

An Investigation of Remote Pet-owner Interaction System: From the pet-sitters' perspective

Jiajing Sun

The University of Queensland
St. Lucia, Brisbane
Australia

Jiajing.sun@uq.connect.edu.au

ABSTRACT

The common pet-care solution for busy or traveling pet owners is to send them to a fostering organization or home. The existing research evidence showing pet owner's potential requirements on having remote communication or interactions with their fostered pets. ACI research groups over the world have also proposed numbers of technical solutions for developing such a system. While there are many relevant papers in this domain and many design considerations have been discussed, there is little evidence showing the role of pet sitters have been taken into the design consideration for the systems. This paper aims to investigate on pet sitters motivations, concerns, and preference over the existing technical solution types. By far the solutions can be categorized into three groups, which are video communication system, GPS service, and lifelogging. To investigate this, we will conduct an online survey supplemented with interviews in the target audience group. The results show that most of the pet sitters willing to support and participate in the remote communication and they would value more of the actual interaction with the pets. Given the background research that we have conducted before the investigation, this is the first time that pet sitter's ideas over the pet-owner remote interaction system are investigated. The insight gained from the study will be used the future design of a remote interactions system.

CCS CONCEPTS

• **Animal Computer Interaction** → **Remote Interaction**
Privacy, ethical, and motivation issues.

KEYWORDS

ACI, Remote Interaction, IoT.

1 INTRODUCTION

With the continuous growth of human-computer-interaction (HCI) study, there is increasing evidence showing that researchers have expanded their investigation area into a broader domain which is the Animal-Computer Interaction

(ACI). Since animals have been an inseparable part of our life, there are a considerable number of products and analysis that are designed for domestic pets and their owners. [11] [12] The research conducted by Neustaeder et al. shows that over 75% of pet owners have the experience of leaving home for long distance trips several times a year. Amongst the participants, most of the owners expressed their interests in technologies that could allow them to gain the knowledge of their pets' activity remotely. [3] There is strong evidence showing that many ACI researchers and designers have had conducted projects and studies around how to design, implement and test such a system. [4][5][6]. These studies mainly used three types of technologies, which are lifelogging, location-based service, and live video. Topics around safety, information accessibility, usability and communication requirements of pet owners are discussed in the above research [5][6]. For this research paper, we investigated one of the circumstances of remote communication of pets and their owners, which is pets in foster homes. This has already become a popular solution in Australia. There is a rising number of organizations and communities that dedicate in provide C2C pet fostering service, such as the PetCloud [7]. Given the research domain of this paper, we have identified a group of people who will also play an important role in the remote communication system mentioned above. These people are the pet fosters or we say pet carers to whom the owners entrust their pets when they cannot take care of the pets by themselves. In this case, pet owners will need their support and consent before they could set up the remote communication with the pets. However, pet carers' privacy issues, motivations, and experience are yet to be defined in studies mentioned above. Therefore, in these research paper, we will investigate this matter by involving real pet carers.

2 Backgrounds

The focus of this paper surrounds the study of pet carers' role in the remote communication system between pets and their owners. The pet carers defined in this paper are people who take care of animals when their owners are away.

These people are temporarily in charge of the pets' living and activities. Therefore, for the types of remote communication systems such as video, GPS service, and lifelogging cameras, they will undertake a supporting role or even become the initiators of communication.

In 2013, Neustaeder et al. launched a research about owners' requirements in having a technology solution to support their remote interactions with their pet. In that study, pet owners are the primary source of data collection. Their research provides substantial evidence in the potential market need of developing a human-animal remote interactive system. They described the system as a video-mediated communication system (VMC) which includes the capability of exploring interactive opportunities for its users. For traveling pet owners, the research shows that there are over 91% of respondents wanted details of their pets and about one-third of pet owners interest in remotely seeing or talking to their pets while only a small amount of respondents expressed their wishes to play or touch their pet in a distance. Neustaeder et al. also pointed out a disembodiment issue that most VMC systems encountered. The disembodiment issue means the confusion a VMC system might cause to an animal when it could not understand the source of sound and image. The sound and image distortion might make it impossible for a pet to recognize its owner and therefore diminished the usefulness of the system. Other ethical issues of developing an ACI system have also been discussed in the paper.[3] The discussion focused on the safety and privacy of pets while the role of the pet carers is not mentioned.

