Michitop: defining, developing and discovering the value of desktop pets

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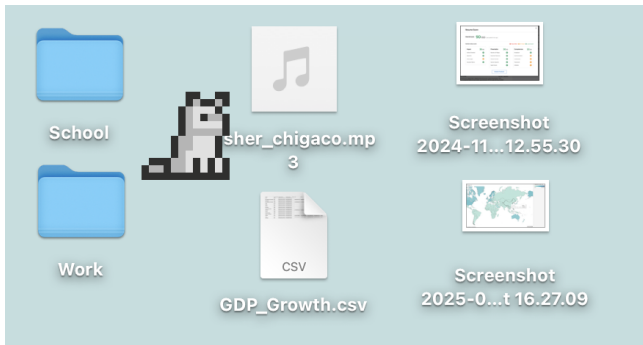
Figure 1: Desktop pet (Michitop) sitting in the desktop

1 ABSTRACT

"Desktop pets", a subcategory of virtual pets, are characters that appear on computer screens and exhibit pet-like behavior. The space that the desktop pet has shifted greatly alongside the evolution of computer technology and the way we think about computer space. While desktop pets used to mainly reside on what is traditionally considered the desktop, they have grown to live both in and across various windows and platforms within the computer, vastly changing the ways users interact with them. On top of identifying a dearth in research on desktop pets, we found a lack of design principles and the accompanying design language for framing and creating modern desktop pets.

In this paper, we present and evaluate our own desktop pet, Michitop. Michitop is a desktop pet that was created with two different variations, which differ in their levels of interaction. The first is the "aesthetic" variation, designed as an accessory, and does not interact with the user in any way. The second is the "companion" variation, which includes interactions with the user, such as petting

and mouse-chasing. We found that the presence of a desktop pet (both variations) increased user enjoyment and boosted mood while using the computer, and that users preferred the increased levels of interaction with the companion variation of the desktop pet. From the results, we identified design principles for desktop pets.

2 INTRODUCTION

While digital devices are often conceptualized and created to serve a practical purpose, their uses often transcend simple utility. One such example is the desktop itself. Traditionally, the desktop embodied the aesthetic function of presenting the user with a "desktop image". Eventually, as people started to think about the desktop as a "place" in the computer, people started to ask the question: "In this place, what kinds of digital inhabitants could occupy it?"

The desktop has had many inhabitants over the years. Some possibilities of these desktop inhabitants are desktop assistants (e.g. Clippy), desktop companions (e.g. Shimeji and Neko) and even malware posed as desktop assistants (e.g. BonziBuddy). In this paper, we focus on "desktop pets", a subset of "virtual pets" that reside on the desktop.

Human-computer interaction (HCI) research has already identified that there are benefits to be drawn from virtual pets for users [1]. However, virtual pet research has not yet explored the rich possibilities of the desktop pet. They are not limited to the confines of a game, window, or web interface but rather reside in the user's operating system (OS), or at least give off the illusion that they do to the user. Due to the great amount of research suggesting the benefits of virtual pets in many applications, we were especially interested in investigating how those benefits are possibly carried over or transformed when applied to the desktop and "computer space".

The first desktop pet for the Macintosh, Neko, was created by Kenji Gotoh [2]. Neko was conceptualized as a small cat sprite that would run around the desktop chasing the cursor. Although Neko began on the desktop background, the boundaries of spaces inhabited by desktop pets quickly became blurred. Many desktop pets starting to jump in between applications, or even being able to interact directly with OS elements (e.g. windows, files). Having transcended past boundaries of location and interaction, desktop pets now inhabit a greater "computer space".

In the face of this evolution and the greatly increased complexity of desktop pets, there has been a lack of any proposed frameworks to categorize these new desktop pets and their provided interactions. We argue that the wide-ranging complexities and questions raised by modern desktop pets necessitate a framework to design and draw from, and propose an interaction-based one.

3 RELATED WORK

Our work primarily builds on the existing field of virtual pet research. Although our philosophy of viewing the desktop as a digital space "inhabited" by "digital occupants" is not related to any concrete research, there is a body of HCI research of "systems-for-a-study" paper by deriving design principles from user feedback of created artifacts.

