Bachelor Thesis

3D Visualization of Network Simulation Traces

Simulation is a key tool for designing and researching new wireless protocols. But even with simulators, researchers often have a hard time finding out what exactly happened in a certain situation. This is due to two reasons: On the one hand, not all information the researcher would like to know about the situation is displayed comprehensibly by the simulator. Often the details get lost in large output files or hidden inspection windows. On the other hand, the reason for unexpected behavior may be due to something that happened in the past. But the simulator can only move forward in time – and possibly only do so much slower than real time.

What the researcher needs, is a visualization of the scenario with meaningful annotation of protocol data to perform face validation. Such a visualization then has to be able to jump back and forth to any point in time of the simulation.

Goals of the thesis

In this thesis, a replayable visualization shall be developed for our network simulator Veins (written in C++). The task can be split up into three steps.

First, the data for the visualization has to be collected and saved (or streamed). This requires the design of a suitable storage format and the implementation of the data collection in Veins.

Then, the collected data has to be dynamically visualized. We already have a basic 3D visualization toolkit [1] implemented in Unity (C#) that has to be extended for network simulation data. Now, flexible interface elements have to be developed that can be mapped to display trace data.

Finally, the visualization has to be extended to allow free navigation through space and time. This requires intelligent handling of the simulation trace and a suitable interface as well as a performant implementation.

Keywords

3D Visualization, Google ProtoBuf, Unity, C++, C#

[1] D. S. Buse, C. Sommer, and F. Dressler, “Integrating a Driving Simulator with City-Scale VANET Simulation for the Development of Next Generation ADAS Systems,” in *37th IEEE Conference on Computer Communications (INFOCOM 2018), Demo Session*, Honolulu, HI: IEEE, Apr. 2018.

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