Designing Personal Embodied Agents with Personas

S. Ljungblad, K. Walter, M. Jacobsson and L.E. Holmquist

Abstract— **We explore the design of novel types of robots for everyday environments. We use a modified method from the field of HCI (Human Computer Interaction), developing scenarios with four fictive characters, so called *personas*, to illustrate future robot owners. The personas are based on interviews with owners of exotic pets. Each persona has a specific interest in robots as personal embodied agents, preferring a particular form, role and behavior. Our motivation is to open up the design space for robots in everyday environments, yet ground the design in existing human interests. From the resulting personas we have found several design possibilities, such as agents acting as interior design objects.**

I. Introduction

WHAT different roles can robots have in everyday environments? Currently, robots intended for such environments are considered either as social companions [1], service or assistive robots [2][3], entertainment robots [4] or therapy objects [5]. From a viewpoint of the richness of everyday life, these categories are however quite limited. Besides, existing hard and software robot platforms are constraining the view and the development of robot appearance and behavior in everyday environments.

Robots intended for everyday settings are usually expected to be social. An underlying assumption of socially interactive robots is that the interaction should be similar to how human are interacting with each other [6]. However, robots with a notion of sociality, social skills and bonds with people are today more science fiction, or a distant goal, than actual reality [6]. There is a big gap between the amazing robot scenarios that science fiction depicts for everyday environments, and what is technically feasible with current robot technology. In parallel to developing robots to become the future "butlers" science fiction suggests, we want to look into alternative views of robots and interaction with them. We use the term "embodied agents*"* instead of "robots" which we currently find too

biased with underlying assumptions of existing forms of robots, or robots inspired by science fiction.

We instead take advantage of the everyday life people live in. We want to see how different embodied agent forms and behaviors can fit in the existing life and interests that people already have. Similarly, instead of investigating possible applications for a specific platform, we are looking into means of extending everyday objects and activities with agent features that are technically feasible to implement and test, and with much less sophisticated features than many existing robot platforms with advanced cognitive abilities.

We decided to investigate specific human interests and how these can be used as input in the design process. For this, we used and extended an established design method originating from the HCI (Human Computer Interaction) field, called *personas*. We created four fictive characters - the personas – with specific personalities and interests in embodied agents, based on data from real interviews. By highlighting various possible interactions with embodied agents grounded on existing ones, the personas illustrate both interesting and plausible roles, behaviors and forms for future embodied agents.

In this paper, we present our process and possible design requirements for personal embodied agents.

II. Related Work

In HRI (Human Robot Interaction), design suggestions for everyday or domestic environments often relate to interaction or technical implications for specific robot platforms [7]-[9], rather than investigating entirely new robot applications. Some more general design implications for robotic artifacts in the home have been provided for example in ethnographic studies of homes and elderly [3] and possible novel applications were investigated in the workshop "Designing robot applications for everyday environments" [10]. However, there is a lack of publications describing design methods to inform new robot applications for everyday environments, in the HRI field.

In the field of HCI and interaction design, several methods exist to support the design of an interactive system [11]. An example of such methods, and a common approach, is to use *scenarios* and *personas* [12]-[15]. A

scenario is a written story describing the future use of a system [14]. It has the traditional elements of a story: an actor (e.g. a system user), a setting (e.g. a hotel) and goals (e.g. booking a guest) with sub goals (e.g. printing the booking). The actor in a scenario can be referred to as a persona. A persona is a fictive representation of a user and should consist of a rich description of her motivations and goals etc [14]. The scenarios can be developed for example by users (who then write them), by conducting observations or interviews with people using an existing system, or having the designers themselves to come up with scenarios.

Scenarios can be used at many levels of the design process, illustrating users' needs, goals and actions in the beginning of the process or to evaluate system functionality at the end of the design process [13]. Below we present our approach of using personas and scenarios during the design process to inform the design of possible applications for personal embodied agents.

III. PROCESS

Our intention with the Personas is to explore forms, roles and behaviors for embodied agents in everyday environments. We aim for designing *personal* embodied agents, and have approached this by learning about current human interests in exotic pets, such as spiders, snakes and lizards. We chose to find out what makes people keep a continuous interest for example in reptiles, in spite of usually involving direct interaction, and not being able to be thought tricks (opposed to more traditional pets such as dogs). Our motivation for this research was not to build spider or reptile-like robots, but instead to understand the core features of an existing human "interest" and transfer and extend this into design of personal embodied agents. The idea is not that the pet owners will be the future robot owners, but instead that they will provide us with knowledge about motivations for their interests. We believe that some of the core motivations for their interest can be transferred and extended into a new domain, and even for a different group of people.

