Virtual Reality Design Platform to Easily Create Virtual Reality Experiences

J. Casteleiro- Pitrez

Abstract—The interest in Virtual Reality (VR) keeps increasing among the community of designers. To develop this type of immersive experience, the understanding of new processes and methodologies is as fundamental as its complex implementation which usually implies hiring a specialized team. In this paper, we introduce a case study, a platform that allows designers to easily create complex VR experiences, present its features, and its development process. We conclude that this platform provides a complete solution for the design and development of VR experiences, no-code needed.

Keywords—Designers, virtual reality, virtual reality design platform, virtual reality system, no-coding.

I. Introduction

VR is a medium that allows immersion. Kirner and Pinho [1] define VR as an advanced interface technique, where the user can perform immersion, navigation, and interaction in a three-dimensional synthetic environment generated by a computer, using multisensory channels. The main objective of a VR system is the total immersion of the human sensorimotor channels in a vivid computer-generated experience [2].

In the last decades, the increasing technological possibilities of VR have raised the interest of the creative industry. This medium can promote new and meaningful feelings, skills, and understanding, which can make content more powerful than when presented through traditional media. Today the immersive technologies are merged with design, advertising, storytelling techniques, including documentary, poetry, and theatre. As the cost of immersive technology decreases, creators are enabled to redefine storytelling and narrative content in an entirely new medium. But should be given to the creators and designers the possibility to create these experiences easily, focusing on the message and not being constrained by the development possibilities. Also, the "research in VR is Turning the corner from being focused primarily on technology to an increasing focus on what can be done using VR – content is now driving the application" [3]. Whether the investigation points to this change, concerning the economic impact, Citigroup is among the most optimistic, suggesting that the market could grow to $692 billion by 2025 [4]. Perhaps the most commonly cited growth forecast is by Goldman Sachs, which estimates that AR and VR will grow into a $95 billion market by 2025 [5]. This report projects demand in the creative economy from gaming, live events, film and video entertainment, and retail.

Joana Casteleiro-Pitrez is with the Universidade da Beira Interior, Portugal (e-mail: Joana.casteleiro@gmail.com).

VR shows its power as an innovative medium that can favor creativity. But non-technical designers and end-users are facing a lack of tools to quickly and easily prototype, create and test new VR user experiences [6]. In this paper, we present a VR platform to create VR experiences without technical knowledge in gesture recognition, 3D modeling, and programming. This platform allows intuitive and fast creation of VR experiences that can contain multiple 360º videos and photos, 2D videos, text, 3D images, and sound. All the VR experiences can be played on all devices, no coding required. Also, the platform lets you analyze the user behavior in the VR experience.

II. Related Work

There has been some effort, on the part of researchers, to create platforms that allow the easy development of VR/AR experiences. Some researchers have looked into the creation of prototyping platforms; one example is the ExProtoVAR, which is a lightweight tool to create interactive virtual prototypes of AR in VR [7].

Some focus on specific domains, as the case of Wang et al. [8] that produce VR-Rides, an object-oriented application framework for creating VR experiences in the health domain that combines exercise equipment and panorama images. The framework employs Unity as the engine to connect and handle communications between different components including multiple VR devices (HTC Vive and Oculus Rift), sensors, and physical activity devices (e.g. exercise bike or a Fitbit sensor). Another example is the Realiteer [9] an innovative AR/VR software content creator. The lead product, Canvrs, helps artists and software developers create VR/AR-optimal 3D assets and animated special effects by providing them with a VR art studio designed for making VR/AR assets from scratch. Realiteer is now more dedicated to psychotherapy.

The XOOM [10] is the most similar to our platform; it is an interactive tool that allows non-ICT-specialists to create web-based applications of Wearable Immersive VR technology that use 360° realistic videos as interactive virtual tours. XOOM also supports automatic data gathering and visualizations (e.g., through heat-maps) of the users' experience, which can be inspected for analytics purposes, as well as for user evaluation.

VRDP is more focusing on giving designers and creators the possibility to give wings to their ideas, so we focus on different tools and the change to insert in the experience's distinct kinds of contents, the possibility to animate and to interact with them.

III. OVERALL DESIGN

As shown in Fig. 1, the components of the whole system can be divided into three modules: Website, VR Creator, Analytics.

