Proposal: An Overview of Biologically Inspired Creative Coding Practices and Ludic Science

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Biologically Inspired Creative Coding Practices

My project idea is probably a little bit unconventional, because there's no goal to create or investigate anything new. Instead, I'd like to draw connections between dynamic models in biology and my own personal interests, creative coding and games. In order to consider this project a success then, I need to excite my audience, and encourage them to learn in a ludic (playful) way. The project will have two parts to it, but both will be very tightly connected. The first part is about the relationship between computational biology and creative coding. Creative coding is a type of programming with an increased emphasis on expressivity rather than functionality. Although creative coding doesn't have to be visual, it is most of the time, and this project will really only focus on the visual side of creative coding. There are many different creative coding practices that have their roots in biological systems, from reaction-diffusion systems[2], to random walks[1], to flocking boids[4]. I plan to cover the creative applications of at least those three biological topics, as well as as many more as I can possibly fit in.

Ludic Science

The other topic I'd like to cover as part of my project is the concept of ludic science; ludic is just a scientific word for "playful". I want to convince my audience (including you, Professor Peleg and Karan Praharaj) of the importance of the element of play in scientific research. I have already been working for weeks on a ludic environment to simulate boid behavior that I intend to use in order to create the graphs and everything else for this class's third homework assignment. Interactivity is one of the most important parts in creating something playful, and the boids simulation is just overflowing with potential interactivity so I just had to start working on this as soon as I found out the homework assignment was about boids. But the boids simulation isn't the only simulation that's full of interactivity, every biological simulation has the potential for play through interactivity. My ludic environment for science isn't just about the interactivity though, otherwise it'd be no work and all play, creating meaningful scientific output is just as important too. I think it's important to work *while* you play instead of working and playing separately. This ludic science approach that I'm taking to homework 3 will be at the heart of my argument for the integration of more play into traditional scientific work.

Background and Pre-existing Work

I am not the first person to want to integrate interactivity into computational experiments science. Afterall, when doing a physical experiment, the scientist is interacting with their

experiment at almost every step of the way. My first exposure to making science playful through interactivity was the Flash and Java simulations from our University of Colorado's own PhET [3]. When I was in grade school, my science teachers would often pull up a PhET simulation to explain a topic, or they would assign one like it were a physical lab activity. Despite them feeling quite dated, even when they were brand new, I always loved the PhET simulations because of how fun they were. PhET isn't the only collection of interactive simulations out there. When I first started expressing interest in a project like this, Professor Peleg showed me the Complexity Explorables website [0]. Complexity Explorables is just as awesome as PhET is, and although it's selection isn't quite as massive as PhET's, it's still incredibly big. Complexity Explorables is also much more similar to the creative coding that I was talking about in the very first section of this project proposal.

I feel like Complexity Explorables however falls a bit short of my own vision and expectation for ludic science because they are limited by just being explorables. They feature fun and expressive output, and interactive controls over the simulation, but no other output of scientific value to a researcher, such as data or graphs. PhET simulations often do have both expressive output and scientific output, but still does not fulfill my personal vision for ludic science. This is mainly because the simulations were designed from the very beginning to be tools for education, not tools for research. User experience goals that followed from that, such as a core interaction loop of running a single experiment and manually recording the data, and other attempts at real world experiment mimicry, are not conducive to the actual workflow of scientific computing. I believe that in-between Complexity Explorables and PhET, there's a need for an environment that gives both fun and expressive output as well as meaningful scientific output to researchers at the same time.

Execution

As mentioned earlier in this project proposal, I have already made significant progress on a ludic boids simulation, the big piece of code that will be at the heart of this project, as I intend to also use this code for this class's homework 3. The first important date in this project timeline is the due date on that homework, **April 2nd**, so at that point I will have completed everything relating to the scientific output. The expressive output will be there at that point, but won't be the most... expressive. The next important project timeline date is a week and a half later, **April 13th**, the day I will be giving my presentation. By then, the ludic boids simulation will be complete so I can exhibit it as part of my presentation. The other part of my presentation that day will be focused on drawing connections between biology and creative computation, like mentioned in the first section of this proposal. Then the final important date on the timeline is the due date for the final paper, **May 5th**. Between my presentation and the paper being due, my main focus will be on writing the paper, and probably two versions, a static pdf as well as an interactive web version of the paper. During this time I will also be reaching out to as many as I have close enough connection to (Mark Ablowitz, CU Boulder Dept. APPM; Justin Cole, UCCS Mathematics; David Schecter, NWRA; and you, Orit Peleg, CU Boulder Dept. CSCI), to get feedback on how actually useful my ludic simulations would be. I want things to be playful, but also really useful, and I will analyze how successful I was at this in the final paper.

Bibliography

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