A. Interviews

We conducted 10 interviews with pet owners in order to get the data for creating personas and scenarios. Overall, we were interested in finding out about the enjoyment of for example having one or several lizards as pets. We were also interested in the interaction between the owners and the pets, and in related social activities. The questions we aimed to answer were for example:

- Important qualities owners find in their pet
- Why they are interested in a rare pet
- What they do with their pet
- What the pets do
- How they see if a pet is sick or in different moods
- Social interaction with other pet owners.

Fig. 1. Interviews were held with people owning exotic pets, such as spiders.

Six male and four female subjects were interviewed. Three subjects were found through friends, one through Göteborg's Herpetological Association [16], and six through the reptile owner's website [17]. The subjects were between 17 and 55 years old (mean 25.6 years, median 22.5). Due to time and logistic restrictions, three interviews were made face-to-face, and seven by phone.

B. Development of Personas

All interviews were transcribed, printed out and read through. In the data, we for example found how some people considered their terrarium as an interior design object, and enjoyed how their pets gave the room a more dynamic impression. Some enjoyed different personalities of their lizards, whereas others mainly were interested in breeding lizards with interesting patterns. Data illustrating different qualities or specific interests were cut out on Post-it notes from the transcribed interviews (see Fig. 2a). The notes were then sorted into an affinity diagram, where related interests or features were grouped together (see Figure 2b). Each group was a starting point for one

Fig. 2.a.b. Interesting data from the transcribed interviews were cut out on notes (a). The notes were sorted into four different clusters of related interests as the starting point to design Personas (b).

Persona. For example, data such as "I like the thought of being a bit odd or different" and "a different pet" was grouped together, and data such as "I don't pet them" and "It is my hobby" were put in a different group. Then, some doublets were removed and the diagram further structured into four separate clusters of related features. On the basis of the resulting clusters, four personas with quite different interests and personalities were created and named: *Nadim, Magda, Christopher* and *Anne*.

At this point, each persona got their first preliminary description (or scenario), focusing more on their overall relation to agents, rather than the actual behavior and form of their agents. In this phase, each description was enriched with imaginary ideas about the persona, in order to lift up and complement the interview data. Pictures representing the characters were chosen from an on-line image database [18].

After the initial phase of developing personas, we refined them as characters and further sorted out details about their specific relation to agents. Several brainstorming sessions were held, focusing on making the personas as different as possible from each other, both in terms of their interest in agents and in their interaction with them. For example, expressions such as "its fun to build their environments" were transferred to Anne, strengthening her interest in agents as a dynamic interior, whereas "I like that they are dangerous" was used for Magda to reflect her interest for odd or dangerous creatures.

Behavior and forms of agents, as well as their technical implications were specified and refined in the last phase of creating the Personas, when their role had been established. During the process we used large notice boards to re-arrange notes and exclude less interesting ones. The written descriptions of the personas were also updated throughout the process.

IV. RESULTS

Below we describe the resulting *Personas* created during the process; Nadim, Madga, Anne and Christopher. Their scenarios illustrate the overall relations between a person and his or her personal embodied agents, giving example of possible interaction as well as some initial technical implications for the agents.

A. Nadim

Nadim is 32-years old and works as a network engineer, living alone in a two-bedroom flat in a small town. One of the rooms is Nadim's hobby room and this is where he keeps his agents. Most of the people in Nadim's home town do not know he owns agents; it is not something he goes around and talks about.

He has always has a great interest in collecting and exploring various

Fig. 3. Nadim

things, and as he got older he became fascinated in having agents as a hobby. Nadim finds it exiting to try to understand their behavior and sees them as a research area where there is always something more to learn. He has specialized in a type of agents that communicates through colours. He enjoys watching them communicating to each other and changing their patterns. Every single agent has its own specific colour pattern, and when it is put closely to another agent they both start to change their individual patterns. The surrounding light, sounds and movement etc, also affects their patterns. The changes are slow, and sometimes it takes several days until it Nadim can see how an agent is reacting. The challenge is to avoid making the result turn white or not looking so nice. Nadim is however quite good in developing agents with unique interesting patterns, and he puts pictures of the agents on his website. He has the patience and knowledge it takes to continue develop interesting looking agents. The number of agents Nadim has varies, and he has never bothered to give them any names.

