Text-to-Scene Conversion for Accident Visualization

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Abstract

This document describes the creation of an automatic text-to-scene conversion system, AVis (Automatic Visualizer), for accident reports. Such reports vary from short text passages to long, complex documents describing the chain of events. The visualization of accidents is an important tool in Accident and Incident Analysis [Johnson 2002] For example, computer animations may be used as a training tool, for police and legal reconstruction purposes, or for aiding designers and engineers in analysing accidents and planning future development. Also, it can be difficult for non-expert readers to trace the increasingly complex arguments that are presented in accident reports. The automatic generation of 3D graphics from a text report can be useful for both expert and non-experts.

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Keywords: accident visualization, text-to-scene conversion, scene generation

1 Related Work

There are a number of current text-to-scene conversion systems. One of the most impressive, WordsEye [Coyle and Sproat 2001], creates 3D scenes from short descriptions. The CarSim system [Åkerberg et al. 2003] is similar to AVis, and can create animated 3D scenes of car accidents from reports written in Swedish. AVis uses a similar system design to CarSim, however utilizes GIS information to generate scene layouts, and Case-Based Reasoning techniques to augment the extraction of information.

2 System Design

The system relies on two main modules, an Information Extraction module, and a Scene Generation module. Each is developed independently of the other. The IE module takes as an input an accident description such as:

"An accident occurred at the junction of Main Street and 1st Street. A truck ran a red light, forcing a red Ford to swerve to avoid collision. It mounted the pavement where it struck a lamp-post".

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The IE module then outputs a structured file with the data required to construct a scene. Should the extracted information be insufficient, a corpus of accidents is consulted, and Case-Based Reasoning is used to fill in any gaps in the output file using information from similar accidents.

The Scene Generator outputs a 3D animation of the accident based on the contents of this file. If an accident location is present, the scene generator may retrieve an appropriate map from a GIS database and generate accurate scene topography. Should the scene location be un-available, the scene layout may be inferred from the retrieved text, or the layout of a suitably similar scene may be used

If the scene generator fails to accurately portray an accident, it may at least aid the manual creation of a scene by producing a scene layout and a list of suggested main participants.

3 Future Work

The aim of the AVis system is to visualize the content of a report quickly and accurately. Future directions of the project involve: Extraction of details from multiple documents to improve accuracy, overlaying two separate descriptions of an accident to identify inconsistencies, and the introduction of automatic rule-learning for improving scene generation, based on user input.

The system will also be used for a series of case-studies on human visualization. A multi-user manual scene constructor has been developed. Individually and in groups, users will construct their own animations of a given accident description. These animations will be compared to the generated ones, in order to improve the scene generation and evaluate human reconstructions from text.

Additionally, professional accident investigators will be asked to guide the creation of a scene animation. This animation will be run through the system in reverse, and a free-text report produced. It should prove interesting to compare this generated report to the original, human written report, in the fields of visualization and incident reporting.

References

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