FELINE FUN PARK: A DISTRIBUTED TANGIBLE INTERFACE FOR PETS AND OWNERS

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Abstract

Many pet owners spend long hours away from home, and are forced to leave their pets unattended and un-entertained during this time. To alleviate this, we have developed a distributed tangible interface that not only promotes pet activity, but that gives the owner the ability to monitor and further encourage cat activity while they are away from the home. Specifically, Feline Fun Park is a computerised 'cat condo' that: a) senses cat activity around and within it; b) automatically responds to these activities by triggering a variety of devices that encourage cat interaction with them; c) displays the cat's activity level to the pet's distant owner, and d) allows that owner, at his or her discretion, to activate the devices manually across the internet. The system offers a level of automatic interactive entertainment for a pet not possible with traditional toys, where it adapts to various levels of play to keep the cat interested, and where it encourages pet/owner interaction.

1. Introduction

The fields of pervasive and ubiquitous computing encompass not only work activities, but social and domestic environments as well. In these non-work environments, most efforts have gone towards promoting social interaction, awareness, and domestic coordination between families, intimates, and friends. However, many domestic environments include pets as well, and they too are considered by their owners to be important and influential members of their families. Consequently, we believe that pet / owner relationships should be considered as viable topics within pervasive and ubiquitous computing research. While this may appear to be somewhat frivolous (e.g., see [6]), neglecting such relationships would be a disservice as it would dismiss an important part of day to day domestic culture.

We are specifically interested in the problems of 'stay at home' pets with absent owners. With long work hours and an increase in working couples, pets are being left alone and un-entertained for an increasing number of hours per day. From a loving pet owner's point of view, this is a serious concern; the typical panacea is for owners to buy pet toys, or employ pet day-care services, or to come home in the middle of the work day to be with the pet for a short time. In rare cases, some owners have placed web cameras and activity-tracking technology to monitor their pets (e.g., [2,4])

Yet consider how technologies have augmented the social lives of family members as they disperse over the day. Stay-at-home people have a plethora of devices to keep them entertained, engaged, and in touch with others [7], e.g., cellphones, PDAs, television, internet communication, and video games. Our own parallel goal is to consider how pets can become part of this technological revolution, in particular, by creating tangible interfaces that encourage pet activity as well as engaging interaction with the pet's distant owner. While a few other projects have been created to link people and animals (e.g., an internet-based chicken petting device [5], these have been notable mostly for their novelty rather than for supporting a real domestic need).

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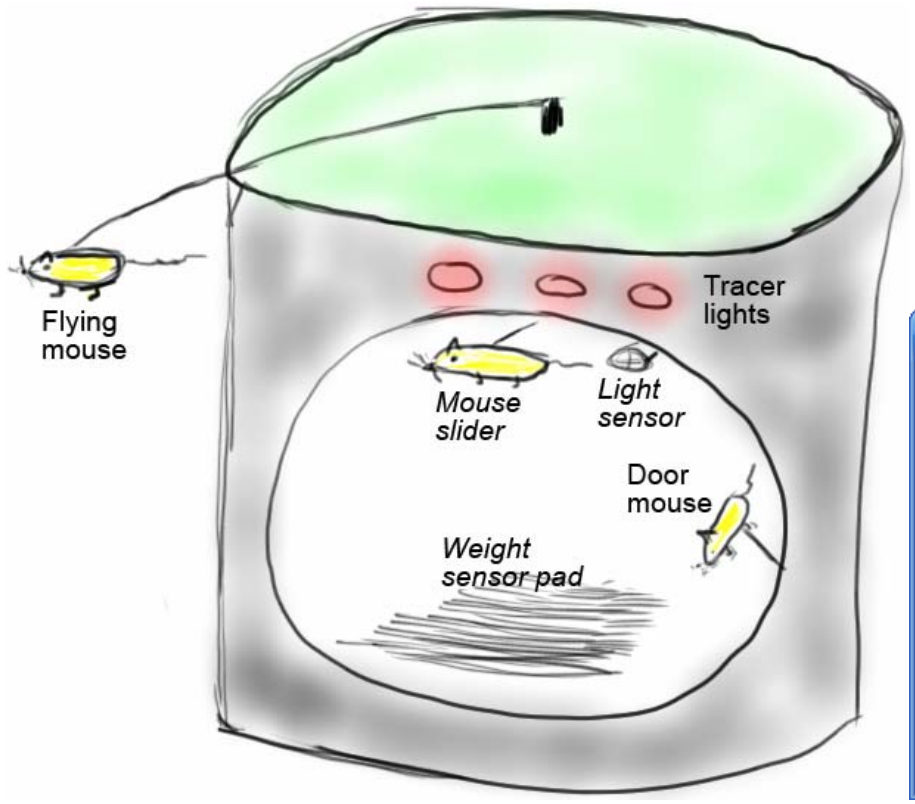

