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Research Article

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The Simulation; See the (Toy Industry)

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1. Introduction

In a grand ceremony in early September 1870, the giant British battleship HMS Captain entered the water for the first time.

While the Lords and Admirals of the Admiralty were still exchanging toasts and glasses of champagne to celebrate this unusual occasion, the ill-fated battleship capsized, drowning more than 500 of the finest sailors in the Royal Navy at the time.

This came as a surprise to everyone except for one person: the renowned English shipbuilder Edward James Reed, who was then the Comptroller of the Royal Navy and Chief Designer because he had conducted a preliminary study on a small model of the battleship and concluded that it would sink with the slightest movement of waves or currents at sea [1].

But the naval leaders paid no attention to this scientist's warnings, when they claimed were based on nothing more than unserious experiments conducted on a children's toy.

2. Mathematical Simulation

People continued to view models and simulations with a disparaging eye for about 50 years after the sinking of the ill-fated battleship HMS Captain.

The first edition of the 20th Century Cyclopedia of Universal Knowledge - 1901 even included three words in front of the word simulation: "See the toy industry."

However, the model gradually imposed itself, especially after the tremendous developments the world witnessed in the fields of medicine, theoretical and applied physics, biochemistry, toxic chemistry, and various engineering disciplines.

Such developments made it impossible to conduct experiments on the original material for many reasons, some of which were extremely dangerous.

This was summed up by the famous German atomic scientist Erwin Oppenheimer (not the more famous American scientist Robert Oppenheimer, who worked in the same field) when he spoke about a dilemma they faced while trying to build a German atomic bomb in 1944 related to what is known in physics as "critical mass." He said: "We did not know the exact critical mass required to initiate the explosion, and it was not possible to reach it through experimentation, as we were working in a secret underground laboratory [2].

" It was possible that we might have accidentally reached the precise critical mass, which would have meant that we, the laboratory we work in, and perhaps the entire city above us would have evaporated.

It was impossible to arrive at the precise value except through calculations, And calculations alone [3].

Indeed, mathematics, through symmetry, provides us with a wide scope for modeling an integrated world we may not know much about by extrapolating from another world we do know.

The striking similarity in mathematical formulas in the abstract is a vast field for constructing mathematical simulations, which are the primary foundation for constructing an ideal physical model later on, and which constitute the basic premise for constructing the more rigorous physical model that follows.

The world of mathematical models may seem strange and unexpected at first glance, given the conventional form of models, as they take the form of purely mathematical formulas.

For example, the mathematical formula for the following two linear equations:

$$\mathbf{a_1x_1 + b_1x_2 = c_1}$$
$$\mathbf{a_2x_1 + b_2x_2 = c_2}$$

by Cybernetics opinion, that can take on dozens of different meanings [4].

When a mathematician is asked what these two equations represent, he will say a very vague and general answer: two linear algebraic equations with two unknowns, and it is impossible to determine exactly what they represent.

An electrical engineer, on the other hand, will confidently reply, "They represent currents in an electrical circuit with effective voltages."

A mechanical engineer will assert that they represent the equilibrium forces of a set of levers, and perhaps, with some mathematical correction, the stretching and compression of a set of springs.

A civil engineer will say that they represent equations for calculating the deformation in a building column.
Thus, we obtain four completely different answers to the two equations.

Amazingly, all four answers are correct. It all depends on the constant coefficients a, b, and c and the variables x1 and x2.

As the famous Belarusian scientist Alexander Gorbatsevich put it, "We may not find any correlation between the rotation of the solar system around the center of the Milky Way and the amount of electricity powering a home somewhere on this Earth." But if we simply wrote down the mathematical formulas and equations, without any words or explanation, we wouldn't know which of the two problems is being solved, since the equations are the same in both cases.

3. Electrical and Magnetic Simulation

The amazing mathematical similarity holds tremendous potential. So why torment ourselves by building an accurate physical model of a nuclear reactor body, with all the risks that could arise from operating this model, assuming it is possible?

When we can rely on the amazing similarity and similarity of the laws of electrical resistance (mathematically) with the physical resistance of the reinforced concrete of the reactor body.

In this case, in a week, we can select 250,000 alternatives, with real potential problems and radiation leaks, while studying the traditional alternatives themselves would take two years, with all the risks involved.

