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Fire and Gas Detection Mapping using Volumetric Rendering

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Abstract

The software presented here provides an interactive real-time tool for the simulation of fire and gas detection mapping using volumetric rendering based on the layouts of fire and gas detectors within 3D virtual environments.

Categories and Subject Descriptors (according to ACM CCS): I.3.8 [Computer Graphics]: Applications—

1. Introduction

The aim of the software developed is to enable the optimisation and verification of the effectiveness of fire and gas detector layouts within high risk process environments in order to mitigate catastrophic events. The software performs this task using a 3D model of a facility that may either be supplied as a 3D CAD model, or constructed within the software itself. Detectors are placed within the 3D model by the user and the software subsequently simulates "idealised" fire and gas releases throughout the model as well as the detectors responses to the releases. The results are then summed and an output consisting of a total percentage coverage of the area as well as a coverage map is generated and provided to the user through the interactive graphical user interface (Figure 1).

2. Software Overview

Our software allows a set of inputs to be used for the process to take place, and produces a set of outputs which are provided for the purpose of the user through the interactive graphical user interface.

For the 3D virtual environment to be used in the fire and gas detection process, the software relies either on a 3D CAD model, which can be imported from the original model provided by the manufacturer, or on the user to build a simple model within the software. Secondly, the user must specify the type of hazardous scenario that will be simulated by the software and the exact parameters of the scenario. Finally, the user must provide the detector locations, orientations and the parameters and specifications of the detectors within the 3D virtual environment.

The software then assesses the coverage provided by the given detectors based on the other inputs. Additionally, depending on the output more detectors may be added or current detectors parameters might be changed.

To provide feedback to the user, a series of percentages specifying the coverage of the area is produced. This percentage may give a percentage covered by a single detector, a percentage covered by 2 detectors and a percentage covered by 3 or more detectors. Different standards however just output a total percentage with acceptable coverage. The software finally generates a coverage map which is a coloured picture and a table of the detector co-ordinates used in the mapping layout.

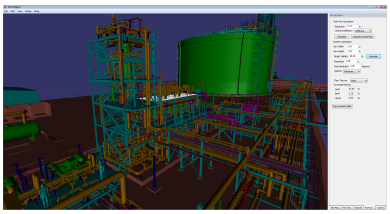

Figure 1: *Overview of the interactive real-time graphical user interface.*

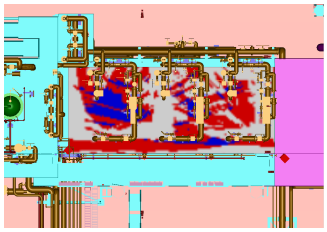

Figure 2: *Top-down view of the visualisation of the fire and gas detectors' field of view.*

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