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EDUCATION: METHODOLOGY VS. LANGUAGES
(A PANEL SESSION)

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SUMMARY

For many jobs in research laboratories, factories and companies, in various fields of human activities, (from business and engineering to music and medicine) knowing computer modeling and simulation is a prerequisite today. This large impact of using computer simulation caused (as usual) many different points of view. We are trying to select and present a few of them. Our effort will be concentrated on discussing some misunderstandings between simulation theory and simulation languages. We will also bear in mind other "hot" problems: liability, education level in general, packages and future work.

There is a wide interest in simulation education, especially within the last few years. Previous to this, computer simulation was treated as a special art.

In this overview, we will try neither to mention any particular language nor to select any theoretical approach.

This discussion is not going to solve all existing problems, but we will give our small contribution in this direction. There are some natural questions: why do these controversies between theory and languages exist; who are the "problem makers", how can we find the best solutions?

Let us start with one "fuzzy" term, "user friendly software". People could define this term very differently, from various points of view. It seems that we have one more vs.: methodology vs. languages vs. packages. Only good packages are friendly enough for the users, and for using them it is not necessary to have some theoretical knowledge in computer simulation or in programming languages. The situation is not so linear as it seems. There is the question of who is going to prepare new packages or make the necessary modifications of existing ones?

On the other hand, there are also very friendly languages. Some special purpose languages, with well organized input/output possibilities and interactive running capabilities are really very attractive.

Are there also "friendly" theories and model buildings? No! "There is the rub..."

During preparations for courses in computer simulation, we are in a situation to select an appropriate special language. In this situation, there are at least three possibilities: to select two languages - one for discrete event simulation and the other for continuous simulation, to select one according to students' main avocation or to use high-level multi purpose oriented language. It is a simple task to find out what our specific needs are and to implement one of the above choices. This becomes less complicated if we are provided with all the necessary hardware and software requirements. We have to admit that there is only a limited number of Universities which are equiped to offer the necessary conditions for work in the field of simulation.

Problems of teaching simulation were discussed a few times during previous Conferences. This was not a waste of time since it resulted in significant improvements relating to computer simulation courses on the graduate level. We are going to use conclusions of this Conference to move one step forward. We also need to place more emphasis on undergraduate courses, since people still use the words "simulation" and "modeling" very loosely.

There are also three popular schools of thought about the theory of computer simulation. The first is to have a mathematically strict and formal theory of modeling and simulation. The second idea is to have theory "from the users point of view"(there are many who believe in this). And, as usual, there is the third opinion that we do not need theoretical approach at all, and everything could be solved through good software.

We are going to point out a few general and relatively new problems in connection with the main topic: methodology vs. languages. The classic statistical tools are prepared for solving many very important problems in computer simulation (mainly for Monte Carlo type). We are using interactive models for the simulation experiment. For these types we do not have complete methodology for validation. We are using our "feeling". Are we artists again? If we mention just a few additional possibilities: hybrid simulation, emulation, we can easily conclude that there are interesting areas for fundamental research. However these areas are not totally covered by the use of simulation languages and packages. It is often misunderstood that "languages" and "packages" are used interchangeably. It is of paramount importance to note the differences here.

We have to point out one very important educational problem. Do we need or intend to have simulationists for all systems? What are the limits towards this direction?

Almost all of us have experience with several simulation languages. There are many software companies pushing users to buy their products. Some of these products are really good (especially for limited area of usage), "friendly", and not very expensive. For a large number of languages there are versions for personal computers (micros), which are very efficient. The "redcoats" are slightly unarmed: computer simulation is not necessarily one

type of investment! We are not using big computers (read: expensive toys), for a lot of preparations and first-aid runs. Sometimes, we are going to finish the whole project using small and inexpensive machines.

There is a great number of high-level language users for system simulation. Sometimes they do not admit (why?) or sometimes it is necessary (for some special projects) to use high level languages. Using multi-purpose languages for system simulation is very effective for educational purposes, especially if we are using process oriented simulation. It is possible to solve many problems (or similar variations of the problem) with less effort by using selected modeling strategies. We have to underline that in this case more theoretical background is obligatory. Using this methodology it is easier to get a feeling about the nature of modeling and simulation. For the purpose of teaching, as well as for self education, it is very important for students to pass through process oriented methodology using high level language.

There are authors pointing out differences between the theories of computer simulation, simulation, modeling and simulation modeling. Nevertheless, the terms "model", "sytem", "experiment" and "data" have been used so often in so many different contexts that they have lost their true meaning. (There are many non-standardized mathematical terms too, but it could not be our excuse). First of all, we have to prepare and accept one possible simulation landscape with existing branching and links. This configuration will be an open system which accepts additional branches and connections, but not new roots. Simulation languages will cover few (all?!) branches.

Extensive research programs are presently being undertaken in the areas of artificial intelligence and expert systems. Simulation theory and languages will definitely play an important role in this field and the overall impact between these various areas of computer education will be of great benefit to all disciplines in the near future.

PANELISTS

Each panelist will present a ten minute presentation covering the problem from his point of view, and take part in the discussion: How to advance the state-of-the-art. The floor will be open for discussion following the presentation. We have an excellent team of panelists who promise an exciting panel session:

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