

Robots with personalities
that create & react to light,
creating their reality

Recursive Robots

System This is a system in which 3 robots engage with each other and their environment by creating their environment and then reacting to it according to their idiosyncratic behaviors. Each robot has a unique personality and performs a certain behavior for the majority of the time. The system makes sense experientially as the viewer sees patterns emerging in the robots' behaviors and starts to understand their personalities.

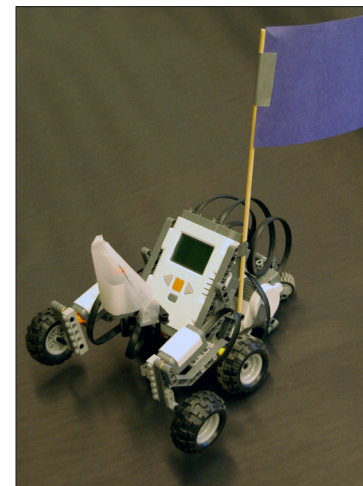
The physical environment the robots occupy is a dark room with a projector showing a large image on the ground. This image is 3 glowing spheres of different colors, which are affected by each color's corresponding robot. The connection between the robot and its sphere is denoted by each one's color (red, green, and blue). Each robot's physical behavior is defined by its personality.

This is an interesting system to watch because it is immediately apparent that each robot has a very specific behavior, but it won't be immediately apparent what those behaviors are or why they are there. However, the longer the viewer spends with the system, the more they get out of it. They will soon unravel the connections between the robots and what kinds of metaphors and comparisons to human behavior are contained within the system.

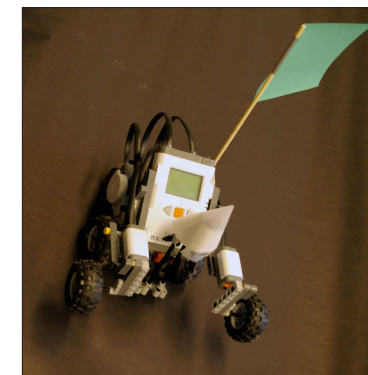
Results We started out with the idea that our robots would make music. We researched this, but due to our relative inexperience with processing digital sound, we decided it would be best to stay in the visual realm. However, we were able to take the feedback/creation system that we had originally envisioned for making music, and apply it through light sensors and a projector rather than microphones and speakers.

We had originally envisioned a more complex system which would have helped to define more character in the robots and their social interactions, but what we have now is what we were able to get done in the time we had.

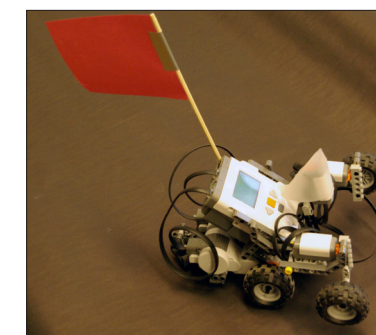
The most important thing we all took from the experience was learning how to work in a team with people from very different disciplines. It took a long time for us all to get on the same page about what we wanted to see from the project, but eventually we all saw it and are all satisfied with the results.



Blue: A graceful robot that travels in a loopy motion. It enjoys jasmine tea and art museums.



Green: An impulsive robot who jerks around in random speeds. It has a strong affinity for cliff jumping and waking up in strange places.



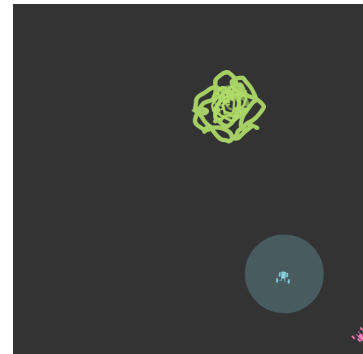
Red: A jittery robot who adheres to a strong zig-zag system. It has a strong affinity for massive quantities of caffeine.

Motivation As a technological experiment, this feedback loop between multiple robots and their environment creates a large number of possibilities with a minimal amount of outside input, and is a fertile ground for further experimentation. As a performative experiential art piece, the robots each display distinctly personified behaviors and our goal is that the viewers will project their own personalities onto the robots and enter a realm where they can experience a reflection of themselves.

