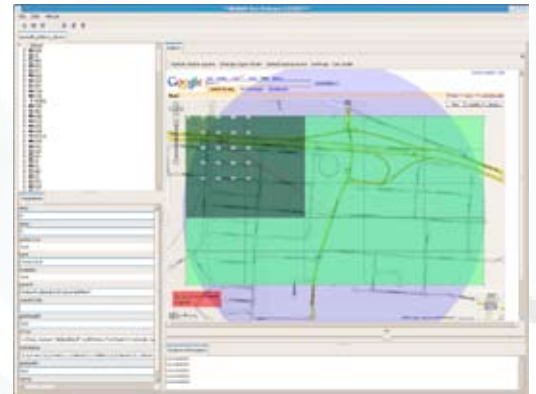


## Risk Assessment Modeling Engine

Patent Pending U.S.#11/518,881

**summary...** Using an agent based modeling paradigm, it enables the analysis of interdependencies of multiple infrastructures over time with detailed repair simulation capabilities to address resiliency. Recent applications include modeling of electrical grids, communication systems and roadways.

**description...** The software enables the simulation of a system of **interconnected** physical and/or non-physical networks. Following the **agent-based modeling** concepts, each agent in the network is given a set of rules that govern their interaction thus enabling a variety of scenarios to evolve. The engine can execute Monte Carlo Simulations to determine the most probably outcome.



Some of the unique attributes of this invention are:

- a **time domain probabilistic risk assessment** method,
- the ability to analyze the **interaction of disparate networks**, and
- **detailed repair simulation** capability.

The time domain risk assessment method is a unique method of analyzing what happens to a system over time when parts of that system fail or malfunction. Other methodologies that attempt to determine failure modes use time independent methods, such as fault trees or failure modes and effects analysis. Those methods lack the capability to produce time dependent results. A flexible and structured methodology of interconnecting disparate networks allows the user to study interactions between those networks. This provides the user with the ability to discover interactions among these networks that might be impossible using more conventional techniques. The repair simulation method integrates the probability of failure and repair/recovery time for the agents in this complex systems.

**market significance...** Typically, this tool is used to analyze infrastructure networks, both physical and non-physical. Additionally, because it can analyze the interaction of separate networks that are usually considered independently, it can provide **great insight into interactions among networks**. Because of the flexibility of the element set software design, and the agent-based model structure, this system can be used for many different simulations and scenarios.

**stage...** The engine is complete and tested with a simple GUI implemented. The engine comes with an XML interface that allows the user to design their own GUI geared towards their industry or corporate standards.

**keywords...** time domain probabilistic risk assessment, repair simulation, multiple infrastructure, interdependency, agent-based model



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