Apart from Neustaeder's theoretical research on the potential need for the remote communication systems, there is also some design and implementation programs that have investigated the technical feasibility and usability for such systems. Cat@log is a lifelogging system designed by Yonazawa et al. in 2009. It uses a combination of camera, sensors (such as accelerometers, and GPS), and a network-enabled computer to support communications between cats and humans. The device is designed to be front-facing and attached to the collar of a pet cat. Data such as video images, sound, motions, and locations are captured, recorded and posted to social media after processing by the device. The data collected including the daily activities of the pets and humans and other animals encounter and present to people in the way of pet diaries or blogs. There were no discussions around how would owners or carers control the logging procedure and the privacy concerns of the people who have their images recorded in the device. In addition to Yonazawa's cat log project, Neustaeder and Golbeck also researched in 2012 to investigate a distance video system for dogs and their owners. [8] Apart from a Skype audio-video system, the project also introduced a remote interaction console, including a sound panel, laser

pointer, and a virtual animated object. The objective of the project was mainly focused on how will dog respond to the interactions that are embedded in a single display. The project proved that most of the pets could engage in the computer-mediated interactions while it is harder to attract their attention when owner control the system remotely.

Other projects: There is another Ubicomp project that launched by Macini et al., in 2014, that responded to the human-pet interaction request for fostered dogs. [6] There are also numbers of projects that have proposed ethical frameworks for conducting ACI researches and evaluation frameworks of ACI designs.

Given the gap found in the background research for this paper, the roles of pet carers and their interaction requirements and concerns are not fully identified in any of the previous studies. Since the most of the technologies used in above projects are audio-video system and wearables that have location-based service, therefore, the privacy issues can be drawn from the concerns of similar devices.

Under this circumstances, the primary purpose of this paper is to research and discuss privacy concerns of the pet carers for participating or facilitating the remote interaction of pets and their owners. Early in 1993, Mark Weiser had listed privacy as one of the issues of Ubiquitous computing. From then, methods for protecting users' privacy have been brought up and tested for various techniques and applications. For example, for surveillance cameras, privacy protection can be achieved by blurring video and extracting the region of interest (ROI) by computer vision.[1]. For GPS, public or private location data can be distinguished and treated differently to provide better security for users.[12]

3 Methods

This paper aims to identify pet carers motivations and concerns over helping pet owners' request to use technology to interact with their pets remotely. For the first stage of the investigation, case studies of existing remote pet-owner interaction projects were used to understand current techniques and research domain for the ACI system.

For the second part of the investigation, a survey was designed and piloted tested. The study was initially designed to identify most popular concerns and motivations of the target group. Questions, such as 'How likely would you agree to help a remote interaction between pets and their owners?', and 'what is your major concern for such activity,' were asked.

Pilot test of the survey

The questionnaire was the first pilot tested before published to online. Two pilot tests ran involving the researcher and participants from the target user group. The pilot tests identified the design problem of the survey. First,

questions such as ‘what are your motivations?’ was too broad, options can be further compared with the degree of their importance. Following this, examples that explain the technologies should be presented to help the participant to understand the nature of the mentioned subject. Finally, questions of the motivations and concerns should be separated with the queries for respondents’ preference for different types of technology. After the pilot tests, alterations are made as follows:

To receive more accurate feedback, a Likert scale was used to prompt respondents to rate their preference on a scale of 1 to 5. To gain further insights into the system design, the questionnaire consists of two parts. The first part aims to identify users concerns and motivations while the second part intends to examine the user preference of the three type of animal interaction system (video chat, location-based service, and life-logging).

Shown in Figure 1 is the finalized survey questions:

Pet sitter's concerns of a remote interactive system for pets and their owners.

Thank you for taking this survey. I am a student from the University of Queensland. I am currently researching the potential possibility to enable a remote interactive system to help owners to have interaction with their pet and their pet's life. This survey is for your feedback. It is a 10-minute survey. Your responses will be kept confidential and will not be shared with anyone. Your email address in the survey is for that we could contact you if you wish we could help you.

