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Work-in-Progress—The Impact World: The Design Process of an Immersive Web Environment

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Abstract. This article describes the development process of the Immersive Web Environment, created in the context of the curricular unit of Virtual and Augmented Reality. The Impact World is a work in progress, subordinated to the general theme of the ECO-SCHOOLS project. The aim of this project is to create an educational resource that alerts people to the impact their daily habits can have on the planet. Visitors to the immersive space, are confronted with some actions, they perform daily and often unconsciously. In this article, we describe the immersive environment created, using the A-Frame structure. The project is still under development, so there has not yet been a formal phase of testing with the target audience. However, before starting the formal testing phase, it is intended that this prototype, already implemented, is tested with a test group. So that they can contribute to improve the immersive experience and/or the graphical interface.

Keywords: Immersive Web Environment, WebXR, A-Frame, Eco-Schools, Design Process.

1 Introduction

Impact World is an immersive environment on the Web (IWE) that aims to raise awareness of the consequences that the various actions and decisions made and adopted by humans daily have on the planet. It aims to show in a visual way the impact of human activity on nature. Although the IWE was developed for the Eco-Schools program [1], and for a primary school target audience, it can be used in formal and non-formal contexts.

Eco-Schools is an international program of the "Foundation for Environmental Education", developed in Portugal since 1996 by the European Blue Flag Association (EBFA). The aim is to encourage actions and recognize quality work developed by schools in the field of Environmental Education. There is a general theme to be worked on, but sub themes can be chosen within this general theme, for example, the basic themes: Water, Waste, Energy or Outdoor spaces and biodiversity: preserve and regenerate (theme for the 2022-2023 school year).

2 Project description

The IWE, still under development, uses A-Frame [2], a web framework for building 3D/AR/VR experiences. Allows the creation of 3D worlds in HTML and entity component system framework for Three.js, on any headset, mobile and desktop [2]. By developing the environment for WebXR, a standard for XR running through regular web pages, immersive content becomes available in browsers, enabling users to interact not only with 2D content, but also with 3D content [3]. WebXR guarantees compatibility between the various devices (smartphones, tablets, computers or even VR and AR headset, since the same code can be used by the various devices, "the browser takes charge of adapting execution to the specific forms of input and output available in each device" [4].

In this project, we follow the Framework for Serious Educational Game Design, The "I's" [5], which is based on Linn's four meta principles [6], to support knowledge integration in science mediated by information and communication technologies.

The IWE consists of a museum that graphically represents the number of animals has been killed for food [7] and the impact of the most polluting industries [8] (more specifically the clothing industry [9]).

When entering the immersive environment, some tiny trees can be visualized (Fig. 1), with which it is possible to interact, using the computer mouse, planting them, making them grow or cutting them.

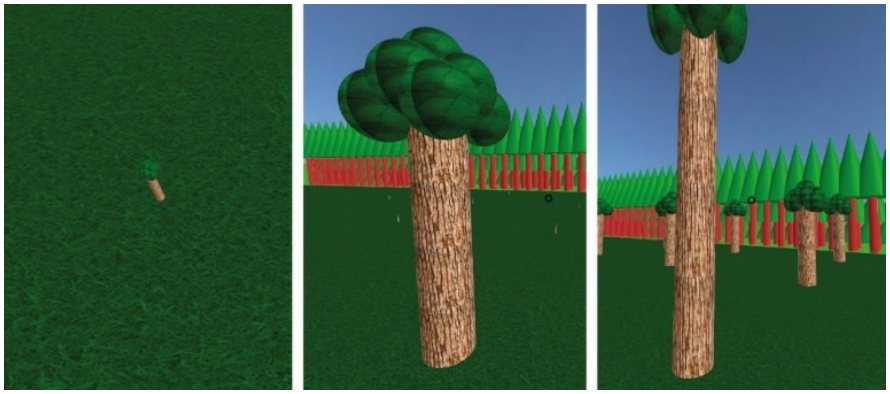

Fig. 1. Interaction with trees.

By moving the mouse over the tree, it is possible to plant them. With a click it is possible to make the trees grow and by moving the mouse over the tree again you can cut it down. This area aims to reflect on the problem of deforestation and its consequences. Nature does not have infinite resources and it is necessary to replant and look after it.

As you "walk" through the environment, you enter a bathing area. One can find a beach (Fig. 2), divided by water. On one side, you can see objects that are produced by well-known brands that dominate the so-called luxury market. On the other side you can see plastic bottles that end up in the water, or cigarette butts all over the beach. This point is intended to reflect on habits linked to consumerism and its consequences.

