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MODELING, SIMULATION, AND MILITARY GAMING.

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Overview

Computer modeling and simulation offers a unique perspective on events because of the ability to hold some variables constant and change others, and run a scenario repeatedly searching for underlying themes. This facilitates an understanding of the cumulative impact of seemingly minor events on grand outcomes. Computer simulation has been used as an analytical tool in the natural sciences, business, commerce, government and to a lesser extent politics.

This course focuses on the creation and application of computer simulations to model strategic international events concerning warfare. The course is intended to bring together computing and international affairs students with the objective of developing the ability to both create wargame simulations and use them to analyze strategic events. The course is project-based, requiring computing and international affairs students to work together in multidisciplinary teams to analyze specific questions utilizing computer-based modeling and simulation tools. The students will collaboratively define and evaluate specific question in international events, formulate hypothesis concerning the resolution of these questions, develop modeling and simulation software to aid in an analysis, and apply the tools to test hypotheses and formulate conclusions from this investigation.

Learning Objectives:

The learning objectives for this course include:

- Demonstrate the ability to formulate specific study questions concerning international events, and formulate hypothesis that can be tested through experimentation with computer simulation tools.

- Develop an understanding of the capabilities and limitations of modern modeling and simulation techniques as applied to the analysis of strategic international events.

- Demonstrate an understanding of accepted methodologies and practices concerning the creation and use of computer simulations to study international events to derive reasoned and justifiable conclusions.

- Demonstrate an understanding of the underlying models, abstractions, and software realizations used in modern wargame simulations.

- Demonstrate an understanding of the basic software architecture and elements of modern wargame simulations.

- Demonstrate the ability to communicate complex concepts to multidisciplinary teams including students from computing and international affairs backgrounds.

- Demonstrate the ability to understand and incorporate concepts from a different discipline and integrate them in the development and use of wargame simulations.

- Demonstrate the ability to collect and incorporate data from historical and other records for use in wargame simulation tools.

Syllabus

The course is oriented around projects including multidisciplinary teams of students. Each team will include a mix of international affairs and computing students, and students from other majors.

The learning objectives will be accomplished in the context of a specific wargame scenario context. For example, a course concerned with World War I might focus on the Schlieffen Plan. This was Germany's plan for the invasion of France through Belguim and Luxembourg in 1914, at the beginning of the Great War, that subsequently was halted at the First Battle of the Marne, six weeks after the war began. There has been 90 years of debate over the reasons that the plan failed, and this debate continues among scholars today. Through computer simulation the class would replicate the plan and test various explanations given for the plan's failure. By manipulating the changes made by the German General Staff between 1905 when the plan was completed, and 1914 when it was employed, the class would attempt a definitive understanding of why the plan failed by engaging in a number of "what if..." exercises. Alternatively, student teams could employ an agent based programming language such as "NetLogo" (downloadable from the web) to analyze battles from antiquity, the gunpowder age, or the 20th Century. Simulations from previous classes included Gaugamela (Alexander the Great vs Darius), Zama (Scipio vs Hannibal), Cannae (Hannibal vs Roman Legions), Bunker Hill, Gettysburg, and retreat from the Chosen Reservoir (Korean War).

The course will proceed through the following stages:

- Review of scenario context; for example, a course offering based on historical events at the outset of World War I will focus on a study of the Schlieffen plan.

- Introduction to war gaming and its use in military analyses, including hands-on wargame exercises

- Introduction to discrete event simulation, and simulation software

- Formulation of study questions and development of hypotheses to be tested in the study

- Preparation and presentation of a study proposal outlining specific goals of the study project and methods that will be employed

- Design and development of simulation models and software for use in the proposed study

- Preparation and presentation of simulation models and tools that will be utilized to complete the study

- Data collection and coding of such data into modeling and simulation software

- Hypothesis testing and development of conclusions for the study

- Documentation and reporting of results and conclusions