Outerspace

Reactive robotic creature

A project by Andre Stubbe and Markus Lerner

http://www.outerspace-robot.com

Overview

Outerspace is a reactive robotic creature. Its motivation is based on curiosity, the desire to explore the surrounding space looking for contact. Touch it, play with it and watch its behaviour.

Curiosity is desire. The desire to discover something. The movements of Outerspace are based on its curiosity in exploring the surrounding space. It looks for light, motion, finally contact. As he finds something interesting, this again increases its curiosity, to find out even more. The same thing happens in the mind of the observer, when he approaches the object.

The basic form is motivated by insect antennae that are able to make flexible movements in order to explore the environment. Outerspaces broad repertoire of motion actually originates from animals, both in the behaviour of single organs and body language. At the same time, human gestures are part of the motion patterns of Outerspace.

Formal reduction and visual abstraction invoke a wide scope of interpretations.

Key Topics and Lessons

“Outerspace”, the reactive robotic creature, can be used to educate visitors about several topics:

• Artificial Intelligence.
The project illustrates “artificial intelligence”. The Computer inside “Outerspace” acts as the brain of the robot consisting of an artificial mind structure that executes behaviours according to the judgement of the outer enviroment. After each action, Outerspace analyses its sensory inputs and responds to that again. This is also called an delegated behaviour system.

• Playful Interaction.
The robot reacts in a playful manner, when one interacts with it a gentle and careful way, providing immediate and spontaneous feedback. You see that your action generates feedback. Every action causes a counteraction. Íf Outerspace likes it, it’ll try to maintain the sensory dialogue.

• Haptic input.
The robot gets his major input signals from two capacitive sensors. These sensors are able to detect superficial contact with organic organisms like humans. If someone touches one of the black limbs, Outerspace senses it like a mouse click and evaluates what to do.

• Formal reduction and visual abstraction.
Outerspace is inspired by shapes like insect antennae but does not copy anything that exists in the real world directly. The visual appearance is reduced in order to express feedback just as the movement of a thin form. In this way its visual appereance supports the interpretative and imaginative thoughts of the observer.

• Physical Computing.
The robot Outerspace is a combination of mechanics, electronics and programming. The Computer inside Outerspace is the brain, the controlling entity. The electronics and sensors are used to interface the mechanical and sensoric input. Finally the mechanics enables the robot to move and express himself. In the end Outerspace shows only the physical analog outside and hides the digital computing inside completely.

Technical Information

• Hardware.
The body consists of three limbs, fibreglass pipes, connected by joints. Four servo motors control these limbs over wires and pulleys. There are three motors for the joint movements and one for the vertical rotation. The head, the uppermost limb, carries 5 photo sensors that are used as eyes for brightness and simple motion recognition. All limbs have capacitive sensors that react to human body contact.
A microcontroller is used for sensory input and control of the motors. The microcontroller is connected to a PC, where all calculations are made by special Java software.

• Software.
The software is specifically written in Java and does the main part of all calculations. The brightness sensors and capacitive touch sensors are read over the microcontrollers and evaluated by Java. A complex mind and behaviour system provides the manifold reactions. Inverse and forward kinematics are used to realize the movements. The calculated values are again sent to the servo motors through the microcontrollers.