

Augmented Reality Animals: Are They Our Future Companions?

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ABSTRACT

Previous research in the field of human-animal interaction has captured the multitude of benefits of this relationship on different aspects of human health. Existing limitations for accompanying pets/animals in some public spaces, allergies, and inability to provide adequate care for animals/pets limits the possible benefits of this relationship. However, the increased popularity of augmented reality and virtual reality devices and the introduction of new social behaviors since their utilization offers the opportunity of using such platforms for the realization of virtual animals and investigation of their influences on human perception and behavior.

In this paper, one prior experiment is presented, which was designed to provide a better understanding of the requirements of virtual animals in augmented reality as companions. Through these findings, future research directions are identified and discussed.

Index Terms: Human-centered computing—Interaction paradigms—Mixed / augmented reality; Human-centered computing—Human computer interaction (HCI)—HCI design and evaluation methods—User studies; Computer graphics—Graphics systems and interfaces—Mixed / augmented reality

1 INTRODUCTION

A strong bond exists between humans and animals, and previous research has documented the multiple benefits of this relationship to humans' health and well being for a wide range of ages and populations, such as reduction of stress and increased social behavior [3, 10]. Various explanations have been provided for the source of humans' inclination towards animals such as the Biophilia hypothesis, social support theory, or the increasing affectionate behaviors towards infantile or cute faces such as the faces of many cats and dogs [2, 4, 8, 14]. However, existing limitations to human-animal interaction due to health reasons or public space laws suggest the exploration of new platforms for developing similar interactions. Advances in augmented reality (AR) and virtual reality (VR) technologies, their increased popularity, and prospective ubiquity has affected some of the humans' interactions, such as socializing with others through a platform like the VRChat¹. Also, increasing research in AR aimed at understanding humans' behavior and perception of other virtual entities such as intelligent virtual agents [11] shows promising opportunities for utilizing AR as a platform for realizing and researching virtual animals.

The remainder of this paper is as follows. Section 2 presents previous findings about virtual animals. Section 3 describes one of our prior experiments on virtual animals in augmented reality. Section 4 presents potential future research directions and Section 5 concludes the paper.

2 RELATED WORK

In this section, we discuss the previous research in the area of virtual animals and the benefits of human-virtual animal interaction.

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¹<https://www.vrchat.com/>

2.1 Virtual Animals

Most people are familiar with the idea of virtual animals/pets through entertainment platforms from Tamagotchi pets² to more recent games such as Little Friends: Dogs and Cats³. To form a better understanding of the motivations of people who play pet games, through a survey and a laboratory study, Lin et al. identified that issues such as allergies and the emotional support provided through pet companionship are some of the reasons for playing pet games [9].

In most cases, virtual pets have been investigated for motivating and encouraging children in different areas such as education and the promotion of healthier choices. Chen et al. investigated the motivational influence of personal and class virtual pets, finding that 11-year old students increased their learning efforts with the inclusion of the virtual pets [6]. Byrne et al. studied the influence of a virtual animal and its range of behaviors (i.e., negative and positive) through a mobile phone pet game in children's adaptation of healthier eating habits [5]. They found a more positive influence when using the pet that was capable of both positive and negative behaviors. Similarly, Johnsen et al. observed the positive effects of interacting with a virtual dog presented to children through a mixed reality platform in the promotion of physical activity, where children could earn tricks for their dog the more they exercised [7]. The positive effects of the virtual animals in past research hold promise for more in-depth investigations of these entities in AR and for a wider range of populations and applications.

3 OWN PRIOR WORK

The presented experiment in this section is aimed at investigating human perception and behavior during an interaction with a virtual dog in AR, and understanding users' expectations of such an entity with an overarching theme of AR animals as potential companions.

3.1 Understanding the Influence of Awareness in Virtual Animals

With this experiment, published at ISMAR 2019 [12], we investigated the influence of strangers' awareness of a virtual dog and the responsiveness of the virtual dog to each strangers' behavior in AR on how participants perceive the virtual dog and the stranger and adjusted their behavior in response to these entities. In our 2 × 2 mixed factorial experiment, participants started with designing their virtual dog and through commands such as sit, eat, and jump got familiarized with it. Our independent variables were strangers' awareness of the virtual dog and the dog's responsiveness during a collision event where each stranger walks over the virtual dog in front of the participant. In the case of the strangers, they either wore a Microsoft HoloLens and verbally noted that they can see the dog in a space shared between them and the participants, or pretended to be distracted while walking over the virtual dog. In the case of the virtual dog, it was either responsive (see Figure 1a)) to the collision by falling over and getting hurt, or unresponsive (i.e., continuing its idle animation, see Figure 1b). We found that the responsiveness of the virtual dog to the collision, increased the sense of *being together* with the dog even though the collision event had a negative connotation. The virtual dog's responsive behavior

²<https://tamagotchi.com/>

³<https://www.nintendo.com/games/detail/little-friends-dogs-and-cats-switch/>