A. Website

The purpose of the website is to be the entry for the VR Creator allowing the login or the register, and also the explanation of the platform, Fig. 2.
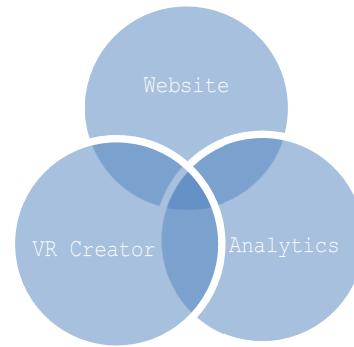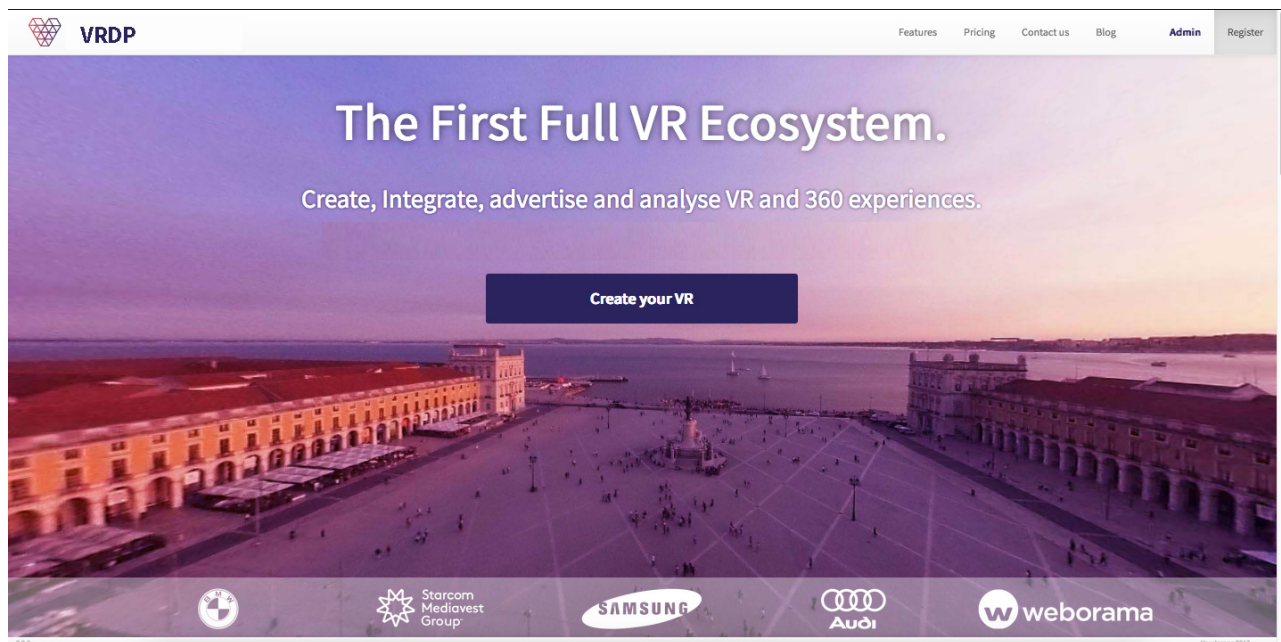

Fig. 1 VRDP modules

Fig. 2 Website module

B. VR Creator

VR Creator, Fig. 3, is the center of the platform, with the simple drag and drop interface anyone can create powerful and engaging 360º VR experiences. By uploading 360º videos or photos, it is possible to create a VR scene. This scene can be overlaid by 3D or 2D objects and can be linked to other scenes.

C. Analytics

The Analytics, Fig. 4, allows accessing to user behavior through real-time in-depth VR specific metrics including powerful contextual data. By introducing the power of image recognition into VR, it is possible to understand what and in which order your audience is viewing the VR experience.

IV. VR CREATOR USER INTERFACE

As we said before, the Creator is the focal point of the platform, so we will describe the design, the development, and the possibilities of this module.

After noticing the importance of creating a tool that allows designers to create their own VR experiences without codding, we start to define the structure and site map, Fig. 5, of the platform.

After that, we create 3 personas, Fig. 6, fictional representations of our users. They represent the goals, motivations, characteristics, and behaviors of a real group of users:

- Represent a major user group for our platform;
- Express and focus on the major needs and expectations of the most important user groups;
- Give a clear picture of the user's expectations and how they are likely to use the platform;
- Aid in uncovering universal features and functionality;
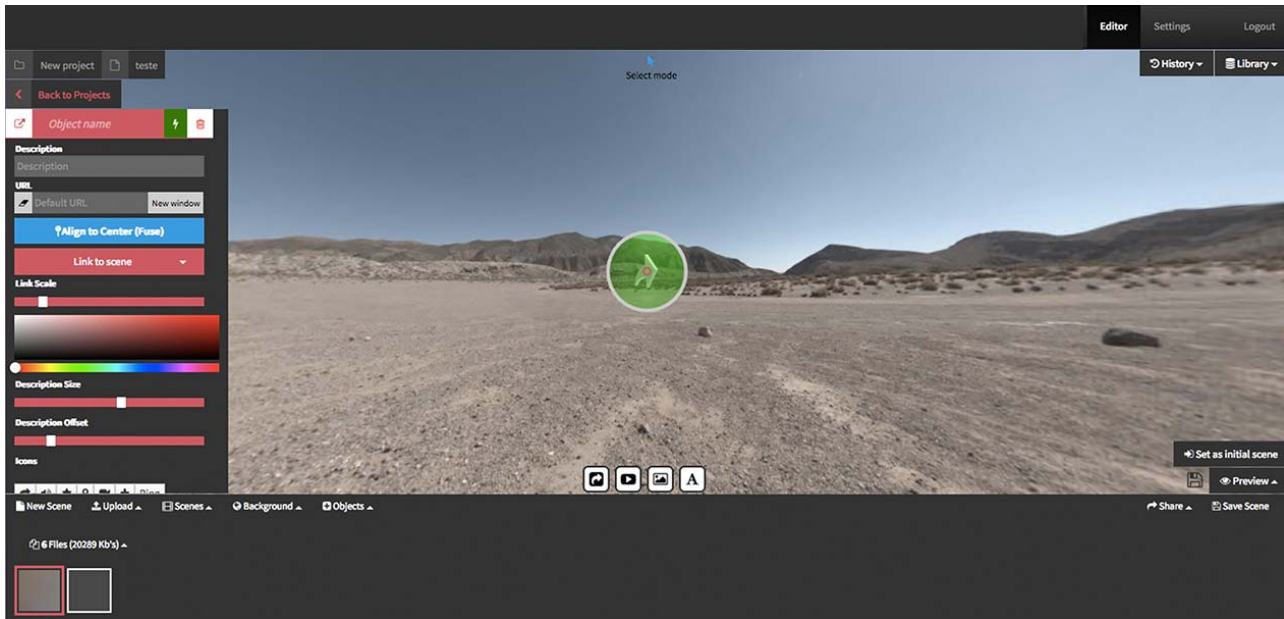- Describe real people with backgrounds, goals, and values.

Fig. 3 VR Creator module

Fig. 4 Analytics module

Having in mind our personas we make the wireframes, Fig. 7, the Style Guide, Fig. 8, and the layouts.

The front end of the platform was made using:

- HTML/CSS/JS;
- React - A JavaScript library for building user interfaces;
- A-Frame - Framework for Three.js;
- Three.js - (JS library) - create and display animated 3D computer graphics (uses WebGL, a Javascript API to render interacted 2D and 3D graphics);
- TweenMax - JS library for high performance HTML5 Animation;

- dc.js - charting library;

For the Back end of the platform we use:

- Node.js/NGINX Framework - an open-source, cross-platform, JavaScript runtime environment that executes JavaScript code outside a web browser;
- MongoDB - a cross-platform document-oriented database program.

V. RESULTS

The development of the platform turns it possible to make VR experiences following the process explained in Fig. 9.

First, one has to create a new project, then create a new scene, upload 360º videos and photos and add it to the background of the scene, then one can add photos, videos, sound, text, hotspots, and position it in the VR environment. In the end, one can share the VR experience, play it in multiple devices, and easily embed the VR experience in websites. One can also analyze the user's behavior.

During the design and development of the platform, we made different groups of tests to tests the usability of the platform, each one with five users. The analysis of the results of each test group led to the:

- Development and design of some new features;
- Design adjustments of some platform components;
- Buttons locations alterations;
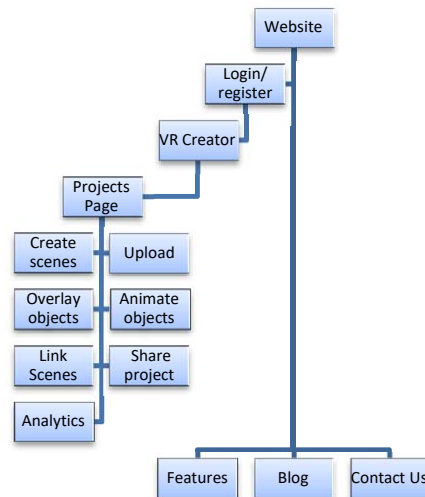- Buttons names corrections.