It was his curiosity and the fact that the agents are easy to manage that made him buy them in the first place, and this is why he still keeps them. He likes to read everything that crosses his path; Internet pages and magazines. He also frequently visits other sites to compares patterns and sometimes he writes in a forum for people with the same type of agents. They sometimes also meet to let their agents affect each other's patterns. He sees his agents as a sort of investment and likes to share his hobby with others at fairs. At these fairs he looks at other agents, meets new people, and sells or exchanges agents.

1) Technical Implications for Nadim's Agents
The agents can evolve interesting patterns over time, yet have a possibility of not succeeding. Agents will be equipped with a colour-display on their back and have one or more sensors for light, movement and sound. The sensing can be different for different agents. Each agent will have a unique color pattern, developed from meetings with other agents the environment it is in. By touching the agent in a particular way makes it possible to temporarily freeze a pattern. Achieving a nice pattern requires several agent-agent interactions and timing. A new agent involves a high risk of turning white, and then forcing the process to start from scratch.

B. Magda

Magda is 19-years old and lives with her mother and two brothers. When she was 7 her dad took her to a fair where they had various kinds of agents and from that point she was certain that she wanted one for herself. When she was 13 her mother finally agreed that she could buy one.

Fig. 4. Magda

Magda's agent is an important part of her identity. Other people may have agents for practical us or to play with, but Magda's makes her feel cool and strong. She is not really an expert in general in agents, but she has learned to handle hers, and more importantly she is no longer scared to interact with it. Magda loves the fact that her type of agent is unpredictable

and hard to grasp. She has learned by interacting with them, taking risks, and is proud of this. She enjoys the challenge to understand the agent's behavior and likes to experiment by letting other people touch it.

The agent is with Magda wherever she goes. It usually sits like a broche on her chest, on her high boots or on her bag. Its body has a purple blinking eye, watching people pass by Magda, and often making them a bit curious. It can give a small electrical shock to people touching it, or start to sound. Magda is the only one that knows how to touch it in order not to make that happen. She can even make the eye close and relax, when she touches it. If Magda or someone else quickly pulls off the agent, it gives off loud warning sounds. This is not only a cool effect, but also makes Magda feel more comfortable whenever she walks home alone at night. Magda is proud of the fact that she has such a cool agent. She has contacts with heaps of people with the same interests but she would like to make even more contacts. She enjoys exchanging experiences and seeing other people's agents. The agents react when they come close to other agents, each having their own way of reacting. Magda's agent reacts by changing the appearance of its eye.

Sometimes she gets into discussions where people refuse to understand the importance of having such an agent. In order to spread her knowledge she chats on the web and has her own blog.

1) Technical implications for Magda's Agents

The eye of the agent will be represented on a colour-display and around it there will be an electrical (mild) shock-giving frame. It will also be equipped with sensors for light, movement and sound. The agent should also be able to clamp to things such as fabric or leather. The trick for the owner to learn the mood of the agent so that clamping and unclamping it does not result in shocks. Similar agents can influence each other when being in proximity, resulting in that their eye change colour or start blinking.

C. Anne

Anne is a 41-year old physiotherapist and when she is not working she enjoys getting together with friends and family. She lives with her boyfriend in a one-bedroom apartment in a suburb of a small city. She is interested in interior design and has a wall of the living room is occupied with agents. Her fiancé is not so fond of

Fig. 5. Anne

the agents, but he is of Anne, so the agents can stay. Anne has had the agents a long time before they got together and she is never going to get rid of them. Anne fascinates by the feeling the agents give the interior. She believes they create pleasant surroundings to live in, as the room feels more

alive and dynamic.

Most days Anne gets home from work before her boyfriend. She enjoys this time on her own; she reads books, takes a bath, or feeds the agents with new data, a color from a magazine, or some patterns that she wants them to draw. To do this, she picks up the agent, squeezes it to sample a color, form or image. Then she puts it back on the wall, and it starts to draw decorations, using patterns or colors from the picked up data. The drawing is affected whether the agent is touched or not, and whether there is activity in the room. Once, when Anne was hiking Norway, she didn't see her wall for three weeks and when she got home the agents had been drawing so much the wall looked like a mess. This was apparently too long time to stay away. She likes that they need some of her attention, to make something that looks nice, but she also appreciates that they don't need to be taken care of every day.

