SNIF: Social Networking In Fur

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1. ABSTRACT

We present SNIF: Social Networking in Fur, a system that allows pet owners to interact through their pets' social networks. SNIF comprises inexpensive hardware that can be unobtrusively and transparently affixed to pet collars and paraphernalia in order to augment pet-to-pet, pet-to-owner, and owner-to-owner interactions. SNIF devices aggregate pertinent environmental, social, and individual information that can be broadcast or addressed to other participating community members.

1.1. Author Keywords

Animal Societies, Petworking, Social Networking, Human-Machine interfaces, Human-Pet interfaces, Online/Offline communities, Wearable Computing.

1.2. ACM Classification Keywords

H5.m: Information interfaces and presentation. H.5.3: Asynchronous interaction

2. INTRODUCTION

Pets function as natural social devices. Walking a dog in the park can lead to conversations that one might not otherwise have. In this way, pets function as active icebreakers that will go up to anyone without any notion of social inhibition. Additionally, pet owners love buying products for their pets: sweaters, leashes, collars, toys, dishes, and a bed. By combining these two aspects of pets and pet ownership with digital techniques, the opportunity exists to enhance the pet owning experience to the benefit of both owners and their pets.

3. BACKGROUND REVIEW

In the United States, pets outnumber people. There are more than 65 million owned dogs in the United States, with nearly 40% of US households owning at least one dog. Nationally, pet owners spend upwards of 32 billion dollars on their animals annually. Approximately seven billion dollars of this goes to purchasing supplies and medication, which includes pet toys.

CHI 2005, April 2–7, 2005, Portland, Oregon, USA.

3.1. Petworking: Networking through dogs

Not content with being man's best friend, dogs also serve as a very strong social catalyzer: people walking their dogs can meet other dog owners, and talking about each others' pets is a convenient ice-breaker. Eagle and Pentland aim to stimulate social interaction by networking through common interests [1]. However, there has been surprisingly very little literature about "petworking", i.e. networking through pets. Several stories report that some dog owners were able to further their career, or create close friendship with other dog owners they met while walking their pet.

These social networks between people are more likely to be established if their dogs are getting along well. This article is largely dedicated to the introduction of devices that help monitor and nurture this kind of bond between dogs, strengthen human-animal relationship, and indirectly help to develop new relations between people.

3.2. Sensing dogs' behavior

Sensors have been placed on animals (primates, whales, penguins...) to observe physiological processes (respiration, blood pressure, thermoregulation...), and motion (migration flux...). We estimate there would be a strong interest for devising a set of sensors that can be carried by animals or insects for military applications. We are interested in finding ways to monitor dogs' behavior and report high-level information on their relationships with other dogs to their respective owners.

Though the field of Wearable Computing has been extensively studied, attaching sensing/processing entities onto a dog is a largely unexplored territory. In [2], authors attached a wireless color video, an audio speaker and a PDA to dogs. Commands to the dog are given through radio from a distance. There is no clear interface between the dog and the owner. In addition, sensing capabilities are dedicated to sense the environment and not the dog's behavior.

Predicting dog's behavior is very subtle: how the tail, ears and lips move, how the weight is balanced on his legs are among many signals that must be interpreted by the dog owner. Sensing these subtle changes would imply fixing cumbersome devices onto the dog's body parts, which is highly undesirable.

Barking is a powerful cue that could give some precious indications about the dog's disposition. In recent years, a few studies on barking, some serious ([3,4]), other less ([5]) have shown that it may be possible to recognize dogs and interpret their "mood" through their barking. But in the case of interaction between several dogs simultaneously, it can be difficult to answer questions such as "Who was that dogbarking at?" between pairs of dogs, based solely on barking.

4. SYSTEM DESCRIPTION

SNIF presents a hardware/software architecture that aims to capture pet social networks and other pet-related information as pets and their owners explore their communities. SNIF employs a multimodal interaction design to improve the pet-owning experience. An ambient display is used to provide information about activity in a pet's network. A web-based, online community provides access to more static information that pertains to pets and owners. During expeditions into public spaces, a collar and leash based system allows for real-time input and output.