Figure 1. Feline Fun Park

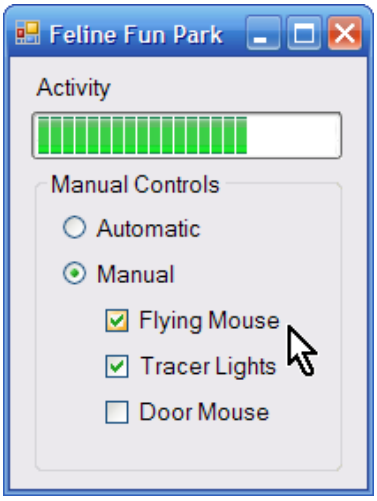

Figure 2. Monitor / Controller

Our idea was to modify a 'cat condo' – a carpeted barrel-shaped box that allows a cat to enter it through a round opening – into a distributed tangible interface that entices play and interaction. We call our proof of concept system the 'Feline Fun Park'. Its design was centered around Neko, the grey tabby cat seen in video, and Neko's interaction with her owner Jim.

As we will see, Feline Fun Park works by:
a) sensing cat activity around and within it;
b) automatically responding to these activities by triggering a variety of devices that encourage cat interaction with them;
c) displaying the cat's activity level to the pet's distant owner via the internet, and
d) allowing that owner, at his or her discretion, to activate the devices manually across the internet.

2. Description

Feline Fun Park is shown in action in the video. We will also use the accompanying sketch of the installation (*Figure 1*) and its graphical user interface (*Figure 2*) to highlight its features.

2.1. Kitty-Awareness Technology

The actual device (*Figure 1*) is a commercial carpet-covered cat condo that we instrumented with a variety of sensors, actuators, motors and lights controlled by Phidgets [3] and our special software.

Three input sensors, indicated in italics in *Figure 1*, are incorporated into Feline Fun Park. These detect various levels of cat engagement with the device. First, a light sensor is located just inside the entrance. It is used to detect the curious cat near the condo's entrance, or the playing cat as it enters and leaves. The nearby cat lessens the light intensity on the sensor. Second, a weight sensor

pad is placed in the body of the condo to determine if a cat is inside, i.e., if it is inside playing or resting. Finally, a toy 'mouse slider' is attached to a slider actuator at the entrance of the toy. As a playing cat is moving, batting or biting the mouse, the slider moves and is thus detected as an actuator change.

The combination of these inputs and how they change over time gives a reasonable approximation of kitty activity: approaching, entering, and actually playing with devices that comprise the Feline Fun Park. The inputs generate numeric values which are tracked for changes that represent the 'activity level' displayed to the pet's owner (discussed later): changing values increase the activity level where the higher the value, the more engaged the cat is with the Feline Fun Park. The activity level decreases as more time passes without changes to the sensors.