3.1 Virtual Pet Research

There have been two broad spheres of focus in virtual pet research: one focuses on the virtual pet's similarities with real pets (e.g. for a possible replacement)[3], the other views virtual pets as distinct from real pets and frames them as a source of entertainment or to serve a practical purpose [4]. Examples of practical purposes include helping children with autism in social development [5] and a portable virtual pet to monitor health metrics such as lung capacity [6].

In contrast to the practical examples, there is also a discussion about how the "uselessness" of virtual pets, in terms of lacking a specific utility, can be a benefit [7]. Kaplan illuminates the benefit of "uselessness" by claiming that autonomy and functionality are incompatible design principles and that making the pet autonomous (e.g. not doing what the user wants and thus reduces utility) creates more interesting and memorable interactions.

A literature review titled "From Real To Virtual Pets" lists categories of different types of virtual pets that were explored in virtual pet research [1]. Unfortunately, the paper does not mention the "desktop pet" as a category of virtual pets and also omits the desktop as an environment where virtual pets can exist. This indicates a gap in research on desktop pets as distinct entities from "virtual pets as games". Our research differs because we are focusing specifically on desktop pets, which remains unexplored in virtual pet research. Moreover, we are not interested solely in defining the concept of a desktop pet but also in deriving the value of it and design principles through the user study.

3.2 Deriving Design Principles

One of the key "systems-for-a-study" papers that inspired our methodology was "Supporting Piggybacked Co-Located Leisure Activities via Augmented Reality" [8]. Similar to the authors, we also created a system (Michitop) which we sent out to users in order to ascertain the ideal design features when creating such a system.

4 SYSTEM DESIGN

4.1 Interaction-Based Framework

With the blurring of boundaries of where desktop pets reside, and the complex interactions that this evolution has enabled, we need a framework through which we can quantify, measure, and design modern desktop pets. The design space of different types of agents that could occupy the desktop, and now greater computer space, is expansive, which poses a challenge in deriving specific guidelines, especially in terms of the space they occupy. While it is possible to categorize certain desktop pets by the spaces they are constrained to, such as earlier desktop pets that remain on the desktop or within certain windows, it quickly becomes challenging to define modern

iterations of desktop pets in this way. Additionally, the ways in which desktop pets are able to interact within and around their space also significantly shift the dynamic; how do you spatially categorize a desktop pet that "only lives on the desktop" but can jump into folders that lie on it? It is with this concern that we propose an alternative lens through which to view and study complex desktop pets that transcend a single screen.

Through our analysis of the evolution of desktop pets, especially of modern iterations of desktop pets, we identified that looking at the desktop pets through the levels of interactions they provided shaped the user experience in a far more consistent and categorizable way than by their spatial boundaries alone. Thus, we propose that in analyzing and designing the modern, powerful desktop pet that lives in greater computer space, we must look at them through the various levels of interaction they provide.

4.2 Desktop Pet Design: Michitop

Working within our framework of designing pets based on levels of interaction, we created our desktop pet, Michitop, with two versions in mind, each corresponding to a different broad level of interaction.

Our first version is the "aesthetic version", which corresponds to low-level interactions. The pet is essentially an accessory to the desktop, rather than an agent that is capable of interacting with the user. It would have more in common with a digital "fidget toy" or an appealing wallpaper rather than a virtual pet. The only interaction that the user could have with this pet is grabbing it and moving it around. Our second version is the "companion version", which corresponds to higher-level interactions. This version includes higher-level interactions, some of which are the inclusion of an interaction menu, petting, and more complex states to reflect design choices made in prior virtual pet applications. We categorize these interactions as higher-level as they engage a greater level of emotional complexity (eg. petting), and/or provide a multi-step process of interaction (eg. the pet chasing the mouse around and pouncing at it).

We hypothesized that users would enjoy the companion version more than the aesthetic version due to the greater levels of interaction provided.

4.3 Technical Implementation

Michitop was created in Godot (version 4.3), written in GDScript. We used a free pixel art sprite sheet, which we credit in our acknowledgements section. We implemented it using a state machine controlling different internal states. Each state had its own assigned probabilities of entering different states after a randomly determined time. Each state would have its corresponding probabilities to enter a different state (along with a random state duration period). The "dragged" state was unique in that it was automatically triggered by the user clicking on Michitop, allowing them to drag the pet around their desktop. Other interactions which involved direct user input (e.g. dancing) would last for a fixed amount of time with the user being able to "cancel" the interaction by clicking on the pet again.