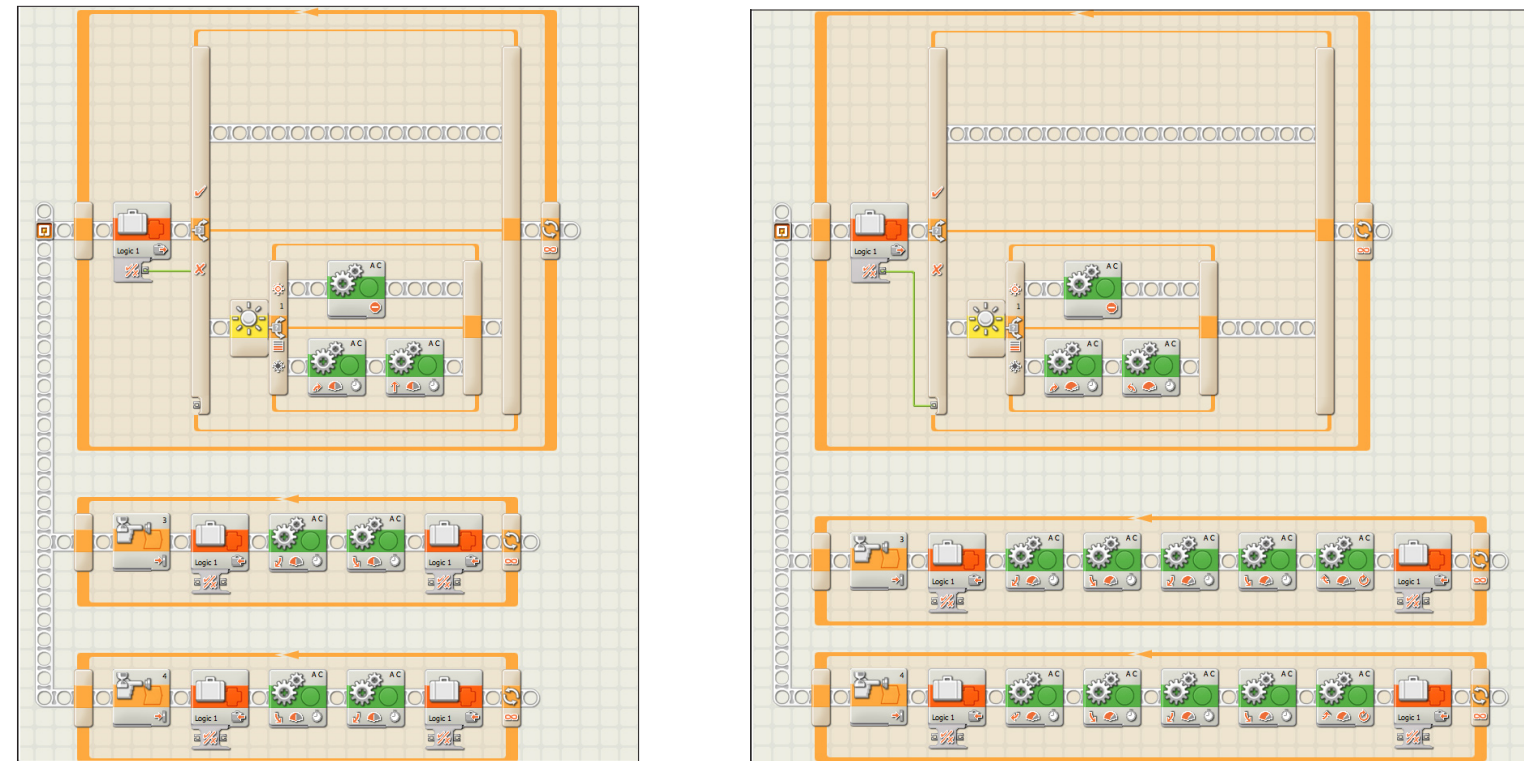
Team **Eric McCambridge** Computer Science & Engineering – Undergraduate
Cale Schupman Digital Arts and Experimental Media – Undergraduate
Mark Parkson Interaction Design – Graduate
Rachel Friend Interaction Design – Graduate

3 robots collaborate to make a feedback loop in which they create their environment by reacting to it, according to their idiosyncratic behaviors.