Section 1

What is your age? *

- ☐ Lower 18 years old
- ☐ 18-24 years old
- ☐ 25-34 years old
- ☐ 35-44 years old
- ☐ 45-54 years old
- ☐ 55-64 years old
- ☐ 65-74 years old
- ☐ Above 75

Have you ever considered to become a pet sitter? *

- ☐ Yes
- ☐ No

Have you ever been a pet sitter? *

- ☐ Yes
- ☐ No

Consider that if you are helping someone take care of their pets, the owner wish to see or interact with their pet using a electronic communication system with your help. How likely will you agree? *

	1	2	3	4	5
Very unlikely	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Very likely					

What kinds of motivations would affect your decision to support the communication? *

- ☐ Money
- ☐ Owner's Gratitude
- ☐ Higher chance of getting next job
- ☐ Interactions with the pet
- ☐ Interactions with the owner
- ☐ Other

If you chose money in the above question, please indicate the ideal amount. *

- ☐ Lower than \$1/hour
- ☐ \$1-\$10/hour
- ☐ \$10-\$20/hour
- ☐ \$20-\$40/hour
- ☐ \$40-\$60/hour
- ☐ Above \$60/hour

Amongst your chosen motivations, which motivation has the strongest impact on your decision? *

- ☐ Money
- ☐ Owner's Gratitude
- ☐ Higher chance of getting a next job
- ☐ Interactions with the pet
- ☐ Connections with the pet owner

What will be your major concerns for pet owners' request on using this type of system? Please rank the concerns from 1 as the highest to 7 the lowest. *

	1	2	3	4	5	6	7
Your privacy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Your time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Your cost	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Your safety	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The pet's safety	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The pet's privacy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The system's performance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Section 2

Preference over different types of remote communication.

Consider that if you are helping someone take care of their pets, the owner wish to see or interact with their pet using a electronic communication system with your help. On a scale of 1 (least preferred) to 5 (most preferred), please rate your preference amongst the given systems. *

	1	2	3	4	5
A Video Chat System with Fixed Camera (for dog)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A GPS service to report the pet's real life location	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A Life-logging system mounted on the Pet (One-lap camera sees what the pet sees)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Given that you have sufficient motivations, how often would you facilitate such an interaction for a pet and its owner? *

	Once a month	Once a week	2-3 times a week	Once a day	On demand
Video Chat System with Fixed Camera	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
GPS service to report the pet's location	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Life-logging system mounted on the Pet (One-lap camera sees what the pet sees)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Figure 1(b): An overview of the questionnaire. Part 2 technology preferences

The survey was conducted online in an Australian pet forum and offline by stopping people on the university campus.

Apart from the designed survey, formal interviews were also used to gain further insights into future design of a pet remote communication system. The interviews were conducted simultaneously with the survey, but interviewees were asked to give their reasoning behind the selected answers. Therefore, interview questions include: *Why would/ wouldn't you agree to use the system? Why would you choose these preferences? Why is money/owner's gratitude/... the most important motivation? Why would you choose your safety over your cost? Why do you like video better than GPS?*

After the research, feedbacks and records of the interviews were taken and analyzed in the following section.

3 Results

3.1 Survey Results

The survey received 15 responses, the age of the respondents ranged from 18 to 44. Over 46% of respondents said they have the experience of being a pet sitter, while over 86% of respondents expressed that they wanted to become a pet sitter in the future. Over 86% of participants would agree to use the electronic communication system to help pet owners to see or interact with their pet, and 61% of these respondents think they are very likely to agree.

3.1.1 Concerns over the Interaction

The participants were asked to rank their top concerns for helping owners with the remote pet interaction. The rated concerns from the most significant to the least significant are pet sitter's privacy, time, safety, the pet's safety, the cost, the system's performance and the pet's privacy. From the result (Shown in Figure 2), we can see that the respondents have shown unanimous attention to the protection of their privacy as the standard deviation is the lowest for the option. Therefore, to design a system that would encourage pet sitter's participation should take the privacy, safety and time efficiency as the priorities.