No one of Anne's friends got agents and she enjoys being the only one, it makes her stand out. When she needs inspiration for redecorating she visits a couple of sites on the Internet. Anne sees the agents as furniture but she has discovered that there are people on the Internet that talk about their agents as if they had feelings. Anne finds this slightly ridiculous - she is absolutely certain that hers only react to the environment. If she moves her hand in front of them, they simply react to the movement and change their way of drawing. Not because they recognize her, but because they can sense the movement.

1) Technical implications for Anne's Agents

The agents will be equipped with camera, movement sensors, sound sensors etc and combined with a projector. They let imprints emerge on the wall surrounding them. The agents are put on the wall, like a pin or a magnet. They can be picked up from the wall and be squeezed to perceive (take an image of) a pattern or color in front of it. Based on what it recently perceived, a pattern will emerging around the agent as it is put back on the wall. The agents can also detect the presence of for example a hand and can then react to it depending their state. The agents can also communicate to each other in order to tell if something is present in front of them, to collectively change the pattern.

D. Christopher

Christopher is 22-years old and has recently moved to a big city in order to study Political Science at the university. He lives in a dormitory with eleven other students. His room is quite small and he would like a pet, but that is not really possible. Instead, Christopher's agent has kept him company during his first time in the

Fig. 6. Christopher

new city. It is always around if he feels lonely, and inspire him to get active. Christopher finds it fascinating to get to

know his agents and find out what it likes. Every agent is unique - you could say they have different personalities that you have to respect. He is certain that his agents recognize him but it would be nice if it could show it more.

By having an agent, Christopher has gotten into contact with other like-minded. He has recently joined a society and they have met a couple of times and discussed their agents over coffees. Christopher finds it rewarding to get together with people who share his interest.

His agent is a kind of pedometer, measuring how much he moves. It likes to be brought along, and gives off little signs showing when it is happy. It also has contact with another twin-pedometer, and is affected by its state as well. It vibrates when Christopher has walked some kilometers, and can also communicate this to other agents. If Christopher passes by someone else with a pedometer agent, it reacts to how far the other pedometer has walked. If the other has not walked so far it can get angry or sad.

1) Technical implications for Christopher's Agents

This agent should encourage the owner to get more active by using movement sensors e.g. accelerometers. It shows an emotional state through discrete expressions, such as a tactile pulsating actuator. The state of the agent is affected by other nearby agents and when the user is active it gives out for example a weak purring noise and light as a token of appreciation. This is also which is amplified by the presence of other active users and weakened by not so active users. Repeated meetings between agents give raise to an extra positive effect on their behavior.

V. DISCUSSION

Even if our personas are fictive character, they are based on real data, and their description is grounded in some existing needs and interests of people. However, the personas are also formed by our imagination and represent possible, but not definitive design outcomes.

The personas inform the design of different personal embodied agents. A possible role of embodied agents is to become *dynamical interior*, extending the furniture in a home or another setting. In our scenario with Anne, we show how the human interest can lie in what the agent can produce or achieve in its role as a design object. In such a scenario, the agents' are "dynamical things" rather than living creatures with different personalities. This preference for agents without personality is also visible in the scenario with Nadim, where they are viewed as dynamically evolving building pieces in a *hobby*, requiring patience and exploration.

In another scenario, the personality is the core feature of the agent, as its role is to *extend the social identity* of a person. In our scenario with Magda, an agent has a specific personality and appearance making other people curious, and resulting in that they give its owner attention. Another form of social contact is visible in the scenario with

Christopher. The role of the agent is to motivate him to move more and make him aware of other people in a similar situation. This way, the agent acts as a *support for a specific lifestyle*, both as encouragement and as an indirect communication device with people sharing the same interest.

Our resulting scenarios indicate how our interviews with people owning exotic pets, clearly affected the design outcome. For example, the behaviors of Nadims' agents were directly inspired from data in the interviews. Some pet owners described how they change sand for their lizard or spider and only could notice a few days later if this was successful or not, depending on the state of the pet (for example eating normally or not). We used this as inspiration when designing Nadim's agents, for example by making their visual patterns change slowly over time, rather than at once. This is just one, of several examples on how our interview data helped us to shape the personas.

