
Digital Game Design for Canines: Getting to Know Your User

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Abstract

There is an increasing demand for entertainment applications developed for pets, in particular for dogs and cats. While there is some anecdotal evidence of pets playing digital games, the nature of animal-computer play interactions is yet to be understood. In this talk we report on an ongoing study based on observing and analyzing dog-tablet game interactions. Using categories emerging from our data analysis, we construct a “catalogue” of behavioral patterns typical of dog-tablet interactions and make some hypotheses for further investigation on the nature of dog-tablet play interactions.

The emerging discipline of *animal-computer interaction* (ACI) [1] aims to understand the interaction between animals and computing technology within the contexts in which the animals habitually live. In the domain of canine users, most ACI studies have so far been concerned with design for working and assistance dogs trained to issue alerts, e.g., by pulling on a string [2] or pushing a button on a multi-touch screen [3]. In these scenarios dogs need to undergo special training in order to interact with the device.

In this work we look at dog-computer interactions for the purpose of *entertainment and enrichment*. This type of interactions has been looked into for other animals, such as apes [4], cats [5], and pigs [6], while dogs have so far been believed to be less responsive to tablet/iPad stimuli [7]. Yet dogs playing tablet/iPad games is a wide-spread phenomenon: hundreds of mobile applications designed for dogs have hit the market; over 10,000 YouTube videos can be found using the keywords “dog playing tablet”; in the last years several dog training centers were reported to open classes teaching dogs to use mobile devices ([89]). In light of the above, it seems timely that principles of responsible, user-centric design of game technology for canines are addressed by the ACI community.

How should we design digital games for pets, in which they find some recreational or other positive value? So far these questions have mainly been addressed from ethical [10] and philosophical perspectives [5], in some sense in a top-down way, deriving game design principles from more general theoretical frameworks. In this work we take a bottom-up approach¹, starting with empirical data and asking what we can learn about our users by observing what dogs actually do when playing digital games. To the best of our knowledge, behavioral characteristics of dog interactions with tablets have not been systematically investigated. These characteristics, however, are key to answering questions such as what constitutes an animal-computer play interaction, what it means for an animal to be engaged by a digital game, and what is its perception of virtual objects. Exploring these questions naturally calls for applying multi-disciplinary behavioral research methodologies.

One of the key tools for studying animal behavior is constructing *ethograms*, which are quantitative descriptions of an animal's normal behavior. According to [12], "It is absolutely fundamental to any study of animal behavior to define what behavior types are being observed and recorded, and therefore production of an ethogram is always the first step in any animal behavior research".

In this work we take such a step by constructing an ethogram of typical behaviors dogs exhibit while

¹ In a popular blog article [11] a similar approach was taken by looking at YouTube videos of dogs and cats playing iPad games. Their focus was however on the question whether dogs or cats are "better iPad players" (cats scored a higher proficiency). No description of the data collection and analysis methodologies was provided.

playing digital games, based on analyzing video data of dog-tablet interactions. For this purpose 32 videos of dogs playing tablet games were carefully selected and tagged with behavioral patterns. We further classified the observed patterns into three basic types, each of which has a strong relation to predatory behavior as elaborated below:

Attention to tablet: Activities expressing an interest towards physical aspects of the tablet without getting into physical contact with it. This includes *eye-tracking the virtual object* and *head twisting*.

Actions not directed at tablet: Other types of activities not directly targeting the tablet, including heavy panting, nose licking, nervous yawn and catching the owner's hands.

Actions physically directed at tablet: Activities based on a physical contact with tablet or moving around it, including *scratching the tablet screen*, *catching the virtual object by teeth*, *pushing the tablet*, *licking the tablet*, *jumping around the tablet with attention to virtual object* or *performing fox jump*. Fox jump (also known as a stiff legged jump) is a typically predatory movement, the dog rearing up on his hind legs and slamming both straightened and held rigid front legs down to the ground. The dog throws significant weight onto the front legs creating a great deal of downward force.

All of the games played by the study participants were "prey-like" games, i.e., included a quickly moving small virtual object (such as a rat, laser or fish). It is thus not surprising that the tablet-directed behavioral patterns obtained in our ethogram seem to be different types of

either *predatory behavior* or *predatory play*. Predation is the act of an individual or group of individuals of one species (the predator) consuming an animal of another species (the prey), consisting of series of stages: encounter, detection, recognition, attack, capture and consumption. Predatory play is a seemingly aimless manipulation of objects or rapid movements, but in fact may be similar to the first stages of predation without consumption.

The observed actions in the first two ethogram categories, attention to tablet and physically directed at tablet, may all be classified as different types of encounter, detection, recognition, attack, capture, all of which are components of both serious hunting and predatory play. Moreover, *none* of the dogs exhibited key social play postures such as play bow (the front-end-lowered rear-end-up position of play intention posture) and raised forepaw, reinforcing our belief that we are witnessing predatory behavior (either serious or playful). More concretely, the behavioral patterns we witnessed may be classified as fixed action patterns (FAPs) of predatory behavior, rather than social play behavior. FAPs are predictable, genetically predetermined and rigid sequences of behavior, triggered by simple stimuli called *sign stimuli* and resulting in simple responses [13]. Once triggered, these responses are unchangeable and must be carried to completion. In our context the sign stimuli are the virtual objects which have some characteristics of natural prey, such as size and mobility. Due to the fact that FAPs are genetically encoded reflex-like actions, the behavioral patterns in dog-tablet interactions with prey-like digital games are expected to be highly predictable, leaving almost no expressive freedom to the dog.

The third type of actions (not directed at tablet) deserves special attention. We believe that these actions may be signs of nervousness and frustration which take one of the following forms. The first is *displacement (ambivalent) behavior*, which occurs when an animal is in some kind of a motivational conflict between two or more tendencies. If such conflict remains unresolved, this is likely to result in a state of frustration and nervousness. Signs of such behavior which were observed in our data were nose licking (generally considered a submissive behavior, showing ambivalence) and yawning, (if performed not during rest, it is also usually interpreted as displacement activity in ambivalent situations) [12]. The second type is that of aggression redirected towards other targets if the ones engaged in the confrontation are unreachable. The difference between this type of behavior and displacement activity is that in the former the target for the behavior is substituted, rather than the behavior itself. In our observations, redirected aggressions was expressed in situations where dogs playing tablet switched their attention to the hands of their owner during their interaction. This further indicates that aggressive dogs playing with a tablet may be dangerous to their surroundings.

To summarize, it is evident that dogs are easily attracted to “prey-like” digital games. Our results show that such games seem to induce predatory behavioral patterns, which in some cases are related to (serious) hunting and may be stressful and frustrating for the user due to its inability to physically catch the virtual object. Exploring other kinds of games and the user’s reactions to them is a question for further research.

Nevertheless it seems that playing digital games has a potential of improving the dogs' welfare: by cognitive stimulation and enrichment, stress reduction, physical exercise, etc. We plan to further investigate ways for measuring these aspects, using non-invasive methods, such as cortisol level in saliva and heart rate measurements.

Dog-tablet interactions are becoming a part of our everyday life, whether we embrace it or feel ambivalent about it. Even the world's first futuristic smart kennel for dogs designed by Samsung this year features, among paw-operated snack dispenser and a treadmill, also a tablet [14]. Understanding the effects such interactions have on our best friends, and applying new technologies in a responsible and beneficiary way call for multi-disciplinary behavioral research methodologies. It is our hope that this work will initiate a discourse on principles of user-centric digital games design, which aim to improve our furry friends' welfare via entertainment.

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