

Using Game Engines in Lightning Shielding: The Application of the Rolling Spheres Method on Virtual As-Built Power Substations

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Abstract : Lightning strikes can cause severe negative impacts to the electrical sector causing direct damage to equipment as well as shutdowns, especially when occurring in power substations. In order to mitigate this problem, a meticulous planning of the power substation protection system is of vital importance. A critical part of this is the distribution of shielding wires through the substation, which creates a 3D imaginary protection mesh similar to a circus tarpaulin. Equipment enclosed in the volume defined by that 3D mesh is considered protected against lightning strikes. The use of traditional methods of longitudinal cutting analysis based on 2D CAD tools makes the process laborious and the results obtained may not guarantee satisfactory protection of electrical equipment. This work describes the application of a Game Engine to the problem of lightning protection of power substations providing the visualization of the 3D protection mesh, the amount of protected components and the highlight of equipment which remain unprotected. In addition, aspects regarding the implementation and the advantages of approaching the problem using Unreal® Engine 4 are described. In order to validate results, a comparison with traditional 2D methods is applied to the same case study to which the proposed technique has been applied. Finally, a comparative study involving different levels of protection using the technique developed in this work is presented, showing that modern game engines can be a powerful accessory for simulations in several areas of engineering.

Keywords : game engine, rolling spheres method, substation protection, UE4, Unreal Engine 4

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