

Realverso Lucanum: a metaverse for innovative didactic and digital tourism

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Abstract – This paper aims to explain how the idea of Realverso Lucanum was born, what technical basis was used to develop it, and what motivations have been moving the team of iInformatica in the last year to realize this project. The potential offered by Realverso includes the tourist enhancement of attractions in the Lucanian territory, thanks to the signing of agreements with ten municipalities in the Basilicata region and the engagement with reproductions of real-world places, allowing users to be aware of historical and cultural facts. Moreover, Realverso is a metaverse with a vocation to sustainability. This is because within it, the dynamics of environmental protection and education for sustainable behavior are re-proposed, and they can be traced back to many of the UN 2030 Agenda points.

I. INTRODUCTION AND MOTIVATION

The metaverse is certainly one of the most talked-about and used technologies of our time: a digital world in which users can create avatars and interact with each other, and experience many of the dynamics of real life such as buying goods and private property [2, 15]. This technology could bring about a revolution like the birth of the Internet. Indeed, in many respects the Metaverse has the potential to become the new Internet. We can imagine it as a continual and linked network of 3D virtual worlds, destined to provide access to most online and physical experiences. A massive, interoperable network of 3D virtual worlds with real-time rendering that can be experienced synchronously and persistently by an effectively unlimited number of users with a sense of individual presence and continuity of data such as identity, history, rights, objects, communications and payments [4]. Its potential is immense, but it is generally regarded as an alternative reality to the real world and not a copy of it. In general, people agree with a definition of virtual reality platform where users can play games, connect with friends, attend meetings, and even go to virtual concerts. The “Realverso Lucanum” is a reinterpretation of the metaverse conception that represents an innovative and interactive way of discovering a territory in a digital format with the aim to promote and therefore encourage a sustainable form of tourism. The project aims to promote the culture and the tradition of a territory by exploiting the technology of the metaverse and therefore reconstructing points of interest, historical tradition, or characters, which belong to the present and to the

historical heritage of the place, in a digital 3D format.

In recent years, digital technologies and serious games have widely affected the cultural heritage sector, offering incredible opportunities to enhance the experiential value of heritage assets and improve cultural activities. In this respect, we know that many museums have already used 3D scanning and modelling techniques to create virtual tours of their attractions [1], which could thus also be enjoyed through apps or websites. Not only that but in [14, 13] we see how virtual reality can even allow users to interact with museum attractions or reproductions of ancient artefacts through mobile devices. Usually, virtual visits rely on technologies that make use of 3D techniques, VR (virtual reality) or AR (augmented reality). These technologies are not the only one that can be used to perform a virtual exploration of museums, other tools such as digital platforms that can be found in [11] can be considered as a tool to explore the museums’ collections. In this case a good usage of UX/UI permitted to recreate a museum visit starting from the museum catalogue or exploring a digital map of the city, from where is possible to discover ancient artefact and their composition in terms of materials used to build them. Other technologies, such as serious games, are been widely used by cultural heritage industry [9]. Serious games are a powerful mechanism to engage the large public into an active state of learning where spectators are motivated to create their own knowledge rather than to receive information passively. For this reason are widely used in many learning contexts: mathematics and science [10, 16, 12], computational thinking and computer programming [7], history [5], etc.

Realverso Lucanum, based on two patents ^{1 2}, is the last evolution of Lucanum project, a cross-media project that aims to promote the territory of Basilicata through board games, card games and cartoons for children. The project aims to enhance the territory using innovative methodologies such as digital or gaming-related tools.

Realverso also aims to educate on sustainable behaviour and actively support the goals of the UN 2030 agenda. The UN’s 2030 Agenda is a global plan consisting of 17 Goals, called sustainable development goals (SDGs).

¹Santarcangelo, V et al: Sistema metaverso etico semantico adattativo, UIBM, patent pending n. 102022000002582.

