Assisting minor everyday pet chores

- Remote controlled cat feeding device

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ABSTRACT

This process explores the possibility of physical connectedness while asks the question: How can we control distant objects? The simple cat-feeding device that we built offers a basic platform using an Arduino board, two servos and sensors that are controlled by a mobile device over a wireless network. A nonverbal communication between the pet and the pet owner is manifested by animated icons on the mobile device and as sounds from both the mobile device and the prototype. The device generates a prerecorded sound loop each time the user shake the device. At the same time, the food package placed on the prototype get shocked and generates a natural sound by the content inside. The prototype shows that we can provide a quick solution for a simple problem in people's daily life.

KEYWORDS

Interaction Design, Prototypes, Interface, Control distant objects.

1. INTRODUCTION

This paper explains a workshop called Mobile Hacking, which was a one-week school course at Umeå Institute of Design. The three classmates Erik Rydell, Yangchen Zhang and Maria Niva were given the brief in which we were asked to: "[…] explore telepresent, nonverbal, communication between a mobile device and a household applicaces. You should imagine that you are away from home and want to communicate with a pet left in the house." Our tutors were Matt Cottam and Brian Hinch [1].

2. DESIGN PROCESS

Brian demonstrated an example of how a mobile hacking concept could work, he also introduced us to the sketchserver software called NADA Mobile [2] that allow users to prototype "sketches" and transfer data from iPad to Flash and Arduino [3]. We sketched a blueprint of how we had to connect the prototype to make it work. In order to manage the given time in a sufficient way, we decided to split up the work with the software and the hardware.

2.1 Research

By remembering previous experiences as a cat owner and some discussions together with other pet owners, we started to think how we could bring some extra value to pet owners who wants to communicate with their pets when they are not at home. Nowadays, people spend a lot of time outside, i.e. at work or just outdoors, their everyday tasks tend to get unprioritized or forgotten. Therefore, we wanted to create a concept that can facilitate for the pet owner to keep track of the food and give the user an opportunity to refill the bowl with food from distance.

2.2 Ideation

Pet feeding robots are not new, they do exist both as mobile versions like what we think looks like a single prototype called Dog feeding robot on wheels [4] and stationary robots like RobotShop [5] which, unlike the dog feeding robot are commercial products. However, what we felt was missing in the two examples mentioned above was a concept that sends information to both the pet owner and the animal. For example, the shaking gesture could be a fun way for cat owners to bring the cat's attention even though it can be done over distance. We also got inspired to use the cat food package because the proportions of it suited the size of the iPad.

2.3 Hardware and software development

It took us about four days to get the code part to work and to connect all the gears with the Arduino board. We found an ActionScript class that worked good to use for the cat food pieces in our graphical user interface and it took a while before we got the code to work with Processing via the SketchServer software. We spent one day making the bottom part and the cage for the food package and assembling the two servos. One of the trickiest parts of the programming was to control the center of gravity of the prototype. The center of the gravity changes when the user tilts the iPad that results with a quite erratic and delayed behavior that we couldn't change.

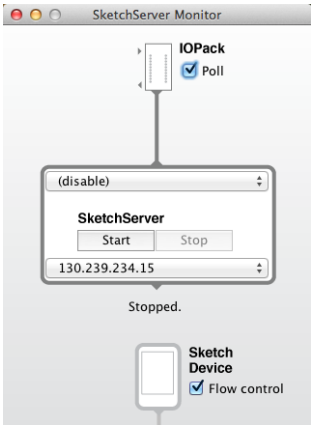

Figure 1. The image shows the interface of the Sketchsever for receiving signals from mobile device and send to IOPack in a serial communication.

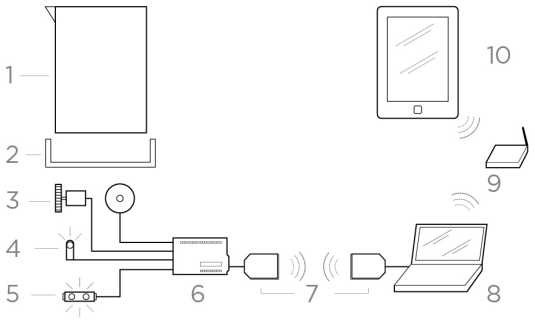

Figure 2. The image shows the interface of the Sketchsever for receiving signals from mobile device and send to IOPack in a serial communication.

2.4 Graphical User interface

We used sound as a tool to communicate nonverbally as a method for pet owners to communicate with their pets when they are away from home. The sound will hopefully get the cat's attention, and it also works as a parameter for the user to understand that the servos actually shakes the food package but in another environment. What we didn't had in our prototype was a weight sensor that could adjust the feedback- sound from the iPad according to the amount of cat food left in the cat food package. At the top of the interface, a cat and a bowl showed whether the cat was close to the prototype or not and how much cat food that remained. A distance sensor and a light sensor controlled these two parameters. We downloaded an appropriate ActionScript class and replaced the original objects with our cat food pieces. The cat food pieces on the interface are coded to react on the centre of gravity. Therefore they behave kind of like the content of a regular cat food package when the user tilts the iPad.

Figure 3. An illustration of the how the Graphical User Interface could look like on the iPad after some revision.

4. RESULTS

The final prototype enables the user to monitor, via the graphical user interface, if the cat food is about to run out in the bowl and/ or if the pet is about to approach the bowl. More technically, the user's gestures are detected by the inbuilt accelerometer in the iPad that sends the signals to the laptop via a wifi or a 3G network. (We used a wifi network to make it work, we didn't try a 3G network in this course but we got taught that it works too.) An Arduino sketch that runs on the computer is then receiving the values from the and forwards it via the XBee radios to the Arduino board, the Arduino board which in turn sends the data to the two servos which rotates horizontally and vertically relative to the user's gestures. The both XBees can operate in a data-transmitting mode for a serial communication within a limited distance from each other. Data that is being collected from the sensors by the cat's interaction with the device is sent back in an opposite route that enables the cat owner to monitor how much food remains on the device. The iPad will trigger an audio loop of a shaking cat food package when the user is shaking the iPad sideways, a sound from the physical food package will of course be triggered in order to get the cat's attention and approach the bowl. The audio is a very important feedback for the user to get in order to know that it works due to the distance between the user and the prototype. The sound feedback together with the graphical user interface on the device makes the concept more in line with the nonverbal communication, as we wanted to achieve.

Figure 4. Image from the presentation of our concept on the project's fifth and last day.

Figure 5. A photo taken from user testing with a cat.

5. DISCUSSION

The most difficult part of this project was how to simulate the feeling of tilting the physical cat food package. There is a gap between tangible object and digital device, i.e. a center of gravity. Therefore, the center is changing when the user tilts the cat food package. We designed a realistic interface to simulate the physical falling of cat food pieces in the package when user tilting or shaking the iPad. Furthermore, we added sound to the iPad when the user shook it in order to make it sound like a real food package and reach closer to the nonverbal communication feeling. Since it was a one-week workshop, refining code could be done in the future to improve the movement of the hardware making it run more smoothly. We also intend to minimize the time that takes from that the user makes a gesture with the iPad until the hardware reacts with a movement. Moreover, this prototype is just an example of how to control distant objects.

Figure 6. Writing notes from the accelerometer at different titling angles.

6. CONCLUSION

In this paper we explored a nonverbal communication tool, using gestures and sound. The challenges we faced during the concept development were how to frame the limits of how much the mobile device could be tilted and how that angel would correspond to the angel of the prototype.

7. ACKNOWLEDGMENTS

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