseSensor.sawStartOfBeat()) {            // Constantly test to see if "a beat happened".

 Serial.println("♥  A HeartBeat Happened ! "); // If test is "true", print a message "a heartbeat happened".

 Serial.print("BPM: ");                        // Print phrase "BPM: "

 Serial.println(myBPM);                        // Print the value inside of myBPM.

}

  if(Signal<Threshold || myBPM==0){

    digitalWrite(7,LOW);

    digitalWrite(6,LOW);

    digitalWrite(5,LOW);


  }

  else if(myBPM > 30 && myBPM <=75 && Signal>Threshold){

    digitalWrite(7,HIGH);

    digitalWrite(6,LOW);

    digitalWrite(5,LOW);
```

```
  }
   else if (myBPM > 75 && myBPM <=95 && Signal>Threshold){
   digitalWrite(7,HIGH);
   digitalWrite(6,LOW);
   digitalWrite(5,HIGH);
  }
   else if (myBPM > 95 && Signal>Threshold){
   digitalWrite(7,LOW);
   digitalWrite(6,LOW);
   digitalWrite(5,HIGH);


  }
 delay(20);                    // considered best practice in a simple sketch.
}
```