Employing multiple scenarios for training is critical to success, but often has two associated undesirable properties. First, to reduce costs and avoid the time associated with validation, scenarios are re-used over and over, which can reduce their effectiveness in training. Second, multiple scenarios places additional responsibility on the individual training facilitator in that the trainer must now track performance improvements between scenarios.

Within any simulation training exercise, a scenario definition is the starting point. While these are, unfortunately, re-used and over-used, they can, in fact, be generated from scratch each time. Typically, scenarios include the entire configuration for the simulators such as entities used, time of day, weather effects, entity starting locations and, where applicable, munitions effects. Previous work in scenario generation, interactive storytelling and computational approaches, while giving a good foundation, falls short on addressing adaptive, automatic scenario generation.

This dissertation addresses the aforementioned need by building a conceptual model to represent scenarios, mapping that conceptual model to a computational model, and then applying a procedural modeling technique, known as Functional L-systems, in a novel manner to create scenarios, given a training objective, scenario complexity level desired, and sets of baseline and vignette scenario facets.

A software package was built and is presented that incorporates all these contributions into a tool for creating scenarios (both manual and automatic approaches are included). This package was evaluated by subject matter experts in a scenario-based “Turing Test” of sorts where both system-generated scenarios and human-generated scenarios are evaluated by independent reviewers. The results are presented from various angles.