

Use of virtual reality in radioactive waste deposits development

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The use of nuclear energy has grown in recent years and, as a result, a greater amount of waste has been generated by this form of energy. This type of waste, which often emits ionizing radiation, is called radioactive waste and is potentially dangerous to both human health and the environment, therefore, it must be managed properly so that the risks associated with acceptable levels/tolerable (IAEA, 1999a, 1999b) are reduced. Although small and medium activity tailings contain only a small fraction of the total activity produced worldwide, they represent more than 90% of the total volume of radioactive waste (IAEA, 2002). For this reason, the nuclear radioactive waste generated by the various applications of this type of energy is assumed to be one of the biggest challenges in the nuclear area. For better utilization of this waste material, it is stored in tanks which are frequently monitored and restructured. Considering the routine process of this work and due to the seriousness of the issue, methods and techniques which can predict the radiation dose absorbed by the worker in performing this task are very useful. One of the possible ways to accomplish the advance planning of these activities is through the use of computer simulators. In this context, this paper presents a methodology based on virtual reality, in order to develop a radioactive waste virtual deposit and enable simulations of virtual relocation in these deposits. With the development of the deposit it becomes possible to simulate the virtual/train allocation and reallocation of low and medium level waste materials, since the possibility of displacement for virtual objects and dynamic calculation of radiation rate is bigger in this type of environment. Through virtual simulations, it is possible to know the dose accumulated by a virtual person in procedures performed in the virtual environment, since each virtual object in the tank is a source of radiation. As a first case

study, the nuclear waste repository located at the Instituto de Engenharia Nuclear e IEN/CNEN was modeled virtually. This first model was evaluated according to the realism of the environment and the computational radiation modeling. The results for the modeling of the virtual environment and the modeling of radiation proved satisfactory, as they were compatible with data obtained by tests carried out in real environment. Therefore this research aims at showing the great potential of virtual simulation tools to the training operation of nuclear facilities, avoiding physical immersion in higher levels of radiation. Following this ratio the editing tool sets, unreal Ed, were used to create the virtual warehouse. Figure 1 shows the editing phase of the deposit. The research presented in this report was published in Progress in Nuclear Energy (in [3])

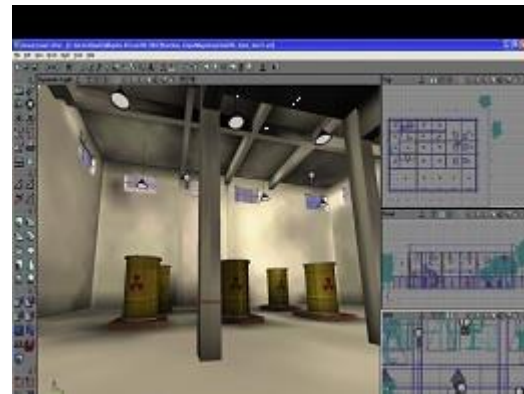


Fig. 1. Virtual scenario being modeled in UnrealEd tool.

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