WORKSHOP – ARDUINO ECOLOGIES

Brief:
On the first day of the workshop we built a ring of "agents" communicating with a single input light sensor, and single output LED. This was a primitive nervous system of neurons sending signals. An "ecology" of individual agents cells talking to their neighbours.

Now we will build three more ecologies. One for each research studio. Each individual student will develop their own agent that lives within an ecosystem of other agents. It might be stationary, or mobile. Each agent should have at least one input sensor and output actuator. Note that organisms often have multiples eyes or multiple other sensory organs so that they can compare signals spatially. The plant and animal kingdoms are full of inspiration and interesting forms of performance.

Though you will work independently you should work closely with your class mates to make sure your agents have means to communicate with some of their neighbours. The aim is to build a complex web of interacting elements exploring a range of input and output signals. Some of these inputs might detail other environmental information and people behaviours.

You agents should be presented as battery powered so that we can reconfigure their arrangements spatially and explore different emergent behaviours. The result should be a complex web of purposeful though unpredictable behaviour.

Schedule

- Monday Introduction to Arduino
- Tuesday Servo Control & Coding principles
- Wednesday Morning develop idea, Afternoon tutorials & project development
- Thursday build
- Friday complete and test in blackbox

Context

From wearable technologies, to the Internet of Things, from building managements systems to urban sensory networks, we are seeing the unprecedented saturation of the built environment with computation and embedded sensing. Billions of passive and active devices building dense, rich layers of real time sensor data where even our own clothes may monitor our bio-data to share with the 'cloud'. These vast datasets, latent with novel applications for consumers and industry alike beg the question – what does a world of hyper-connectivity and high definition sensing offer design? What hybrid ecologies form out of the interaction of natural and digital agency? And how in particular does the saturation of such technologies in the context of the home, augment daily routines, and mediate social interactions?

Key Fields of Reference - ECOLOGY

When Sir Arthur Tansley proposed the term Ecosystem (1935) to describe units of the environment in which a stable dynamic equilibrium exists between (biotic) organisms and their (abiotic) environment, he would not have imagined how such an idea of ecologic balance would capture societies imagination. Today the popular understanding of ecology is synonymous with conservation, environmental and sustainable design. While Ecology has much to offer in understanding and protecting our natural environment, to reduce Ecology to this function alone would be to deny us its many other insights. This year of research focuses on Ecology's driving principle of *Adaptation*. So powerful and central an idea of the past century, it transformed the study of natural and social sciences, guided the engineering principles of computing and continues today to offer us a mechanism to mediate between the natural, synthetic and digital. Tansley presented his holistic view of the ecosystem arguing that ecology fundamentally must be conceived as examining a whole system including not only the living organisms (biotic factors) but also the entirety of physical (abiotic factors) which form the habitat. Therefor to design ecologically requires an understanding of whole systems not of parts – of objects, inhabitants and environments all in complex and continual communication and interaction. To do this we will harness the science of control and communication systems, Cybernetics.

Key Fields of Reference - CYBERNETICS

Stafford Beer eloquently described Cybernetics as owing as much to biology as to physics, as much to the study of the brain as to the study of computers, and owing also a great deal to the formal languages of science for providing tools with which the behavior of all these systems can be objectively described. (1966) Its founder, Norbert Wiener had brought together a range of independent lines of scientific development through the principles of cybernetics which he formalized mathematically (1948) - which in turn allowed the synthesis of the ecological principles through mathematical descriptions of biogeochemical cycling, and energy flows. A cross-disciplinary language was formed enabling the science of ecology to share a common language with computational and design thinking. From it came the foundations of robotics, artificial intelligence, networked communication, and modern computing among its many innovations.

Key Fields of Reference – ADAPTIVE & EVOLUTIONARY ARCHITECTURE

Cybernetician Gordon Pask emphasizes in his foreword to Evolutionary Architecture (1995) that John Frazer's early work in harnessing evolutionary processes through computation, had the goal of not merely copying the work of nature in architectural form, but actually making it alive. Pask goes on to question the role of the architect suggesting he may not only design buildings or cities but also design new ways to catalyze them, to enable their potential to adapt. The Interactive Architecture Lab's agenda is firmly rooted in this ambition to make our built environment more responsive to human needs and catalytic to social interaction.