The SNIF starter kit includes a collar, a leash, and a wall-mounted leash docking station (Figure 1) as well as membership in the online community. SNIF collars function as both input and output devices; they contain an LED display, IR and RF transceivers, and various sensors for recording signals such as movement, temperature, and humidity. They function as output devices that display the pet's personalized identity marks, which we call "collar tones", when the pet comes into immediate proximity to another pet. They also serve as input devices that sense activity levels, microclimate conditions, and other pets' presence.

The SNIF leash contains a two-way RF device, such as the Ambient Devices platform [6], an LED display, and two buttons for input from the owner for manual feedback on dog's interactions. The leash serves multiple purposes in the SNIF system: when attached to a pet's collar, it can continuously upload information from the collar to the SNIF servers. In this mode, the pet owner can also annotate her pet's interactions with other pets by pressing on the positive or negative buttons. When plugged into its wall mount, the leash functions as an ambient device that displays real-time information streamed from the SNIF servers in the form of "collar tones", which give information about the status of the pet's social network.

The wall-mounted leash holder not only supports the leash in its ambient display mode but also affords its own ambient display. Whereas the leash displays the collar tones of specific pet peers, the leash holder provides a space for more general pet-related information that is tailored to the receiving pet. This may include information on the pet-walking activity level and weather information in the neighborhood.

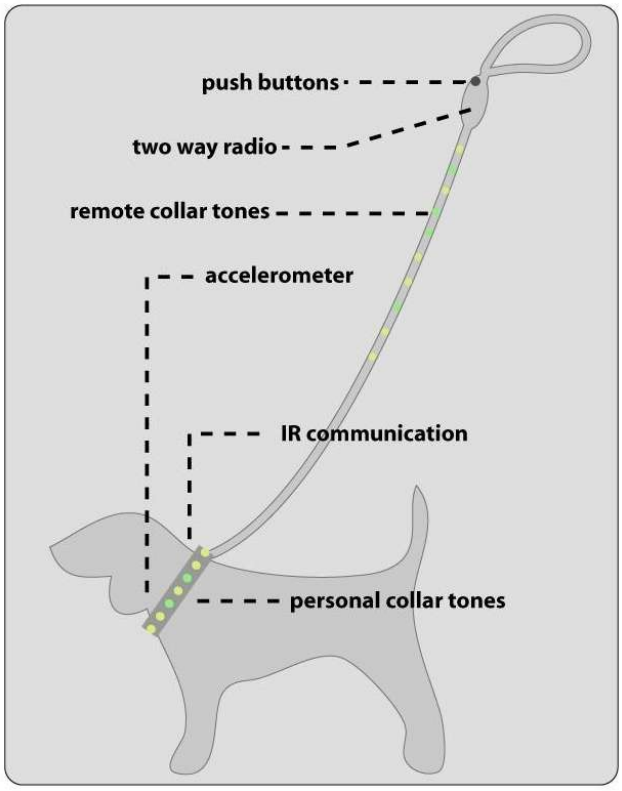

Figure 1 Components of the SNIF System

Collar tones enable pet owners to distinguish their pets as well as recognize other pets. In its simplest form, a collar tone consists of a custom sequence of LED pulses. SNIF uses collar tones in three different ways. First, the pet's collar emits a collar tone to identify it when in the immediate proximity of other pets. Second, when a pet owner is walking her pet, the leash plays other pets' collar tones in conjunction with a previously entered compatibility bit when the pets are detected in the vicinity. Third, a leash docked in its wall-mounted station displays the collar tones of the pet's closest peers that are going out for a walk.

When pets that are strongly tied to the pet's network embark upon a walk into a public space, the leash plays their specific collar tones.

The devices were conceived such that using them would be as transparent as possible. When hanging on the wall, the SNIF leash recharges its internal battery. The leash, in turn, can power the collar when attached during a walk. It was vital to the design of the system that the collar and leash perform their basic purposes when their augmented functions are not available. Therefore, the connector that joins the leash to the collar provides a digital connection as well as a physical one. The LEDs on the leash are barely noticeable when not illuminated and can be worked into the existing aesthetic of the leash design.

5. PROTOTYPES

We built a SNIF prototype system using stuffed animals, leashes, collars and modified versions of s wearable social networking device called the UbER-Badge [7].

These prototypes implemented the IR sensing, RF transmission and ambient display of collar tones, and they helped demonstrate the feasibility of the SNIF interaction paradigm (Figure 3).

