Time & Location: October 9, 2015 at 11:00 AM in Partnership II 301
Title: Assessment of Terrain Database Correlation Using Line-Of-Sight Measurements

The uncountable number of tools for the creation of synthetic terrains poses as a challenge for simulation interoperability. The permutations of tools, elevation maps, and software settings leads to combinations of poorly correlated virtual terrains. An important issue in distributed simulations is the lack of line-of-sight correlation. For example, in military networked simulations, consistent intervisibility between simulated entities is crucial for a fair fight, especially when simulations include direct fire weapons. The literature review presented in the Chapter Two discusses a multitude of interoperability issues caused by discrepant terrain representations and rendering engines noncompliant to any standard image generation process. Furthermore, the literature review discusses past research that strived for measuring (or mitigating) the correlation issues between terrain databases. Based on previous research, this thesis proposes a methodology for analysis of line-of-sight correlation between a pair of terrain databases. All the mathematical theory involved in the methodology is discussed in the Chapter Three. In addition, this thesis proposes a new method for measuring the roughness of a visual terrain database. This method takes into account the 3D dispersion of the vectors normal to the polygons in the terrain’s mesh. Because the vectors normal to the polygons are conveniently stored in most visual databases, the roughness calculation suggested here is fast and does not require sampling the terrain’s elevation. In order to demonstrate the proposed method, twin terrain databases and a tool were created as part of this thesis. The goal of this tool is to extract data from the terrain databases for statistical analysis. The tool is open source and its source code is provided with this thesis. The Chapter Four includes an example of statistical analysis using an open source statistic software. The line-of-sight correlation analysis discussed here includes the terrain’s geometry only (terrain’s culture is not addressed). Human factors were not taken into consideration.

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Approved for distribution by Brian F. Goldiez, Committee Chair, on September 16, 2015.

The public is welcome to attend.