Use of Virtual Reality in Creating an Interactive Radioactive Waste Repository

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One of CNEN's priority projects is the Repository for Low and Medium Radiation Radioactive Waste which is related to the disposal of radioactive waste produced in Brazil. This radioactive waste management covers operations that start in their generation and end with their disposal in a repository, with the main objective of managing the waste in a safe way to protect man and nature from negative impacts [1]. The repository is part of the solution for the disposal of radioactive waste produced by nuclear energy activities in the country. Another important point is to clearly disclose to the public its mode of operation and the safety criteria involved. It is also equally important to create tools that can help in the prior planning of activities to be carried out in areas subject to radiation, estimating possible doses received by operators, so that the limits of radioactive safety are respected. One of the possible ways to accomplish these tasks is using virtual reality [2]. This proposal seeks to use Virtual Reality (VR) technologies to inform and raise awareness among the population about nuclear energy, its benefits, and risks, in addition to the safety aspects of the facilities and the population surrounding nuclear units. For this purpose, it is proposed to use VR capable of assisting in the planning of nuclear installations to be implemented in the country. For the creation of the computational model, it was necessary to develop a virtual environment, using the building models of the repository. The Unity 3D game core was used to model the repository terrain. Using the measurements and proportions of the topographic images of the nuclear installation, the Unity 3D terrain was dimensioned. After the development of the terrain, the existing objects and buildings were added in the real environment. Finally, to enable interaction with the developed scenario, avatars, virtual characters, controlled by the user of the application were inserted. The method applied in the construction of the virtual environment allowed the creation of all the desired items and generated as a result a virtual environment that represents the radioactive waste repository, allowing the user to go through the virtual installation. Figure 1 illustrates the operation of one of the buildings.
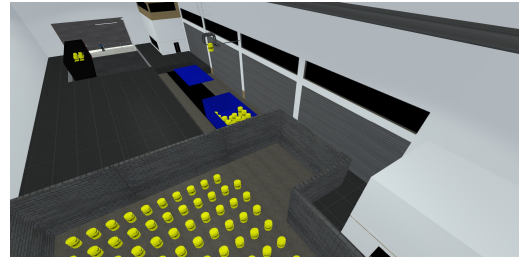

Figure 1: Building where radioactive waste is handled.

Figure 2 shows the repository running on a network, that is, with more than one user logged on to the system. The user can view, interact, and simulate some operational procedures performed.

Figure 2: Virtual repository with multiple users connected.

The results show that a virtual environment has been developed that allows the user to scroll through the radioactive waste repository, observe an animation of the main activity of one of the facilities and interact with elements of the scenario. This type of tool can extrapolate the limits of nuclear professionals and contribute to a better understanding of the sector by the population.

References
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