Fig. 5 Site map of the platform

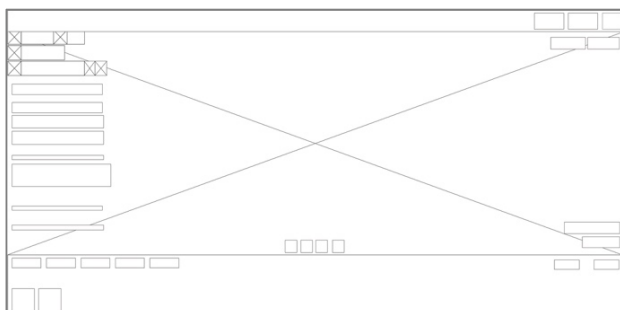Fig. 6 One of the personas used to develop the platform

Fig. 7 VR creator wireframe

VI. CONCLUSION

This project provides a complete solution for the design and development of VR experiences, no-code needed. The platform allows each person to upload 360º images or videos, add objects and position them as necessary, allowing a high level of control over the contents, which increases the creative possibilities. The easy way to share and play the experience is something described by the users as "essential" and "very useful". The possibility of analyzing user behavior while trying the VR experience is something we want to explore in future studies. The VRDP system also can be extended according to future needs.
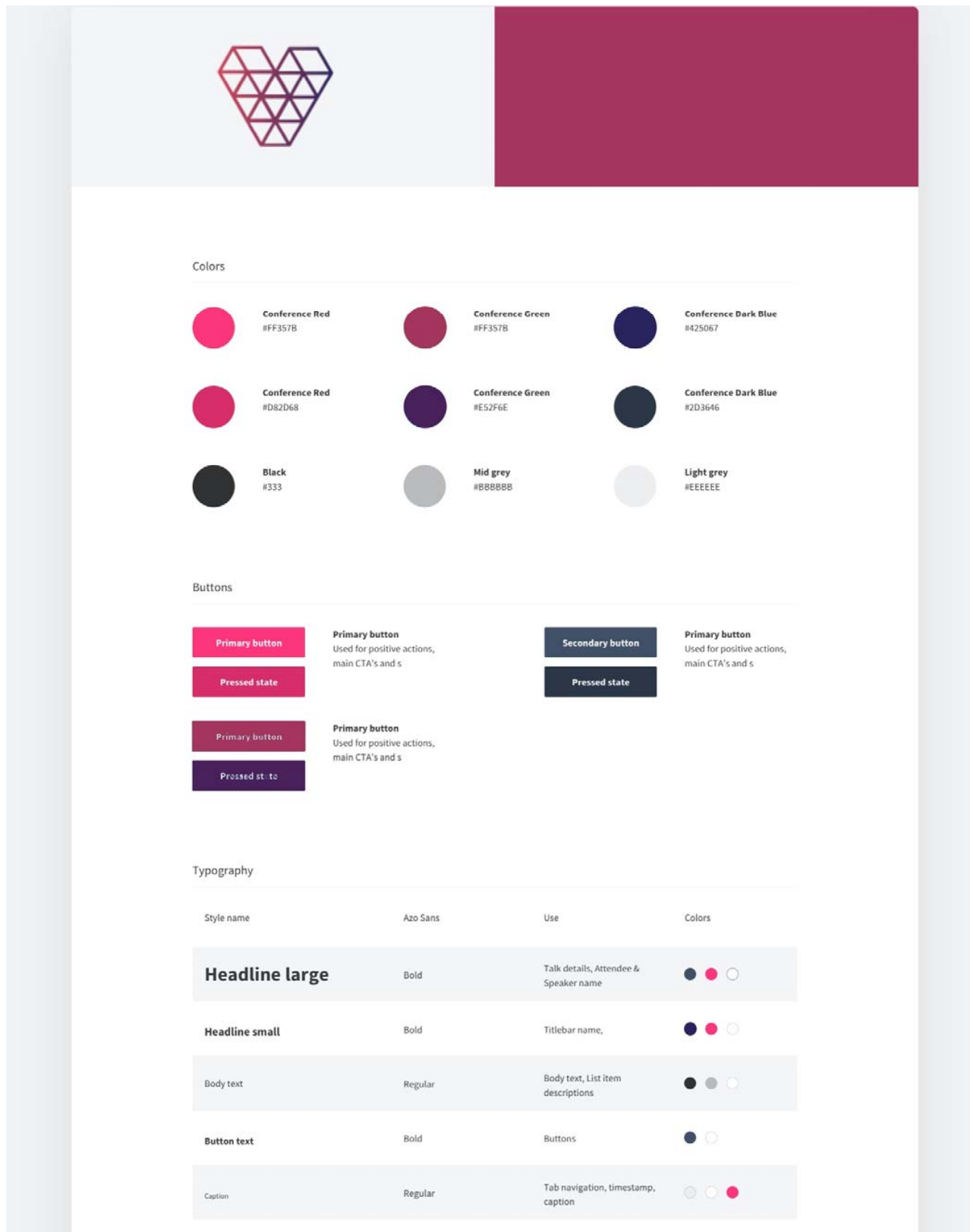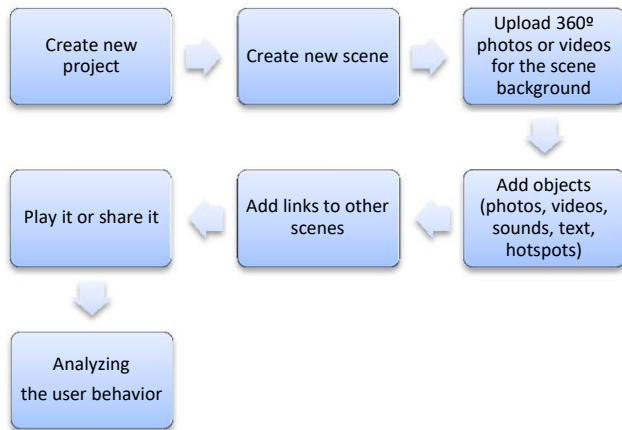
Fig. 8 Part of the platform style guide