The principle of electrical simulation is essentially based on building a model composed of separate electrical cubes. Each of them represents a part of the actual final shape of the body to be designed or tested, as in the following image of a bridge truss, Taken from a relatively old book dating back to the mid-1970s

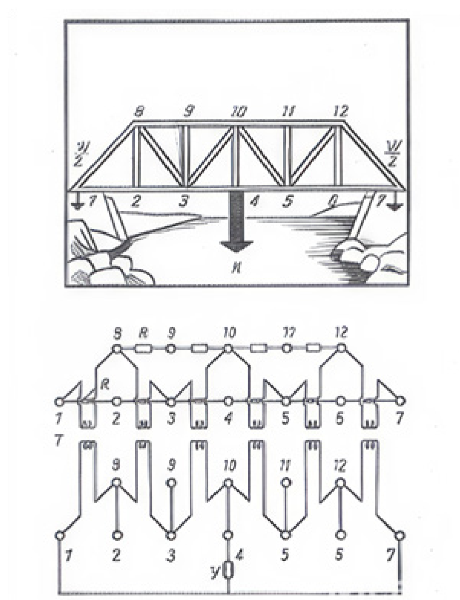

Figure 1: Electrical Resistances and Simulation Construction in Civil Engineering

These cubes are currently controlled by logic gates connected to a powerful computer, while electrical simulators are still preferred by many engineers and research centers.

The distortions and forces affecting each part of the model are calculated individually by disconnecting or increasing the power supply to its electrical cube.

This is the method adopted in the design of the late shuttle Columbia.

There are highly complex modern models based on the EMC principle, where electrical cubes are replaced by electromagnetic ones.

The effects are calculated by distorting the magnetic field of each cube separately, within almost zero tolerances.
This is the method currently used to calculate the effects on many designs, such as the movement of an aircraft during experiments in wind tunnels, for example.

Of course, the most important feature of simulation in its modern concept is the ability to conduct experiments on objects beyond the researcher's control and inaccessible due to their extreme distance, such as stars and quasars, or because their lifespan is so short that contemporary technology does not allow us to interact with them directly.

Electrical simulations subsequently developed and became a key component of electrical research.

The ETAP program, for example, possesses amazing and proactive capabilities in solving contemporary electrical problems, such as harmonics, It was credited the finding solutions of the Faden Spectrum phenomenon

Dr. Hazar Shtat (a visiting professor at the University of Lattakia) and his team worked to discover and find solutions to this phenomenon, which plagues electrical networks worldwide by using simulations programs [5].

All theoretical and practical research related to this phenomenon was conducted in the laboratories of the Faculty of Physics at the University of Lattakia using a power quality analyzer linked to the ETAP program, The results were astonishing and conclusive.

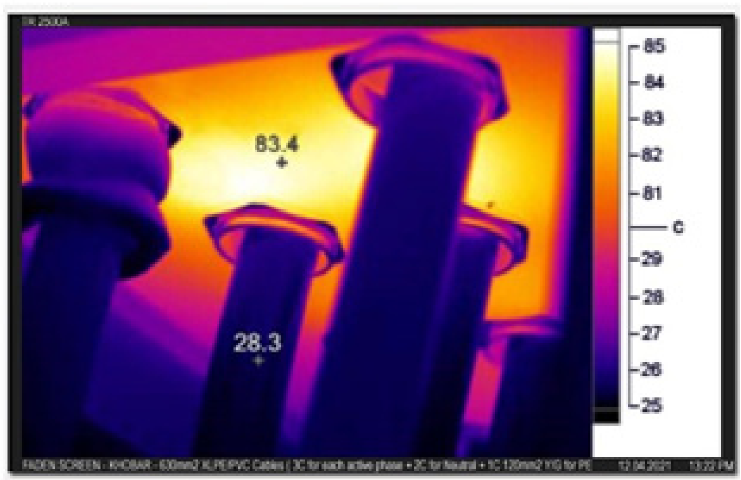

Figure 2: Faden Spectrum Phenomenon

4. Computer Simulation

The remarkable development of computer technology in recent years has led to a significant reliance on computer simulation. The primary training program for race car drivers, air pilots, and space navigators now relies primarily on driving through simulation software.

Modern software has enabled us to create structures that closely resemble the real-world environment.

However, the expansion of computer programs prompts us to note that simulation is fundamentally different from virtual reality, even if their software tools are equivalent.

Simulation essentially views reality as it is, while virtual reality views it as it should be.

Consequently, most (but not all) virtual effects designed using Simulation Tools in a professional language structure such as VHDL, or curves that serve as the skeletons of design and are constructed using Nurbs in the popular 3D Max program, are considered more of a means of explanation and the personal Hollywood creativity of their designers than a true simulation of scientific and engineering phenomena and dilemmas, unless the concepts and structures are formulated according to strict mathematical equations.

This makes traditional manual and mathematical electrical and magnetic design the preferred method by the world's leading scientists.

Perhaps the computer illiteracy of a large segment of senior professors (with all due respect and appreciation) has played a role in this matter.

However, what is certain so far is that there is no single standalone program that provides absolutely reliable modeling and simulation that our professors are comfortable with.