The main difference between the two versions was the type of states that each version had. The aesthetic version had internal

states of "idle", "walk", and "sleep" (as well as a special "grabbed" state for when the player grabs the pet). The companion mode included all of these states, as well as additional states of "chasing mouse", "pouncing at mouse", "being pet", and "dancing". The companion version also included a context menu, where when the user right-clicks the pet, an "interaction menu" will appear (Figure 2), which enables the user to interact with the pet in their preferred ways.

The desktop pet is rendered as a transparent, full-size window that is always on top. Mouse position sensing is handled through Godot functions.
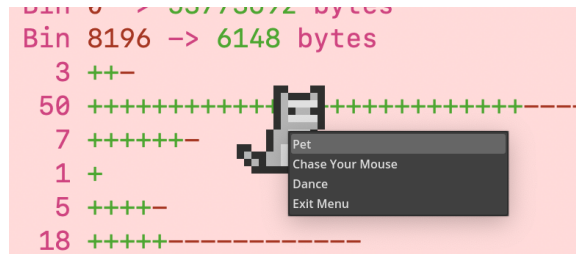

Figure 2: Companion mode with interaction menu

5 USER STUDY: DISCOVERING DESKTOP PET VALUES

For this research study, we were interested in researching how people interact with virtual pets that occupy a digital space frequently visited by the user, mainly their desktop on their computer. We decided to evaluate these findings through a three-part study design.

5.1 Preliminary Survey

To conduct our user study, we reached out to potential participants from within our local network and sent out a preliminary sign-up survey to 21 participants to verify their participation while asking questions to get a gauge for peoples' familiarity with virtual pets and their experience with any if they have seen or used one in the before this research study.

5.2 Desktop Pet Assignment

After confirming user participation from the anonymous list of agreed participants from the preliminary survey, we sent one of two versions (aesthetic or companion) of Michitop, the desktop pet, evenly and randomly distributed to these participants to use for 3 days, corresponding to their Operating System (which were limited to macOS computers). We made sure before sending Michitop to each participant to keep track of which version of the desktop pet we sent to them to later be able to compare which version users enjoyed more during our evaluation.

5.3 Final Survey

After the 3-day trial period, to investigate and learn how users interacted with the desktop pet and receive feedback about their experience, we sent out a final follow-up survey asking a series of optimally scaled questions to the participants. We designed these questions to reflect what value the desktop pet had for users, the impact the desktop pet had on the users while they were using their computer, and whether the desktop pets were seen more as a digital companion or an accessory. As society becomes more digital and more people spend a lot of time on their computers, this user study looks to support that the presence of a desktop pet will make the experience using a computer more enjoyable and make digital spaces more human. Among the 21 initial participants that sign-up for the study, we received 13 responses for the final follow-up survey.

6 RESULTS

The preliminary results of our follow-up survey asking users to rate their overall experience and enjoyment with their desktop pet, suggest that the desktop pet (regardless of which version they received) had a positive impact and impression on the majority of the participants with 10 out of 12 participants submitting a response of 'slightly good' or better (Figure 3 in Appendix A).

6.1 What Users Had To Say (Positive Criticism)

Among the responses collected from the participants in the research study, the respondents suggested that users have found value in the presence, "cuteness," and design of a desktop pet, but were concerned with being able to control its behaviors and could often be seen as a distraction. The results of the follow-up survey suggest that users thought the desktop pet aligned with what they expected and quickly understood how it worked.

Some more notable comments of the positive impact the desktop pet had on users include:

- "The desktop pet really **improved my mood** while doing my homework." -P1
- "I like that it **makes my screen a bit livelier** without too much additional power/complexity needed from my system." -P2
- "I thought the pet struck a perfect balance between **giving some lightness** to tasks done on the computer without feeling intrusive." -P4
- "It's a cute little animation that **gives a slight burst of joy** when doing some mundane things on the the computer." -P4
- "I thought the pet running around the screen way slightly distracting but in a good way - it **lets me take my mind of work and smile** just for a little bit." -P5

6.2 What Users Had To Say (Negative Criticism)

From their criticism reported in the follow-up survey, participants of the study have expressed a desire to treat and see the desktop pet as if it were a real-life pet, including the desire to want to feed and play with it and being bothered by the way the desktop pet distracts or attracts the user's attention. This suggestion is supported by the following most notable critiques:

