Data Ecologies

Symposium

Time's Up Laboratories
Linz

March 28-29 2003

http://www.timesup.org/laboratory/DataEcologies

Welcome

The Data Ecologies Workshop is a small two day event organised by the Time's Up Research Department as a part of the Txoom project. The Txoom project is an EU Culture 2000 funded project investigating biologically inspired interactions with artificial and mixed reality spaces.

Of the many things that this workshop could have turned into, the things that it has become is an interesting blend of computers, philosophy, physics, biology and a few other things that we cannot quite pin down yet. The introductory article will hopefully outline some of those aspects. The presentations on the first day, here summarised by a small abstract, will hopefully send us away with the feeling that although we know a lot about how the universe works, it all could be a lot stranger than we thought. We haven't been able to get into the depths of strangeness that these theses allow, that would require days, at least. But we anticipate that the three speakers can help us realise how strange the world might really be, and that there are glimpses to show that perhaps we will get to peek behind the curtain.

The second day, concentrating upon the Framsticks system for programming evolving systems in an artificial but realistic physics, will be a lot more hands on and will lead to more heated discussions about what we can do with such systems. As many of the participants have worked or are working on related and similar systems, we expect the breadth of knowledge and experience to lead to an interesting afternoon.

Saturday evening will allow us to relax into tangential discussions and to follow up the possibilities that will have become apparent over the two days talking, demonstrating, trying out and playing with.

Introductory remarks

Simulations of physics, Physics as simulation.

A two day workshop investigating the interplay between the simulation of physics for the creation of artificial (data) ecologies, and the possibility that physics (and thus, all ecosystems) is itself, a data process.

This workshop evolved from the title: a small seed that sprouted, bloomed, mutated and turned, with all the necessary branches of a growth process, into something completely different.

Perhaps the simplest: "workshop." Thus the days should be most simply used to work over the ideas and implications that the other two words, in their reinforcing reflexive combinatorics, lead to. The ideas and their implications should be paid attention to, the free exchange of ideas among an audience of interested participants will be encouraged.

"Data" leads us towards the realms of the bit, the abstraction, that which is distinct from physicality, order or disorder, complexity, algorithmics and other (con)textualities.

"Ecology" gets us into the realm of sloppy goop, the primal soup, structures of highly physical, biological processes that reiterate, the regenerate, breed, eat, reuse and generally get as far from the cleanliness of data as possible.

Of course, getting these two things together leads us to the ecology of data (the movement of data in networks? That's not what we thought that we meant), or the data of ecology (logs of plankton travel? Hmm, neither). As the terms begin to intermingle, we get artificial evolution, data niches, simulation of biological systems, genetic codes as data collections, genetic manipulations of data collections...: the autocatalytic list seems not to want to stop!

In order to escape this Sorcerer's Apprentice situation, we skimmed the top of the brew and removed a small fragment with two flipsides, both of which seem to be of relevance: ecosystems in simulated physics and the question of physics being a simulation.

Evolution in Simulated Physics

We cannot help ourselves: pure data is not our thing. Time's Up has spent too much time running around building things to be satisfied with the purely informational. If we are to delve into simulated evolution, then we need to get our fingers dirty and to know that there is a certain aspect of physical "realism" behind the plans.

In the a-life heydays of the early 90s Tom Ray's work showed that an ecosystem of sorts, with the spontaneous evolution of all sorts of niches and parasitisms, could exist on a purely informational level. These results, surprising and full of motivations for further work, have led to all sorts of evolutionary simulations and systems. The presentation of these results has often run up against the barriers of understanding: making the processes visible to an interested but not fully comprehensive viewer is difficult. Since then, other work has extended towards looking at things that make more intuitive sense for the viewer of such artificial systems. Karl Sim's work on evolving critters to actually *do* something, in this case to walk, to swim, to act in the simplified world that he created, is part of this sequence. Of course, this moves away from ecosystems and into the realm of virtual husbandry, but the motivation to be able to see the artificial evolution of action and motion was important.

The development of more and more "realistic" physical models has led to an increase in the usefulness of the results. The ability to not just evolve shapes as per Dawkin's early experiments, not just bodies with the evolution of L-systems, not just controller systems as per the swathe of evolutionary robotics, rather the complete coevolution of "bodies and brains" has become the focus of interesting work. One end result of this work, the construction of actual machines based upon the results of evolutionary development, has led to some extremely intriguing machines and methods of movement.

As the construction of physical systems is a little more than trivial, this end of development has been placed in the "interesting but too hard" basket. The workshop aspect will instead keep its feet at least vaguely in contact with the ground and will look into the more developed of the available systems for the evolution of bodies and their control in a simulated physics. In particular, we will focus upon the system Framsticks developed at the Poznan University of Technology in Poland. This system, developed since 1997, allows several levels of evolutionary force to act upon bodies and their controlling systems. The system has been greeted with a broad range of uses. The workshop will introduce the system and outline some of the ways in which it differs from other such systems, where it has been successfully used, what can be done with it. Then a more intense introduction to the system should enable the workshop participants to get into the use and misuse of the system for their own purposes.