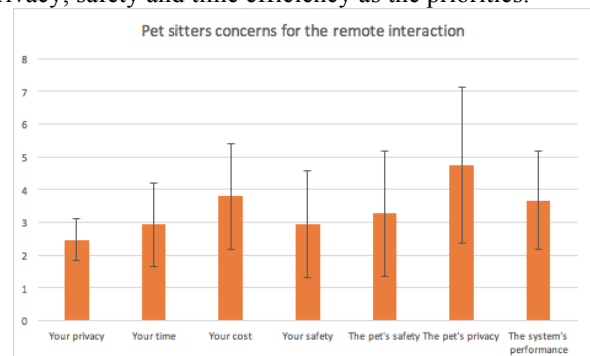


Figure 2: An overview of the questionnaire.

3.1.2 Motivations for Participation

The survey has asked respondents to select their motivations for participating in the remote interaction between pet and owner and select an essential motivation from the group. The two most popular motivation chosen are 'Owner's gratitude' and 'Interaction with the pet' which both received 66.7% of the vote. 'Money' and 'Higher chance of getting next job' came at the second place and are both 40%. Amongst the listed motivations, 'Interaction with the pet,' 46.7%, has become the first important motivation while followed by 'Owner's gratitude,' 33.3%. Therefore, we can see that apart from remuneration, the system should design in a way that pet sitters could actively participate in the interaction.

3.1.3 Preference over Technologies

In this survey, we have investigated three types of technologies which are 'video chat systems,' 'GPS service' and 'Lifelogging system.' As we can see from the Figure 3, the video chat system is the most widely accepted system. It has an average of 4 where one has the lowest preference, and five has the highest. This result gives us an insight that a VMC system is worth for further investigation.

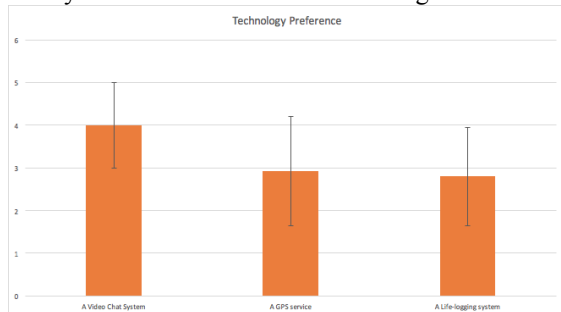


Figure 3: pet sitter's preference of technologies: 'video chat systems,' 'GPS service' and 'Lifelogging system.'

3.2 Interview Results

3.2.1 Concerns over the Interaction

The interviewees targeted their concerns to the potential privacy and security issues while using the proposed system. They pointed out that if their control over technology is not sufficient and the system security is not comprehensive, it might disclosure their private life, location, and home details. The situation could be severer if the owner is a stranger unless the system is carefully designed with enough control and awareness raising mechanism (the mechanism that explicitly and distinctly tells users what data have been disclosed to the other end).

3.2.2 Motivations for Participation

Both interviewees have the experience of being a pet sitter for more than once. When asked about the motivations for helping the remoter interaction between pets and their owners, one mentioned that money is not as important as the interaction between the pet. It is because the core

reason for them to become a pet sitter is they love small animals. However, pet sitting is more of a hobby for them than a real career. Therefore, money is more like a bonus but it will affect their decisions of choosing a pet caring work.

3.2.3 Preference over Technologies

The two interviewees showed their different opinions on the listed three technologies (i.e., video chat, GPS, and lifelogging). One participant pointed out that enabling the GPS means also unveiling her locations when she walks the dog and takes the pet home. Therefore, she worries the potential security threats as if criminals might pose as a pet owner and abuse her location information. However, the other interviewee said that the home address has already given to the pet owner in the pet sitting agreement as an essential contact information. She wouldn't mind using the GPS service, and it could be better for her safety if the GPS is not on real-time base but provided to the owner as a daily or weekly summary. Both interviewees preferred video chat over the other two technologies, as the control over a fixed camera will be more accessible than devices mounted on the animal.