- "When it roamed into the screen space where **I was working I became so frustrated**." -P3
- "Would consider keeping the desktop pet **If it had less interruptive behavior**." -P3

- "The implementation of the **pet's behaviour could be a bit less intrusive**. In particular it's quite annoying that the pet doesn't go back to where it came from when it wanders around the screen, and needs to be put back manually." -P5
- "It would move to a part of my screen that I needed to click on, and instead of clicking on that part of my screen, I had to move the pet. I **wish it didn't move around so much**, and if it did, that it would go back to where I initially placed it." -P6
- "It would be fun to **have other ways of interacting** with the desktop pet! I would love to be able to feed it." -P7

Recurring and critical themes of participants wanting less intrusive behavior, more predictable behavior, and more interaction from a desktop pet suggests that users of desktop pets have a desire to see and treat this system as more of a companion without the trouble of having to deal with the behaviors of a real-life pet and the burden of substantial costs that are associated with taking care of one. This system may be a viable and potential solution to mitigate loneliness, as per the former Surgeon General of the United States, Dr. Vivek Murthy, warning of the American epidemic of loneliness, which addresses the issues of loneliness, isolation, and lack of connection [9]. This point is supported by our user study, as one of the questions we asked gauging the feeling of loneliness suggests that while the desktop was active, there is a lower sense of loneliness, as no participant has reported feeling either 'very' or 'extremely' lonely and 8 out of 13 participants reported 'not at all', and the desktop pet's presence was particularly prevalent especially by companion mode users (Figure 4).

6.3 Companion versus Aesthetic

Among the questions that we asked participants as a part of the follow-up survey, there were a few significant questions and responses we thought were important to look at side-by-side between the two different (aesthetic and companion) modes. One these questions was 'how much the presence of a desktop pet make using a computer more enjoyable'? Companion users had more of a varied response compared to those of aesthetic user responses which do not seem to entertain any extremes (Figures 3,4). This shows us that interactivity, behavior, and features play a vital role in users' experience and may suggest they prefer to have a desktop pet as a companion. Aesthetic users also wondered if there were more interaction possibilities (as reported by P7 in their critique) and were more "neutral" ("might or might not recommend").

6.4 Design Principles

From the user study, we have extracted the following design suggestions when creating a desktop pet:

(1) Enable the user to choose the degree of agency they have over the pet's behavior (e.g. Decide if the pet is more autonomous or predictable. While autonomy makes it more immersive, it risks being unpredictable and frustrating.)
(2) The pet should aim to bring joy and be positive (e.g. there are mechanics with negative emotions like forgetting to feed the pet which leads to it being sad. These should be minimized.)

(3) The pet should be as unobtrusive as possible. (e.g. prevent it from wandering around "workspace" areas or having sudden movements which can be distracting)
(4) The pet should be designed as a "companion" with multiple different interactions.
(5) Despite the previous point, the desktop pet's behavior should be simple enough that the user can quickly understand how it works.

7 LIMITATIONS

The image of the desktop pet did not render properly and was not compatible on Windows Operating System devices and thus limited the study to users that had macOS computers. Considerations for other handheld devices were also rejected due to the nature of the desktop pet and how substantially different the needs and behaviors are for users using their handheld devices compared to how they operate and navigate a desktop computer.

Moreover, though we wanted to implement more complex behavior in the companion mode we had to consider CPU usage. Thus, the CPU power consumption became a constraining factor which prevented us from adding more engaging interactions.

8 CONCLUSIONS AND FUTURE WORK

The results of the study suggest that users find value in and prefer to treat desktop pets like a companion with interactive elements to a certain extent more than just being seen as an accessory or for their aesthetic appeal. Future work should consider using different designs for the desktop pet (e.g. different animals or even inanimate objects that are anthropomorphized), more diverse types of interactions, using more features of the desktop (e.g. the pet interacting with folders and files) and more user customization (e.g. customizing the appearance of the desktop pet, control over behavior parameters).