²Santarcangelo, V et al: Un sistema sostenibile adattativo per l’interazione realtà-metaverso, UIBM, patent pending n. 1020220000024507.



Fig. 1. On the left a picture of Largo Duomo at Potenza compared with the same place 3D modelled in the Realverso on the right.

It aims to achieve equality, eradicate poverty, and promote environmental sustainability. The Agenda addresses a range of challenges, including education, equality, economic growth, innovation, and climate action: goals in common with those of Realverso. Realverso is in fact an inclusive environment where anyone will be able to access and interact with other users, fostering integration and educating on diversity.

The remainder of the paper is structured as follows: in Section ii. the concept of metaverse is analyzed and a comparison between different platforms and Realverso is carried out; In Section iii., we discuss the most important feature of Realverso, the activities that can be performed by digital visitors and how these can educate people to make sustainable choices in line with the goals of the UN 2030 agenda; In Section iv. a description of the software and its implementation is provided; Finally, the paper conclusions and future works are included in Section v., where the key points are summarised and future developments are presented.

II. METAVVERSE VS REALVERSO: ANALYSIS AND DIFFERENCES

In the last three years, metaverse platforms spread on the internet, allowing their users to visit and to conduct a parallel life in virtual and usually fictitious environments. The word metaverse was used for the first time by Neal Stephenson in his cyperepunk novel *Snow Crash*. In his novel, Stephenson gave us an incredible foreshadowing of what the future was going to be, describing a virtual three-dimensional space where people could interact. Metaverses, in fact, allow users to create their own avatar, a three-dimensional representation of oneself, and to move in a virtual world where it is possible to interact with the elements in the scenario and with other users through voice, but where the actions performed by users do not have any consequence in the real world. The best-known metaverse platforms to date are Decentraland and Sandbox. These are reproductions of worlds that are inspired by real world, while remaining completely fictional, and in which it is

possible moreover to buy and own virtual property [6]. Realverso is based on a different metaverse concept [8]: its users can interact with the environment and each other by voice, just as in any metaverse, but this interaction does not take place in fictional scenarios, but in faithful three-dimensional reproductions of real places as shown in fig.1.

In the second place, Realverso does not display some of the typical features of the classic metaverse platforms that exist today, such as cryptocurrencies and NFTs. The choice to avoid the use of cryptocurrencies is linked to the concept of sustainability, one of the core concepts on which is based Realverso: the generation of cryptocurrencies requires a big amount of energy and has a non-negligible impact on environment [3]. As a replacement for cryptocurrencies, Realverso proposes the use of Ethical Points: an ethical coin that is earned by performing ethical actions in Realverso, that cannot be used to purchase goods or property, but can be spent to interact with “Digital Twins”, virtual objects that are connected with their real counterpart with which they share the physical state (eg. active/disabled, opened/closed, etc. . .). Moreover, every action performed within Realverso has the aim to educate, raise awareness and give an effective contribution to the UN 2030 agenda goals. Finally, unlike the classic metaverse, which usually has only a playful purpose, Realverso was designed for educational purposes and to improve the awareness of the territory and sustainability concept. In fact, all the interactive elements in the Realverso such as totems, narrating avatars, ethical actions, are linked with the educational purpose.

III. THE REALVERSO

Realverso moves away from the classical concept of the metaverse, firstly because it reproduces real places and environments, intending to promote the territory, and allow users from all over the world to discover the beauties of Basilicata. Thanks to the agreements signed with some municipalities of the region: Barile, Brindisi Montagna, Campomaggiore, Chiaromonte, Craco, Pisticci, Potenza, Satriano di Lucania, Stigliano and Ginosa; Realverso aims

to promote these small villages that would otherwise be forgotten or little known, turning them into centres of tourist attraction. The main objective is to arouse the curiosity of users through 3D reproductions of these small villages, encouraging them to visit them in real life.

