ASTER

SEEDS HackSciArt
SEED 08-IA

RESEARCHERS

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1. ESSENTIAL DIMENSION

(Objective descriptive information of the scientific seed)

NAME

"The Yin Yang of Science and Technology – An Neverending Story"

(From cell computing to population dynamics of species of interest)

KEYWORDS

Cell computing, Population dynamics

BRANCH

• **Computer Science (more specifically, computer models)**

• Computational modeling (of complex systems)

• Population dynamics

ABSTRACT

The main idea is reflected in the linked informative talk (in the "resources" section):

• Science, in this case computer models, try to produce an advance in the ability to solve problems, with desirable characteristics in terms of efficiency, parallelism, expressiveness, etc.

• The theoretical progress of this science, for example, of cellular computing models, should ultimately lead to having real cellular machines, breaking known barriers in technology.

• On the other hand, for these current theoretical studies, the technology that we do have in electronic machines and the software that we develop with them allows us to better study and deepen this scientific branch of cellular computing. This is how this symbiosis between science and technology is illustrated.

• On the other hand, theoretical machines and their potential practical devices are general purpose, abstract machines, which might seem out of the interest of society. However, the task of these machines is precisely to provide general solutions that can later be applied to solve a multitude of real problems. Once again, this duality between the abstract and the concrete is presented, and how sometimes we must go to the most abstract to produce concrete advances in aspects of reality of the greatest interest.

METAPHOR

In the informative talk several metaphors related to this idea are collected, which starts from the duality of Yin Yang, science-technology, concrete-abstract, and is exemplified by the never-ending story, in which Bastian escapes from the real world (real problems) going to the fantasy world (imaginary world, abstract?), there he helps to solve the problems that affect that world, and that helps him to return to the real world reinforced to solve the real problems. In this way, we can understand how these machines, apparently far from the real problems, will finally help us to solve them.

PHASES OF THE USUAL SCIENTIFIC METHOD

Theoretical design of bio-inspired computing devices (inspired by nature) (1), abstract mathematical computing models that can then be applied to different fields to solve specific problems. Specifically, we created models within the so-called Membrane computing, inspired by the functioning of living cells and the fact that they present multiple compartments in which multiple interactions between molecules and the transmission of substances between cell membranes occur, which can be interpreted as a calculation process. Starting from this inspiration, the aim is to one day have general-purpose biological machines, with the inherent parallelism of our cellular systems, where all our systems, organs, cells or organelles work simultaneously to carry out multiple processes.

I use the above abstract devices to solve concrete problems, such as studying the population dynamics of an endangered species or an invasive alien species (2), or trying to better understand the evolution of a certain network of genes involved in a disease.

I develop simulators of the theoretical devices described in (1) so that they accept as input instances of real problems such as those discussed in (2) in order to study their evolution.
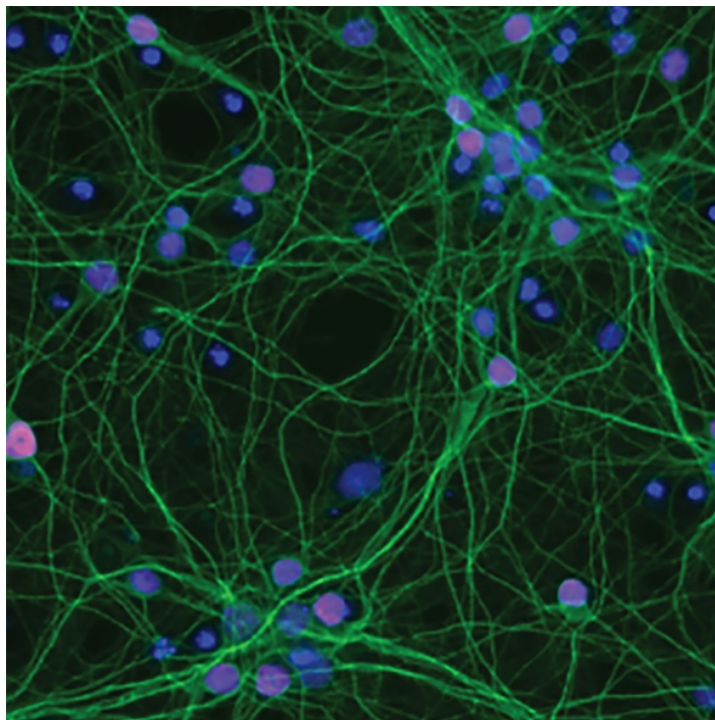
1. Design of (abstract) cellular theoretical devices.

2. Study and modeling of processes of interest (population dynamics).

3. Use of simulation software to use the device and the model to study scenarios of interest (specific instances of the problem under study, such as the evolution of the zebra mussel ecosystem in the Ribarroja reservoir in the decade prior to 2014).

4. Try to convert the theoretical devices into real biological machines, in the long term, in the ideal case (current technology helps to understand these cellular models, and the study of them aims to arrive at a more advanced general-purpose technology to solve real life problems).

TOOLS

Theoretical study, simulation tools (P-Lingua, MeCoSim, CellDesigner, etc.).

RESOURCES

1) 01_Informative_Talk
   https://www.cs.us.es/~lvalencia/investigacion/NIT2016-LuisValencia-20161020.pdf
2) 02_ Article_Modeling_Zebra_Mussel https://doi.org/10.1016/j.ecocom.2014.09.006

2. ADDITIONAL DIMENSIONS

(The following sections add subjective information from the scientific seed, in order to inspire creatives in the creation of a SciArt work. Some of the sections may not have information if the researcher chose not to specify anything.)

SCIENTIFIC MOTIVATION

• It is often difficult to try to explain to someone far from the world of computer models what is the use of studying new theoretical machines, but it is crucial to understand theoretical machines as well as possible in order to one day have real machines with the power that we pursue

• The purpose of these machines is not the devices themselves, but to try to solve various problems that concern the human being and the world that surrounds us, and an improvement in an abstract model allows for an improvement in the multiple fields of application that may arise. .

• It is very interesting to develop tools, technology, that help to better understand the theoretical devices, the computer science in which we work, and the advancement of science itself will help a crucial advance in technology, at the moment when these machines may be real biological devices.

• Meanwhile, the very mathematical-computational models that we are creating are serving to attack many real problems, such as the population dynamics of species of interest.

• There are many real life problems whose solution requires stepping back and looking for scientific-technological improvements, there are no direct feasible solutions, but we can find alternative ways fighting with the help of science and technology, acting in symbiosis to solve enormous problems. that help to provide us with a better world, solving problems that concern us as human beings and as citizens of the world.

METAPHYSICS

The previous sections have tried to capture precisely aspects of an abstract world that with the help of science and technology and inspiration from nature can help us to solve the problems that we find in it.

ETHICS

Can we accept the impossibility of attacking certain seemingly intractable problems or should we seek solutions, however complex they may be, trying changes in perspective that result in groundbreaking advances in science and technology that imply leaps forward that finally solve these problems that are so difficult to address?

COLORS

The intermediate level colors of this wheel: red, green, yellow... although they may well be pastel colors or other more dreamlike ones, it's hard for me to define it.

SOUNDS

The theme song of The Neverending Story, the sounds of silence, Imagine…

AROMAS

Something soft like a lot of floral or fruity, but quite neutral.

FLAVORS

Something soft like a lot of floral or fruity, but quite neutral.