9 ACKNOWLEDGMENTS

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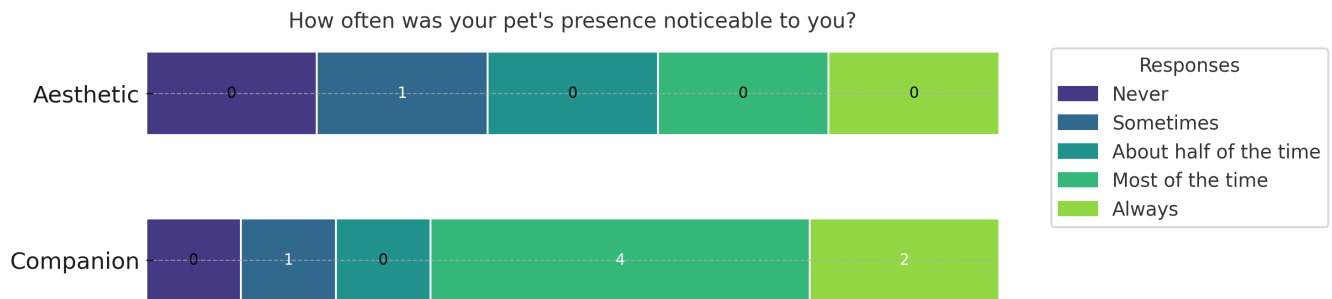
A   APPENDIX SECTION A

Figures 3, 4, 5, 6 show a side-by-side comparisons between aesthetic and companion mode response data to significant follow-up survey questions.
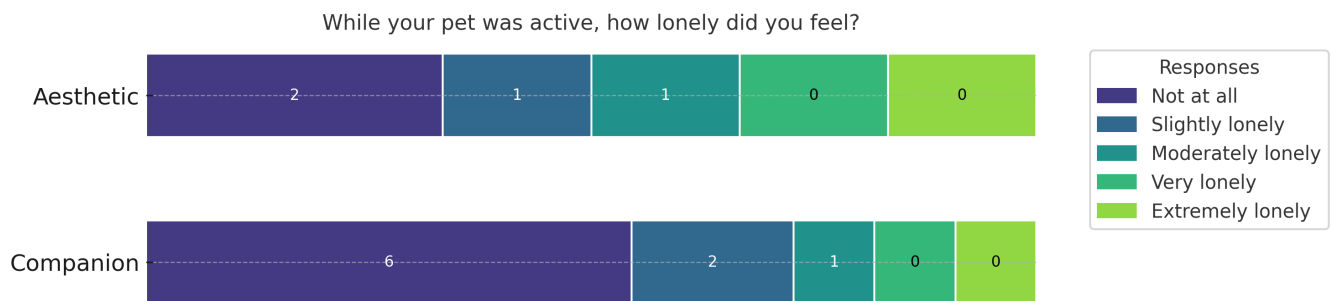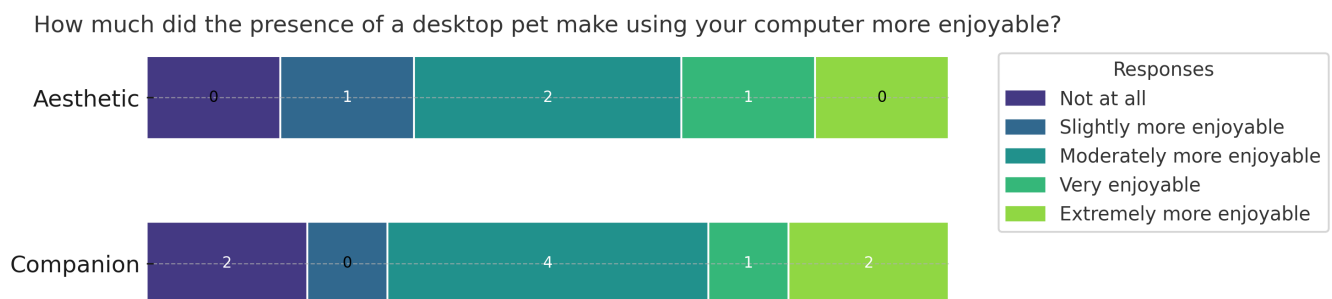
Figure 3: Side-by-side comparison on rating users' 'overall experience and enjoyment' with their desktop pet

Figure 4: Side-by-side comparison on how often the 'desktop pet's presence' was noticeable to the user

Figure 5: Side-by-side comparison on the degree of 'user loneliness' while the desktop pet was active

Figure 6: Side-by-side comparison on how much the presence of a desktop pet make 'using a computer more enjoyable'