6. SCENARIO

"Lola takes her dog Fifi for a walk. Before leaving the house, Lola puts her new SNIF collar around Fifi's neck and attaches her new leash to it. On their way to the park, Lola can see a dog and his owner coming towards them. LEDs on Fifi's collar start flashing, showing that a secured ID transfer occurs between the two collars. While approaching, the other dog sees Fifi and starts barking suddenly. Lola has to pull on Fifi's leash to avoid the fight, and walks past the other dog. She pushes the button 'Incompatible' on the leash and keeps walking.

At the park, Lola greets the other dog owners and releases Fifi's leash. Fifi goes to play with the other dogs, her collar recording the IDs of dogs she spends the most time with along with some additional information such as activity levels during the encounters. While Fifi is enjoying her time, Lola chats with other dog owners.

After an hour, Lola calls Fifi. She attaches the leash again, which starts the transfer of information collected from the collar to the leash and updates the external SNIF server. On the way home, Lola notices that the leash starts blinking red, indicating that the local RF transceiver has identified the presence of a nearby dog, with whom Fifi is not comfortable. She anticipates the encounter and crosses the road to avoid a confrontation.

Back at home, Lola checks on the SNIF website and learns about her dogs' new friends through the profiles left by their respective owners. Later in the day, she notices that one of Fifi's friend, Sugar, has just left for her typical walk to the park. Lola met Sugar's owner a couple of times, a woman who teaches French cooking, and Lola has always wanted to learn how to make a good terrine. 'Time for a walk', she said to herself, smiling as she grabs the leash and calls Fifi."

The main steps are summarized in Figure 2.

7. ONLINE COMMUNITY

SNIF's power emerges when linked to an online community; simple data delivered via light signals becomes a detailed social network when brought online. By taking the data received on the pet collars and linking it into a database of other SNIF users, a naturally occurring social network unfolds. Unlike typical social networking sites [8] [9] where users must confirm they have met, SNIF automatically verifies whether they have actually met, the status of their relationship and how often they see each other.

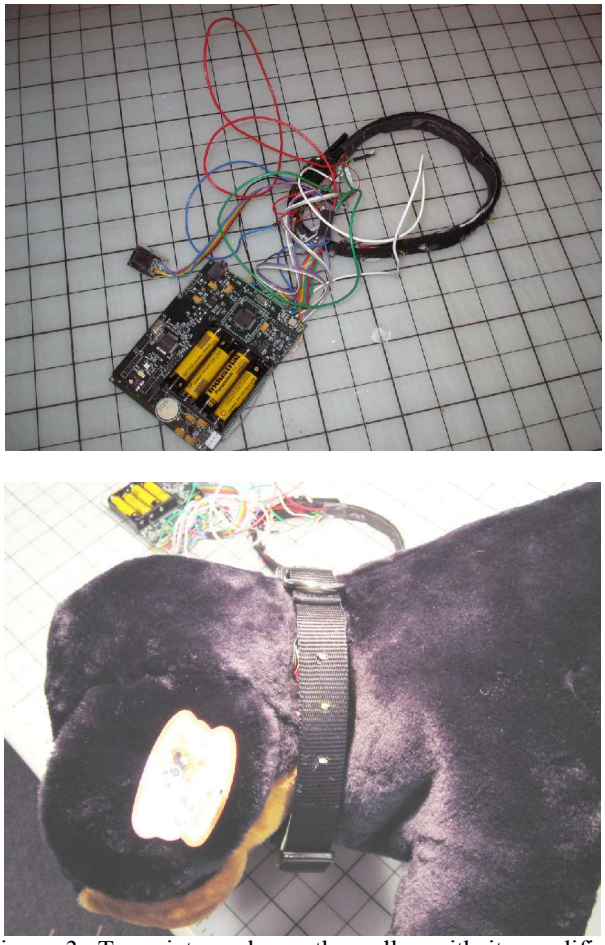

Figure 3: Top picture shows the collar with its modified UbER-Badge. Lower picture show how the collar fits on the stuffed dog.

In many respects, the coupling of pet to pet owner makes SNIF social networks a strong indicator of human relationships. Such is the case when two people frequently walk their dogs together. Not only does this fact say something about the dogs, but also it often implies that a relationship exists between the two people walking the dogs. As pets that use SNIF broaden their social networks so might the pet owners who are holding the leashes. Allowing SNIF to influence one's schedule lets the pet owner maximize the gain from the socially uninhibited pet. Although a person may choose not to cede a large amount of control, pet owners can potentially benefit from the SNIF online pet community, which is constructed by pet activity but correlated to their own social networks.