To promote the knowledge of the territory, in each of the Realverso scenarios, visitors can find “Narrating Avatars”, characters with which it is possible to interact, representing the culture of the village in which they are located through their costumes and clothing as shown in fig. 3. Narrating avatars have been created with the aim of spreading the culture of the area and providing information about the villages they represent. Users can interact with narrating avatars in different ways depending on their type. First type of avatars can ask questions about the history, geography, and traditions of that particular village or zone. Other narrating avatars implement a different kind of interaction with users, instead of proposing questions these avatars are able to tell stories about the place they refer to. In this case, users can ask to the avatar a question and this will be answered using a pre-recorded audio. This is an example of how gamification is being used to disseminate culture and teachings, opening doors for future uses in different fields, not only related to popular culture and traditions but to other school disciplines. avatars can be fictional or real characters that are representative of the location, e.g. historical or publicly known personalities in the city of reference. In addition to narrating avatars, visitors can also refer to the “Totems”, notice boards that are spread in the scenario and that provide information about local history.

Realverso is also a platform for open innovation. The virtual world is open to all stakeholders in the area, such as organisations and companies, that want to have their space in the Realverso, but also to local artists who can display their works and organise their exhibitions in this virtual space. Every company that demonstrates a concrete commitment to sustainability and respect for the environment is given a space in the Realverso, where they can tell their story, their mission and promote their products or services.

The proprietary software platform on which the Realverse is based was developed with a scalar perspective. Companies or institutions can purchase software licences to develop their own scenarios by creating other meta-verses either separate or linked to the Realverse. It is possible to virtually recreate shops, offices, schools. Several companies in the area (Derado, Capurso Azienda Casearia, G.Inglese) that have joined the initiative are already present within the Realverse with information points or shops, which can be explored from the inside, that tell the story of local products and can be used as connection points to e-commerce. The collaboration between several actors, whether public or private, and the connection with other metaverses are aspects that will allow the growth of this virtual world and the longevity of the product itself in

the future.

According to the concept of gamification users are rewarded with “Ethical Points” when they perform actions in the virtual world. Ethical points can be earned by correctly answering questions posed by narrating avatars and by reading information on totems spread in the scenario. As explained above, Ethical Points are not a cryptocurrency, nor are there any goods or properties that can be purchased in Realverso. Instead, Ethical Points can be used to interact with Digital Twins, that in the case of Realverso are digital representations of historical buildings or monuments. In Realverso digital explorers can find digital twins of some of the most famous attractions in the reproduced villages, such as the Fittipaldi-Antinori Castle in the municipality of Brindisi Montagna or the Fontana Ottagonale of Potenza. Users interacting with digital twins are able to decide whether to turn on or off lights or water in the reproduction of the fountain or the castle, and any action taken in the Realverso will have the same effect on its real-world counterpart, through two-way communication between hardware and software. Currently, actions performed on a digital twin in the Realverso have a corresponding reaction on a scale replica of the monument, but the hardware is easily scalable to be applied in the real counterpart: in the future, it will be possible to switch on the lights of the real castle or fountain, rather than their reproduction.

The municipalities themselves, as well as the users, are able to access statistical data on visits and interactions with the digital twin through linked QR code³.

Realverso has also been designed as a tool to educate people about sustainable and socially responsible behaviour, such as the correct sorting of waste and the planting of trees. Whenever an ethical action is performed, a pop-up window will also appear giving more information about the importance of the action being performed and the properties of the recycled material (e.g. aluminium, which

³Fittipaldi-Antinori Castle digital twin: <https://lucanum.it/realverso/brindisimontagna/>

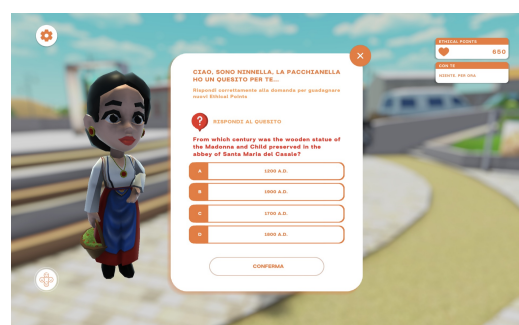


Fig. 2. Narrating avatar with typical dress of “Pacchiana” related to the territory of Pisticci.