Here, I can cite as an example a dilemma I faced—and perhaps many others—in the field of extended, conflicting quantities.

To date, there is no program that can handle them with complete reliability.

Therefore, we resort to writing the quantities and dealing with them as non-zero, conflicting matrices. We then solve them in MATLAB after inserting the matrix coordinates. We then graphically transform them after returning them to their original vector form.

We then perform the cladding and modeling in 3D Max. This is an extremely tedious process that takes a significant amount of time.

However, advanced mathematical programs allow us to create mathematical simulations that are astonishingly close to reality and identical to it by defining arrays of values instead of discrete variables.

A set of binary points is defined for the three-dimensional coordinate representation, and with some ingenuity, for example, a cosmic tunnel can be constructed inside a black hole using sinusoidal operators arranged as matrices.

These operators can then be manipulated in a well-trusted simulation program, yielding extremely smooth curves.

Equations that may at first glance appear to have little or no connection to modeling, astrophysics, or space engineering can in fact be used as the skeletons for many analogies, including cosmic tunnels.

Below is a set of instantaneously adjustable equations similar to those we discussed earlier, they are solved in Mathcad and represented graphically within the program's structure.

The Fill Surface/Plot operator was added by the programmers themselves [6].

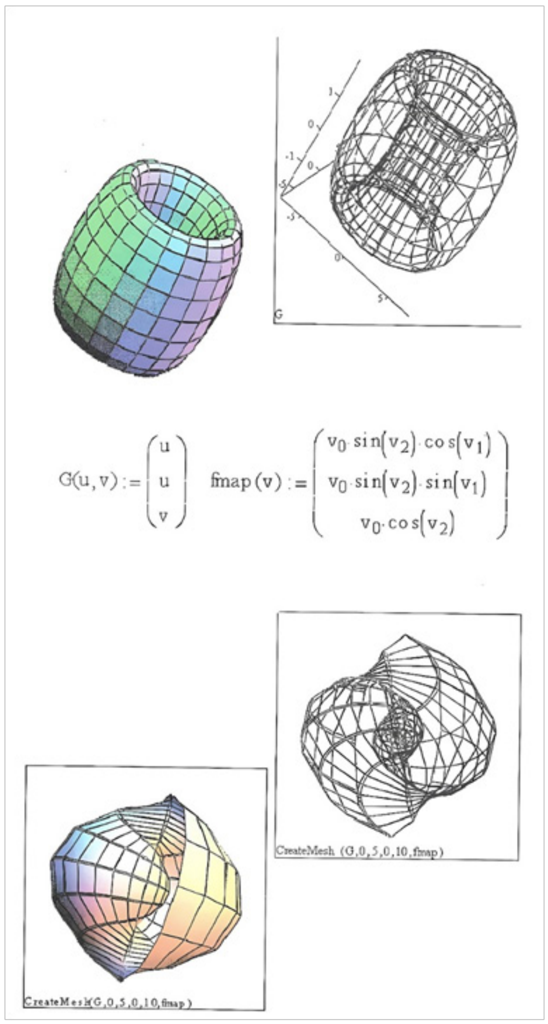

Figure 3: Simulation using Advanced Computer Systems

As for Math 4 program, originally designed to solve mathematical physics problems, it has more impressive capabilities for modeling than other specialized modeling and simulation programs.

What distinguishes Mathematica 4 is its remarkable ability to integrate an unlimited number of variables and transform them into a set of second- and third-order differential equations.

This means that any physical form can be transformed into a set of mathematical equations whose solutions and graphs accurately reflect the general shape.

By including some color effects and variables in the equations, the actual shape can be obtained.

Of course, in this case, the entire study can be conducted mathematically, calculating all possible effects, wear, and leakage by manipulating the variables in the main equations.

5. Simulation in Biochemistry and Medicine

Quantum simulations have been credited with the development of many medical devices and vaccines in epidemiology [7]..

Virtually producing and testing a vaccine using simulation takes only a few months, compared to years using traditional methods.

This is what happened recently with the COVID-19 vaccines, where modeling enabled safe vaccines to be developed in less than four months, compared to twenty years for other vaccines using traditional methods.
The same applies to catheterization and arterial dilation springs.

3D printing has also enabled the manufacture of human body parts with greater efficiency and greater harmony with the body's defense system, all thanks to simulation.

We should not forget the role of simulation today in the development of modern cancer treatments and contemporary cancer tumor removal operations.

6. Conclusion

Simulation plays a pivotal role in all aspects of contemporary science, especially in artificial intelligence research [8].

This increasingly important role is so essential that it is virtually indispensable today, to the point that it is impossible to find a contemporary encyclopedia that defines simulation as simply a part of the children's toy industry.

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