Lectures on Some Advanced M&S Topics

In September 2011, Emeritus Professor Tuncer Ören was invited by two Chinese universities:

- Beijing University of Aeronautics and Astronautics; (aka) Beihang University, School of Automation Science & Electrical Engineering; and
- National University of Defense Technology, System Simulation Lab.

In addition to academic meetings, he lectured on four topics at Changsha and lectures one and four in Beijing. The abstracts of the four lectures are given here below:

Lecture 1: Modeling and Simulation: Big Picture and Body of Knowledge

Modeling and simulation is a vital infrastructure for hundreds of application areas. Several important aspects of modeling and simulation can be discriminated through proper perception of its big picture. In the lecture, the following are covered:

1. some motivations and rationale to see the big picture of modeling and simulation as well as ways to see it,
2. reality and model dichotomy and a systematic perceptions of several aspects of simulation, and
3. current status of development as well as elements of an index for the body of knowledge of modeling and simulation.

This lecture provides a solid background for the other lecture titled: "Future of Modeling and Simulation: Normative Views, Desirable Growth Areas, and Challenges."

Lecture 2: Agents with understanding abilities and ways to avoid misunderstanding

Advanced software agents need to have several types of understanding abilities. In the talk, the essence of as well as about 60 types of machine understanding will be clarified. In any simulation study, reliability issues exist and are studied mostly as validation and verification. A more general framework, namely failure avoidance (FA) developed by the presenter, allows perception of the reliability issues in simulation in a comprehensive way. In the second half of the talk, reliability issues associated with understanding, namely sources of about 60 types of misunderstanding are clarified.

Lecture 3: Multimodels and Multisimulation

Multimodels provide a powerful paradigm to allow encapsulating several aspects (or submodels) of models in a single entity. They provide a basis for all types modeling formalisms. During a simulation run, only one, some, or all submodels may be active at a given time. Several types of multimodels will be presented in a systematic way. Multisimulation allows simulation of several aspects of reality at the same time. During the presentation, while presenting multimodels and multisimulation, the presenter will also share his experience of creating concepts based on previous experiences.
Lecture 4: Future of Modeling and Simulation:
Normative Views, Desirable Growth Areas, and Challenges

This lecture is intended for professionals seriously interested in simulation. Academics, Ph.D. students, other researchers as well as advancement-looking industrialists and advanced users from all application areas may find it useful. The aims are:
(1) to develop a framework to elaborate on –in a systematic manner– the desirable growth areas and challenges for the future of modeling and simulation; and
(2) to start populating this framework; hence, presenting challenges in desirable growth areas of modeling and simulation.

A revised version will be the basis of an article for the International Journal of Modeling, Simulation, and Scientific Computing of the Chinese Association for System Simulation - CASS) by the World Scientific Publishing Co. China.