Fig. 9 VR experiences creator process

REFERENCES

[1] C. Kirner and M. Pinho, "Introdução à Realidade Virtual". 1o Workshop de Realidade Virtual São Carlos. São Paulo: 1oWRV, 1997.

[2] F. Biocca, and M. Levy. Communication in the age of Virtual Reality. New Jersey: Lawrence Erlbaum Associates, 1995.

[3] W. Sherman and A. Craig. Understanding virtual reality: interface, application, and design, Cambridge: Morgan Kaufman, 2018.

[4] K. Ezawa et al. "Virtual and Augmented Reality", October 2015. Available at: https://www.citibank.com/commercialbank/insights/assets/docs/virtual-and-augmented-reality.pdf.

[5] W. Chen, M. Sugiyama, H. Bellini and M. Shin, "Augmented Reality Starts to Liven Up the VR/AR Market" Goldman Sachs, July 2016.

[6] M. Nebeling and M. Speicher, "The Trouble with Augmented Reality/Virtual Reality Authoring Tools," 2018 IEEE International Symposium on Mixed and Augmented Reality Adjunct (ISMAR-Adjunct), Munich, Germany, 2018, pp. 333-337, doi: 10.1109/ISMAR-Adjunct.2018.00098.

[7] N. Pfeiffer-Leßmann and T. Pfeiffer "ExProtoVAR: A Lightweight Tool for Experience-Focused Prototyping of Augmented Reality Applications Using Virtual Reality". In: Stephanidis C. (eds) HCI International 2018 – Posters' Extended Abstracts. HCI 2018. Communications in Computer and Information Science, vol 851, 2018. Springer, Cham. https://doi.org/10.1007/978-3-319-92279-9_42

[8] Y. Wang, K. Ijaz and R. A. Calvo, "A software application framework for developing immersive virtual reality experiences in health domain," 2017 IEEE Life Sciences Conference (LSC), Sydney, NSW, 2017, pp. 37-30, doi: 10.1109/LSC.2017.8268135.

[9] F. Garzotto, M. Gelsomini, V. Matarazzo, N. Messina and D. Occhiuto "XOOM: An End-User Development Tool for Web-Based Wearable Immersive Virtual Tours". In: Cabot J., De Virgilio R., Torlone R. (eds) Web Engineering. ICWE 2017. Lecture Notes in Computer Science, vol 10360. Springer, 2017, https://doi.org/10.1007/978-3-319-60131-1_36

[10] F. Lee. "Do-it-yourself virtual reality experiences on networked mobile devices". In ACM SIGGRAPH 2016 Studio(SIGGRAPH '16), Association for Computing Machinery, New York, NY, USA, 2016.Article 1, 1–2, https://doi.org/10.1145/2929484.2929485

Joana Casteleiro-Pitrez. (30-11-83 | Covilhã, Portugal). Phd (2015) in Fine-Arts Communication Design Specialty in the Lisbon University - Faculty of Fine-Arts. Master degree (2008) in Multimedia Design, University of Beira Interior. Major field of study is design, augmented reality and education. She is an Assistant professor at Art Department, University of Beira Interior.