Networked Objects

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Introductions and General Themes

This class revolves around a few simple questions and thought experiments. What use is a network? How does a network change the meaning, scope, scale, impact, mobility and design of an embedded device? What new possibilities are provided by a world wide network? What new challenges? What freedoms, privileges, concerns, and contexts are opened up with mobility? Throughout the semester we'll break down a number of the possibilities afford us through networked interaction into a few categories.

Space Annotation

Complimenting the surrounding world with embedded technologies and networked communication. What does it mean to always be carrying a source of data? What can we add to the world around us?

Context Awareness

Devices designed for their surroundings, aware of other devices and needs. What needs, circumstances, assumptions, capabilities, and context to we need to take into consideration when designing context specific devices? How can a network help? How can the context help?

Remote Displays & Remote Controls

Push/Pull data and interaction; controlling the world from a network, and the network from the world. How do the materials we build a project with change when we can communicate around the world just as easily as across the table? How can we bridge distance and context? How can we control the world around us?

Location and Identification

Awareness of the physical, social, geographic, and biometric spaces in which we function. What can location do for us? Should my device know who I am? Where I am? What can a device tell me about the world around me that I don't already know?

Types of Embedded Processors

Building on Intro to Physical Computing, we'll be using a variety of components and processors in our work.

Microprocessors

PIC

All of the examples for the class will focus on using PIC processors to manage our other communications devices. Code examples will be in PicBasic and PicC, please use which ever language is more comfortable for you.

BX-24

A few examples will touch on code for the BX-24, but it will not be covered in all of the examples. You are welcome to use the BX, so long as you are able to keep up with the work we do on the PIC.

Network Co-Processor

There are innumerable networking devices out there for various communication protocols, and we'll touch on a few of them as we go through the semester. The majority of our work concerning wired and wireless networking (TCP/UDP) will be done with the following network co-processors from Lantronix. It is recommended that you purchase at least one of these:

Cobox

> A daughter board containing an ethernet controller, port, and serial connection. The Cobox can be a little bit easier that the XPort to work with, but either function well for an ethernet connection.

XPort

> The next generation of the Cobox, the XPort does everything the Cobox can, but is the size of a standard RJ-45 ethernet jack. Incredibly useful for custom circuit boards.

WiPort

> The 802.11b equivalent of the Cobox or XPort, the WiPort is not yet widely available, but is available for some student projects.

Mini-Computers

There are certain tasks that the PIC or BX won't handle well; audio, video, graphical interfaces, large quantities of data storage, etc. In some cases we need to move beyond the power of an microcontroller IC, but we don't want to jump to the size, cost and immobility of a desktop computer. Where a laptop or a desktop is overkill, but a micro-controller not enough, we have Single Board Computers and Small Form Factor Computers. These systems use regular computer processors (usually a generation or two old), and can run Linux, Windows, and BSD operating systems. These can be configured to use any number of media types, sometimes as little as a flash thumb drive, but provide significant processing power and networking capabilities for our purposes.

Mini - ITX

> A small form factor mother board developed by Via Technologies, the motherboard is only 170mm x 170mm. Typically very low power consumption, suitable for driving media applications.

Nano - ITX

> Similar to the Mini -ITX form factor, but with dimensions of 120mm x 120mm.

Single Board Computers

> Single Board Computers are just that; a CPU, IO, memory and any other necessary components to have a function computer all built into a single circuit board. Useful for embedded projects with tight space constraints.