In encouraging interactions between pet owners whose pets tend to interact, SNIF works from the assumption that a relationship between pets implies a similar relationship between pet owners. However, this may prove not to be the case in certain instances. The scenario where two pets routinely play together while their owners watch without interacting illustrates this point. The online component of

SNIF allows pet owners to customize and override the collar tones and other ambient information that they receive from the system. This allows pet owners to direct the social networking efforts of their pets.

8. PRIVACY ISSUES

Where the system would need careful design is in how much information the owner of the pet would expose to other SNIF members. Since there is no way to automatically tell whether or not a pet's relationship with another pet means a similar compatibility between owners, there could be problems in sharing sensitive information without member explicit member authorization. Privacy would be a central issue in the system's design, and pet connections will likely have to be carefully screened by the owners of the pets. Allowing other SNIF members to see when and where one is walking one's dog would need to be treated with the utmost concern for safety and privacy that such information deserves.

9. FUTURE WORK

The SNIF original proof of concept illustrates how the system would work in a toy environment. Further development must take place in both the social and technical design of the system. We aim to refine the SNIF hardware and create systems that we can unobtrusively test on actual pets and pet owners.

Placing sensors on animals allows us to know more about connections between animals and their relations with their environment. By integrating sensors such as temperature and humidity sensors into the dog's collar and combining it with a positioning system, dogs would be able to collect environment information and act as mobile weather stations.

Explorations of the various types of ambient displays that could be fitted to the leash wall-mount stations could benefit the pet owner's experience using the system.

Collar tones, which currently only consist of specific time sequences of LEDs need to be expanded upon for a pet owner to be able to reliably differentiate between many pets.

We would also be interested in studying how pet toys that are instrumented with sensors can help supplement the information collected from pet interactions. Pet toys with sensors and output devices could also serve as additional mechanisms to help stimulate interaction between SNIF pets.

10. CONCLUSION

This paper introduced SNIF, a social networking architecture for pets, and dogs in particular. We showed how communication between animals, owners and animals and finally owners and owners, can be enhanced through unobtrusive, easy-to-use equipment.

11. ACKNOWLEDGMENTS

We want to thank Prof. Hiroshi Ishii for offering his insights and advices on the project, as well as Research Assistants Amanda Parkes, Hayes Raffle and Kimiko Ryokai for their suggestions.

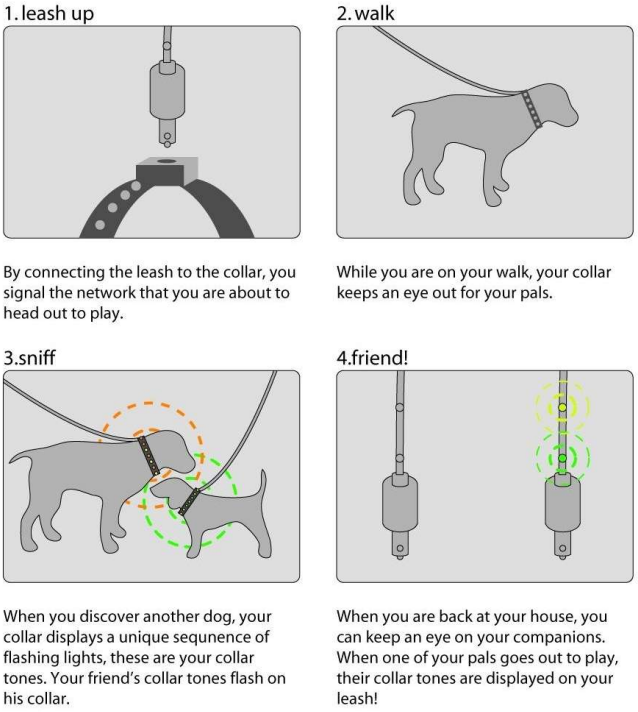

Figure 2 SNIF - How it works

We want to express our sincere thanks to Matt Laibowitz, whose UbER-Badges have been used as the hardware architecture for the SNIF prototypes.

We are indebted to Bruce Blumberg, who kindly answered our questions on dogs' behavior.

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