In particular the ability of the Framsticks system to maintain some sort of semi/pseudo physical reality yet run complex processes of spontaneous, i.e. non goal-oriented evolution, is of primary interest. The interfacing of other data systems to an artificial pseudo-physical ecosystem is relevant and of interest here.

Physics is a Simulation?

The flipside theme for the workshop, taking the second day, is the following question:
What if the world is actually, at its finest level, computational?
That is, what if the idea of simulating physics as we understand it (a continuous process) is somehow redundant because physics is in fact an informational process.

This radical proposal, often termed the "Zuse hypothesis" after its earliest proposer, Konrad Zuse, has recently gained some serious scientific interest. Ed Fredkin's version of the thesis, sometimes argued with, sometimes argued strongly for by none other than Richard Feynman, has gained more attention recently. A popularisation of the idea by Stephen Wolfram in his recent self-published tome has raised some other forms of attention.

The thesis leads to some strange conclusions. Some of these begin to differ from what is commonly accepted as the standard model of physics. Looking into some of these ideas, for completely different reasons, Hartwig Thim has conducted experiments that begin to disagree with the standard model in the same sort of way that Zuse's thesis would disagree with it.

Although this meeting is not meant to become some sort of meeting of arcane physicists, it is planned that the ideas that are collected in this model should receive quite some critical and other attention. Although most of us are deeply involved in computer-based activity, we are happy that there is in fact a "real world" out there. This group propose that the equations of our world are perhaps more relevant than the objects whose motion they are meant to model, that the terms real virtuality and virtual reality are, perhaps, interchangable.

URLs:
http://www.frams.poznan.pl/
http://www.spiderland.org/breve/
http://computing.tay.ac.uk/timtaylor/cobb/
http://web.genarts.com/karl/evolved-virtual-creatures.html

http://www.numa.uni-linz.ac.at/Board/thim.html
http://fodok.uni-linz.ac.at/fodok/publikation.xsql?PUB_ID=11801
Http://tph.tuwien.ac.at/~svozil/
http://www.bottomlayer.com/
http://www.digitalphilosophy.org/

Abstracts

Friday 28 March 11:00 - 15:00
with a small coffee break

Karl Svozil

Suppose you are God---How would you do it?

Abstract:
The concept of the world as a machine is an old suspicion that has its ups & downs as time goes by. From early Pythagorean thinking to present day non-mainstream speculations of Zuse, Fredkin, Toffoli, Wolfram and many more, this project lingers on. Let us consider the question top-down: suppose you could create a universe. What options do you have, what would you do, what do you obtain?

Ross Rhodes

Suppose you are in a computer game simulation -- How would you find out? Interpreting quantum mechanics as a computational process.

Abstract:
Quantum mechanics may be described as a set of mathematical tools with a perfect relationship to the universe we observe. The results predicted by the mathematics can be demonstrated, yet these results have been characterized as 'impossible, absolutely impossible to explain' in physical terms. [Feynman] In many respects, the paradoxes that plague physical interpretations of quantum mechanics can be seen as logically arising from the operations of a computer. Let us consider our human experience bottom-up: if you were immersed in a virtual reality computer game, what would you expect to notice that would be understandable only as artefacts of a computational process?

Hartwig Thim

Experimental refutation of relativistic time dilation

An experiment is described showing that a 36 GHz microwave signal received by rotating antennas is not exhibiting the frequency shift ("transverse Doppler effect") predicted by the relativistic Doppler formula. From the observed absence of the transverse Doppler shift it is speculated that either the time dilation predicted by the standard theory of special relativity does not exist in reality or, if it does, is a phenomenon which does not depend on relative velocities but may be a function of absolute velocities in the fundamental frame of the isotropic microwave background radiation.

Abstracts

Saturday 29 March
11:00 onwards.
Lunch break at 13:00, workshop continues until evening

Maciej Komosinski and Szymon Ulatowski

Framsticks introduction and workshop

The objective of these experiments is a study of evolution capabilities of creatures in simplified Earth-like conditions. They are: a three-dimensional environment, genotype representation of organisms, physical structure (body) and neural network (brain) both described in genotype, stimuli loop (environment - receptors - brain - effectors - environment), genotype reconfiguration operations (mutation, crossing over, repair), energetic requirements and balance, and specialization.

The simulator allows the study of both directed (with fitness criterion defined) and spontaneous (with no such criterion) evolution. In the directed case, it is possible to "grow" creatures with the given properties, like simple construction and smooth movement, strength and robustness, ability to move in land and water environments, seeking food, following targets, escaping and many others. The system allows users to create more experiment definitions, which may lead to unexpected results and emergence of very complex behaviours.

The most important part of the research is the study and evaluation of capabilities of various evolutionary processes, including those concerning undirected evolution (which has not already been done in such a complex environmental and simulation conditions).