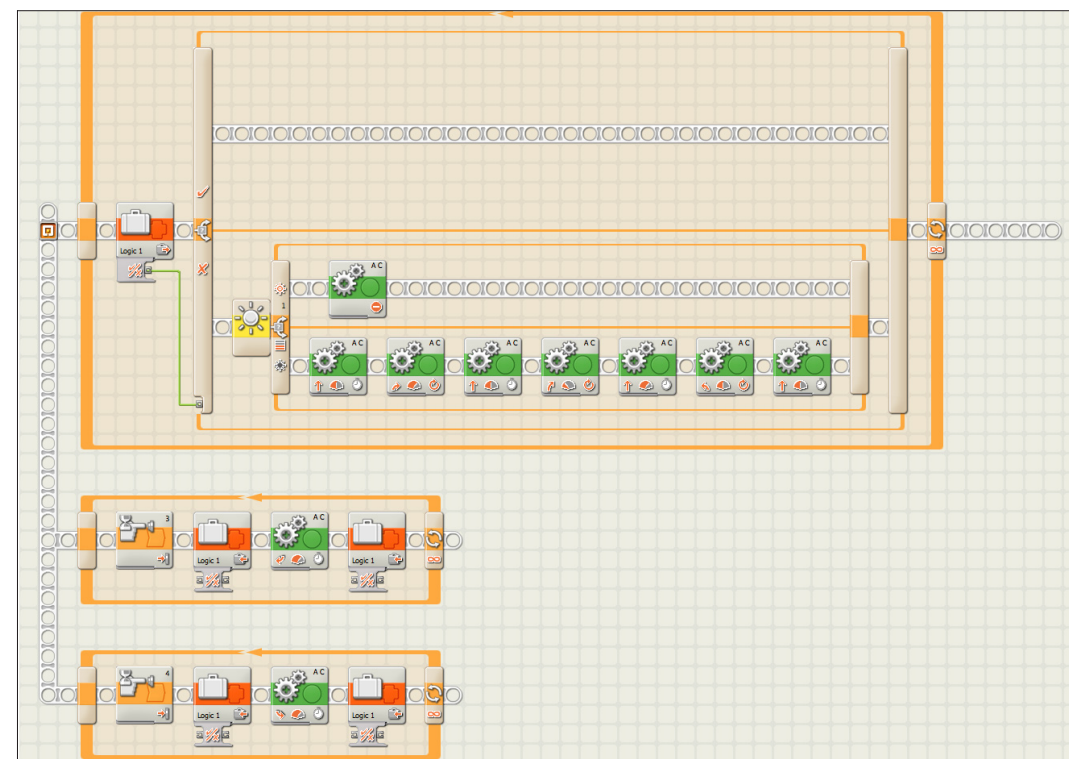
Environment Example



Mindstorms Program



Research Much of the research on the software side consisted of finding and learning pre-existing technologies to achieve the goals of the project. The two key technologies which came into play were the MindSqualls project, a C# library which facilitates communication between C# programs and the Macromedia Flash ActiveX component, which allows Windows programs to communicate with Flash movies, allowing our Flash movie to respond dynamically to the data from the robots.



Software Design The projected image is created by the computer in response to the input stimuli received from the robots by the host computer. With the built-in Bluetooth communication on the NXT, the robots actively send their current light sensor values to the computer. For this, we used the open source MindSqualls project by Niels K. Handest of www.mindsqualls.net. The program is built with Visual C# to allow the robots to communicate with an embedded Macromedia Flash movie that runs on the host computer, which generate the projected image. The system polls each robot several times per second to get the current values of the sensors and forwards this data to the flash movie to create blips, blooms, and bleeps to complement the actions of the robots.