VI. CONCLUSION AND FUTURE WORK

Personas is only one of many possible methods to explore different roles, behaviors and forms for embodied agents. Here, we have focused specifically on *personal* embodied agents, but we believe a similar method also could also be useful when designing other types of agents. Then however, other people than exotic pet owners should be studied. We will start by implementing one or several of the embodied agents described in our scenarios, for example by using e-puck technology developed at EPFL [19]. The step after this is to test the design with possible users.

This work exemplifies one case of ongoing work, where we use people with special interests or activities to inform design requirements for technology development. We call this approach *transfer scenarios*, as it transfers human interests from one domain into another. Just as exemplified in this paper, the people we use as input in the design process are not intended or even representative end users. Instead we chose them to provide insights of specific human interests, hobbies or activities that can be transferred into the design of new technology. This way we are learning about how to ground the design in a real human interest, yet come up with novel ideas for technology development.

REFERENCES

[1] F. Tanaka, J. R. Movellan, B. Fortenberry and K. Aisaka: "Daily HRI Evaluation at a Classroom Environment: Reports from Dance

Interaction Experiments", *Proceedings of the 1st Annual Conference on Human-Robot Interaction (HRI 2006)*, Salt Lake City, U.S.A., March 2006

[2] Independence Enhancing Wheelchair, ActivMedia Robotics Availible: http://www.activrobots.com/ROBOTS/RoboChariot.html

[3] J. Forlozzi, and C. Disalvo "Service robots in the Domestic Environment: a Study of the Romba Vaccum in the Home" *Prooceedings of the 2006 ACM Conference on Human-Robot Interaction. (HRI 2006)*, Salt Lake City, U.S.A., March 2006

[4] Sony Aibo Robot Dog Available: http://www.sony.net/Products/aibo

[5] W., Taggart, S. Turkle, and C. D. Kidd, "An interactive robot in a nursing home: Preliminary remarks." *Toward Social Mechanisms of Android Science*, Stresa, Italy,. Cognitive Science Society July 2005

[6] T.Fong, I. Nourbakhsh and K. Dautenhahn "A survey of Socially Interactive Robots" *Robotics and Autonomous Systems 42* 143-166, 2003

[7] K. Kawamura, R.T. Pack and M. Iskarous "Design philosophy for service robots". *Proceedings of the 1995 IEEE Conference on Systems, Man and Cybernetics. IEEE Press,* 3736-3741,1995

[8] S. Lauria, G. Bugmann, T. Kyriacou, J.Bos. and A. Klein, "Training personals robots using natural language instruction" *IEEE Intelligent systems*, Volume 16, Issue 5, IEEE Press 38-45, 2001

[9] P. Robler and U.D. Hanebeck, "Telepresence techniques for exception handling in household robots" *Proceedings of the International Conference on Systems, Man and Cybernetics*, IEEE Press , 53-58. 2004

[10] S. Ljungblad and L. E. Holmquist. "Designing Robot Applications For Everyday Environments" *Proceedings of sOc-EUSAI, Smart Objects & Ambient Intelligence Conference*, Grenoble, France October, 2005

[11] J. Löwgren, & E. Stolterman "Design Methodology and Design Practice". *Interactions*, 1, 13—20, 1999

[12] A. L. Cooper "The inmates are running the asylum: Why high-tech products drive us crazy and how to restore the sanity" Indianapolis: Sams, 1999

[13] J. M. Carroll, *Making Use: scenario-based design of human-computer interactions* Cambridge, Mass, MIT Press, 2000.

[14] L. Nielsen "From User to Character – an Investigation into User-Descriptions in Scenarios" *Proceedings of Designing Interactive Systems (DIS'02)*, 2002

[15] J. Pruit and J. Grundin "Personas: Practice and Theory" *Proceedings of the 2003 Conference on Designing for User Experiences (DUX'03)*, San Francisco, USA, 2003

[16] Göteborgs Herpteologiska Förening. Availible: http://ghf.hittas.nu/

[17] Repti.net Availible: http://repti.net

[18] Morguefile Availible http://www.morguefile.com/

[19] E-puck Available: http://lsa.epfl.ch/~mondada/e-puck/