Fig. 3. Mr. De Salvo, narrating avatar of Chiaromonte tells the stories about his life in Chiaromonte, custom and traditions.

can be recycled infinitely). In fact, in Realverso scenarios, avatars may come across litter on the ground or fountains left running that use water unnecessarily, and it will be up to them to interact with these elements of the scenario and recycle the litter properly or turn off the fountains to save water. Even these actions are rewarded with Ethical Points that can be used to interact with digital twins or even customize the avatar. These types of actions and activities that can be carried out in the Realverso effectively connect and contribute to the goals of the UN 2030 Agenda, in particular to the points: 4) Quality education; 8) Decent work and economic growth; 9) Industry, innovation and infrastructure; 12) Responsible consumption and production.

IV. THE PLATFORM

Realverso has been developed using the Unity game engine, a tool used at all scales of video games development, from the large studio to the hobbyist bedroom. There is indeed the possibility to export the final product on the most spread platforms: Windows, iOS, Android, WebGL. Thanks to WebGL is possible to get a web based build compatible with the most modern browsers such as Chrome and Safari for desktop devices. With a low additional effort, for better compatibility Unity is able to produce builds for mobile devices (Android, iOS), since WebGL is on experimental stage on mobile devices at the moment. To join the Realverso users have to visit the link <https://accedi.realverso.cloud> from their browser: no app installation is required to access. Before proceeding, users will need to read the GDPR notice and terms and conditions and tick the box stating that they are over 16 years of age. Access to the Realverso requires an access code, which is distributed free of charge during Lucanum events or by the partners of the project. This personal access code allows users, after creating the avatar on first access, to save the appearance of the avatar and the ethical points obtained in the various sessions. The Realverso is based on a proprietary software divided into three components: server, client and the content manage-

ment cloud platform. The server, is the main core of the system, inside the software are stored all the scenarios, 3D objects and scripts for managing functionality and logic. The client that represents the access point to the Realverso, is web based and can be installed on any kind of web server, is the component that stands between the server and end users. Several clients can share the same server, which gives us the possibility of having separate worlds that can be connected even in the future. Furthermore, it is possible to customise the clients with colours, logos and graphics according to their use and customer preference. Finally, the last component is the database where the dynamic content and the web platform for management of it. In this way any type of user, without special training, is able to manage the contents of their scenarios.

V. CONCLUSION AND FUTURE WORKS

In conclusion, Realverso is a tool that combines several objectives, starting with that of territorial enhancement, which characterises the entire Lucanum project, through the reproduction of villages that would otherwise have little visibility in the eyes of visitors. In the same way, companies are enhanced through their presence in the Realverso, with totems that tell their story and their commitment to building a more sustainable future. Also individuals, such as the artists whose exhibitions can be visited in the Realverso, find their showcase in Realverso.

One of the other functions of the Realverso is didactic: through the Realverso it is possible to learn interesting facts about the territory, culture, history and geography of Basilicata, but also to receive a proper education in civic and sustainable behaviour, through the discourse on the correct recycling and disposal of waste, the promotion of sustainable behaviour such as planting trees and raising awareness on the issue of pollution, using the project's partner companies as virtuous examples.

The didactic function of Realverso may be expanded to different subjects, making it a very powerful tool to use in school for teachers and students. Future steps of the project are oriented to the continuous development of new actions that can be carried out in the virtual environment. For instance, sports will be soon introduced, always with a view to sustainability and inclusiveness: it will be possible for avatars to play "walking football", an inclusive sport by definition. In addition, there will be the possibility to take walks along the mountain paths of Basilicata and to be provided with information about the geographical area and autochthonous species of mushrooms, with a link to a pedometer app that collects information on the distance covered and the calories burned.

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