2.2. Kitty Outputs

Feline Fun Park has three outputs that entice the cat to play with it; these are indicated in plain text in Figure 1. Their form factor was carefully chosen to be of interest to a playful cat, and each represents different kinds of playing that a cat may like. First, because cats like to chase fast moving objects, we created a 'flying mouse' (*Figure 1*, top): a rubber mouse attached via a wire to a DC motor that can be spun under computer control. Second, because cats enjoy hiding and peek-a-boo type toys, we created the 'door mouse', a rubber mouse attached to a servo motor (also under computer control) that will rapidly peek out from inside the toy and then hide again. Finally, because cats enjoy lights (such as a flashlight or laser pointer), we created 'tracer lights'. These are a series of LED lights under computer control positioned above the entrance to the condo, and that flash in a pattern that emulates a moving light.

2.3. Automatic Mode

Feline Fun Park operates in two modes: automatic or manual. In automatic mode, the computer senses cat activity through the inputs and uses a set of rules to determine what combinations of outputs to activate. With low cat activity detected, the flying mouse is enabled as an attractor. As the cat approaches and peeks inside, the door mouse is enabled. With high activity, the tracer lights are turned on. During this time, the cat activity is transmitted to its distant owner over the internet, where it is displayed as an activity meter embedded in the GUI shown in *Figure 2*.

2.3. Manual Mode

At any time, the owner can switch into manual mode where he or she can directly control the kitty outputs. Through a checkbox interface (*Figure 2*), the owner can activate or deactivate the flying mouse, the tracer lights, or the door mouse. This interface can be used for collocated owners to play with their cat, or for distant owners to monitor and remotely control the Park. For example, while working during the day, the owner can gain an awareness of when the cat is playing and can partake in the fun.

3. Implementation

Feline Fun Park is built using Phidgets™ [3, also see www.phidgets.com], a hardware and software toolkit that allows for rapid prototyping of physical devices. Inputs are created using a pressure sensor, light sensor, and sliders attached to a Phidget Interface Kit. Outputs are created using a servo phidget, a DC motor connected to a relay phidget, and a series of LEDs connected to the digital outputs of an interface kit. All devices are connected together, and plug into the USB port of

the owner's computer. The electronics are embedded into a common carpet-covered cat toy. The wiring and components are installed with glue and staples, and hidden underneath the carpet. The cables leave the toy at the back through a plastic tube and enter a break-out box where they interface with the Phidget hardware boards, which are in turned plugged into the owner's PC. The result is a clean looking toy, with minimal risk of damage to the electronics by the playing cat. All outputs are low power, so there is also little risk of harming the cat as it plays with these electronic devices.

The Feline Fun Park Controller Interface software uses the Phidget API to gather and integrate sensor data and to control the outputs. All data is stored within a distributed data structure – a shared dictionary notification server [1] – in a way that implements a distributed model-view-controller pattern. This software is easily installed at various distributed sites, and reduces the complexity of monitoring and communicating with the Feline Fun Park.

3. Discussion

Neko the cat's actual experiences with the Feline Fun Park were very positive. Before the cat condo was recrafted as a tangible interface, Neko was not particularly engaged with it. Afterwards (and as seen in the video) Neko actively engaged the Feline Fun Park to the point where, after only a few days, our working prototype was destroyed. This is highly encouraging, because we can think of few other usability tests that resulted in such overuse that the interface eventually wore out.

While papers and videos on this topic are often tongue-in-cheek [5,6], our own research is serious, as it presents a viable option to pet owners who are concerned about leaving their pets unattended and un-entertained for long hours at a time. Devices like these not only automatically entertain the pet, but offer a way for internet-connected owners to monitor their pet and remotely play with them.

Of course, this class of devices can be improved by increasing their entertainment value as well as the amount and quality of pet/owner communication they offer. In this case, the toys can be made even more engaging for cats by devising more involved and intelligent activity and playing schemes, possibly including treats or feeding mechanisms. For the owner, more detailed activity information or a camera showing cat activity and two-way sound could be added for further remote interaction possibilities. It would also be interesting to consider how a pet interacts and behaves towards a more 'intelligent' toy over time, particularly if it dispenses food.

7. References

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