3.3 Setbacks and Improvements

The survey and interview of this investigation only focused on the pet sitters' opinions on the remote pet-owner interaction system while the understanding of pet owners requirement was gained from a prior research launched in the US. [3] Therefore, the bias of pet sitters in the Brisbane area may affect the future selection of technologies and design of the system, including the design of the incentive system and the interaction mode. Furthermore, the survey and investigation were organized without any prototype showing the basic idea of the pet-owner interaction system. Respondents might confuse about the concept of the technologies or mechanisms mentioned in the survey. Therefore, the next user study should be supplemented with a low-fidelity prototype.

4 CONCLUSIONS

From the survey results, we understood the primary motivations and concerns of pet carers when they were asked for help in establishing remote connections between pet owners and their pets. Apart from material reward from owners, interaction with pets gained the highest vote. This insight could be used when design activities for such a system. As expected, privacy is the major concern as the carers will expose to personal information disclosure if they sign up to video chat or logging and location-based service. To pet carers, live video chat becomes the most acceptable choice as they could exert better control over what information would be shared with the other party. During the interview, respondents explained their ideas of how to secure their personal information and privacy when using

the technologies, such as taking precautions to select the filming background and have quick access for switching on/off the communication. Apart from the controls interviewees mentioned in the research, other privacy protection approaches could also be taken, such as extracting the pet video image by motion or depth sensors. These technologies can be used for the future system design. For the next step, a video-mediated communication system will be designed and tested with target user groups including pet owners, pet carers, and pets.

REFERENCES

- [1] Edgcomb, A. and Vahid, F. Privacy perception and fall detection accuracy for in-home video assistive monitoring with privacy enhancements. *ACM SIGHIT Record* 2, 2 (2012), 6-15.
- [2] Wood, J. Preserving location privacy by distinguishing between public and private spaces. *Proceedings of the 2012 ACM Conference on Ubiquitous Computing - UbiComp '12*, (2012).
- [3] Neustaedter, C. and Golbeck, J. Exploring pet video chat. *Proceedings of the 2013 conference on Computer supported cooperative work - CSCW '13*, (2013).
- [4] Yonezawa, K., Miyaki, T. and Rekimoto, J. Cat@Log. *Proceedings of the International Conference on Advances in Computer Entertainment Technology - ACE '09*, (2009).
- [5] Mancini, C., van der Linden, J., Kortuem, G., Dewsbury, G., Mills, D. and Boyden, P. UbiComp for animal welfare. *Proceedings of the 2014 ACM International Joint Conference on Pervasive and Ubiquitous Computing - UbiComp '14 Adjunct*, (2014).
- [6] Paldanius, M., Kärkkäinen, T., Väänänen-Vainio-Mattila, K., Juhlin, O. and Häkkinen, J. Communication technology for human-dog interaction. *Proceedings of the 2011 annual conference on Human factors in computing systems - CHI '11*, (2011).
- [7] PetCloud Pet Minding. *Petcloud.com.au*, 2017. <https://www.petcloud.com.au/>.
- [8] Golbeck, J. and Neustaedter, C. Pet video chat. *Proceedings of the 2012 ACM annual conference extended abstracts on Human Factors in Computing Systems Extended Abstracts - CHI EA '12*, (2012).
- [9] Golbeck, J. and Neustaedter, C. Pet video chat. *Proceedings of the 2012 ACM annual conference extended abstracts on Human Factors in Computing Systems Extended Abstracts - CHI EA '12*, (2012).
- [10] Westerlaken, M. and Gualeni, S. Digitally complemented zoomorphism. *Proceedings of the 6th International Conference on Designing Pleasurable Products and Interfaces - DPPI '13*, (2013).
- [11] Westerlaken, M. and Gualeni, S. Grounded Zoomorphism. *Proceedings of the 2014 Workshops on Advances in Computer Entertainment Conference - ACE '14 Workshops*, (2014).
- [12] Wood, J. Preserving location privacy by distinguishing between public and private spaces. *Proceedings of the 2012 ACM Conference on Ubiquitous Computing - UbiComp '12*, (2012).