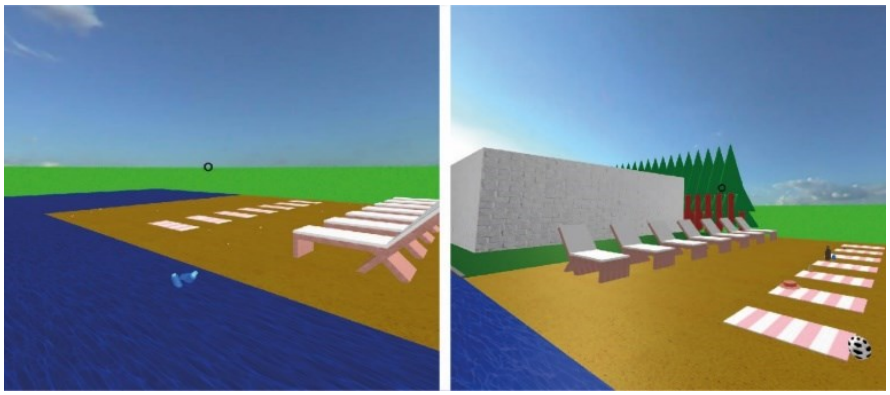

Fig. 2. Beach (from luxury to trash).

Near the beach, there is a museum that shows some of the impacts that the consumption habits of human beings have on nature. The museum has three thematic rooms, two of them are represented (Fig. 3).

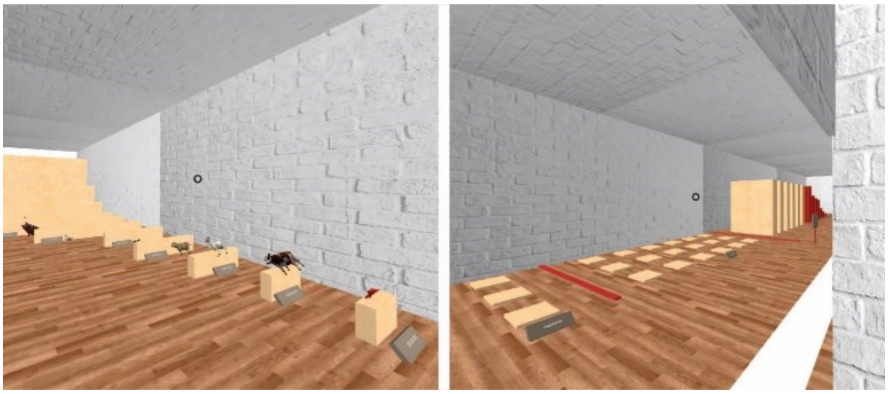

Fig. 3. Two of the three museum rooms.

One room is dedicated to food, where the number of animals which have been killed for feed humans is shown and the impact of this type of diet on the various natural habitats is indicated, these figures are shown to scale. To create the scale, a reference cube was defined that represents 1 million deaths, then the calculation was made to define the volume of each object, being, in this way, made its representation. It is also worth mentioning that all the objects, were created by programming, except the 3D objects that represent the animals, which were taken from a 3D modelling platform that allows to publish, share, buy and sell 3D, VR and AR content [10].

Another room is dedicated to food waste, the values are also represented to scale, using a reference cube, as was done in the previous room, and indicating the number of food trucks wasted per second.

In the third room (Fig. 4) you can see a graph showing the impact of the most polluting industries, where we produce 400% more than two decades ago; in this room the clothing industry stands out, and you can see that 80 billion new articles of clothing are produced every year.

Fig. 4. The third room.

Besides the IWE, a marketing campaign using Augmented Reality with AR.js [11] and A-Frame is being planned. The campaign has not yet been designed, but it consists of a set of billboards, spread around the city, and placed mainly in public transports, where it is alerted to the issue of IWE. Each billboard will address the issue of rubbish on the beaches and the questions raised in the three rooms of the museum. All billboards will have a QRCode, personalized, which will redirect to the IWE.

3 Final remarks

This article described the development process of IWE, The Impact World. A WebXR-based environment that allows users to access it from a web browser, providing a low-cost VR experience [12]. The environment can also be easily accessed through other existing devices [12]. The Web has platform-independent specifications - defined by the World Wide Web Consortium (W3C) - so there is no need to consider compatibility between the platforms on which the application runs [13].

The project will now enter the preliminary tests phase, which will be carried out with a small group of primary school students, so that they can test and suggest changes, so that adjustments can be made to the prototype.

Afterwards, the formal phase of tests with the target public will be defined. Survey questionnaires will be applied to the different groups and statistically treated. The prototype test group will be subject to observation. The aim is to monitor the test groups to verify if, the use of this IWE and the advertising campaign, that is being designed, have an impact on behavioral change. It has not yet been decided how to measure the change in behavior. With the test group, it will be by direct observation during usability testing. With the target audience, by questionnaire surveys.

Regarding IWE, the appearance of text and sound in some of the areas is still being considered. Tests are being made to replace some of the signs placed by text. This change is intended to increase user immersion.

It is still necessary to include more information and probably create more rooms in the museum. It is also intended to create more animations, namely for the trees, to allow them to be planted and watered.

With the creation of the advertising campaign, it will be necessary to create an identity of the project, so the colors should be changed.

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