# Dog: Can you feel it ?

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## Abstract
This paper describes our attempt to make a wearable haptic actuator for dogs and the difficulties we faced while we experimented it.

## Author Keywords
ACI; Haptic; Wearable

## ACM Classification Keywords
H.5.2. [Information Interfaces and Presentation]: User interfaces

## Introduction
ACI is a growing field of research. It aims at monitoring individual or groups of animals, facilitating communication and relationships between the animal and humans, or allowing working animals to better accomplish tasks. In this paper we describe our attempt to make a haptic harness for a dog. This harness does not serve as a means of passing orders, but as a means of rewarding the dog. Rewards are important when working with dogs. Our research aims at working with dogs over a distance, hence giving rewards over a distance is also important.

## Related works
There are several works on how humans can get more information or better information from animals. This is done

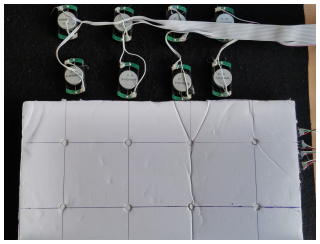

**Figure 1:** On top the speakers stuck to the fabric. In white, the microphones in the input surface

**Figure 2:** The haptic harness on the back of the dog and the input surface being rubbed

in two ways: passively for the animal using passive sensors like GPS for the localization, or by posture detection [9, 5, 1]. It can also be done proactively by training dogs to use a device [3]. There are little research on how humans can give information or instructions to an animal. We have done some work on giving instructions over audio channel [6]. However other channels like haptic sensations are also available. Lee et al. [4] made a vibrating jacket in order to interact with a chicken. Miller [8] uses the vibration to give directional instructions to a dog. The aim of his work is to automatically guide a dog over a field using a GPS and a waypoint systems. It worked well, however the dog need rewards for more than two waypoints.

In our project we give also instructions to a dog over a distance using a collar. Basing ourselves on the work of Miller and Lee, we wanted to give a reward to the dog using an haptic harness.

## Haptic harness

We wanted to give a reward to a dog by rubbing his back wirelessly. We used audio technologies to do it. Sounds are produced by the vibration of the air. We made a prototype using audio exciters consisting of speakers with no diaphragm which can bee stuck to any support. They can generate sound at high frequency or vibration at low frequency.

Our prototype is composed of two grids: a grid of microphones and a grid of audio exciter (Figures 1). 8 microphones and 8 audio exciters allow the spatialisation of the haptic sensations. The microphones record the sound when the input surface is rubbed, patted or tickled. We then use a low pass filter on the recorded sound. Finally the filtered sound is played by the audio exciters. Thus we remove most of the audible sound and keep the vibrating frequency.

## Experiments and Results

Two experiments were conducted, one with humans and the other with dogs.

In the experiment with the humans, we asked 4 persons to wear the belt containing the exciter grid. The exciter grid was placed over the side of the belly. An other person then rubbed, patted and tickled the input surface. They were asked if this sensation was relaxing and realistic. The rubbing didn't feel like a rubbing, but they found the moving sensation interesting. However the patting and the tickling were quite realistic.

For the dog experiment, we tested our prototype on two assistance dogs. We put the exciter grid inside a harness they are used to wearing (Figures 1). We recorded the experiment to see the reaction of the dogs. During the experiment both the dogs didn't show any sign of disagreement and seems relaxed. The aim of this prototype was to reward the dog, however we couldn't determine if the dogs like any of the gestures. Lee et al. [4] used the method of Duncan [2]. They allow the chicken to choose between a red door and a blue door. In case the blue door is chosen, the chicken is left alone. However if the red door is chosen, the vibrating jacket is put on the chicken. The experiment recorded that the door with the jacket was chosen with a percentage of 73%. They also said that they didn't really know if the chicken like the jacket or all the interactions with the humans when they put the jacket on him. We didn't used this method because we thought it would not be relevant to our assistance dogs who are social animals and naturally search interactions with humans.

At the beginning we were confident that the handlers of the dogs could tell us what the dogs felt, as they live with them every day. Surprisingly the dogs didn't seem to care about the harness behind their back. The handlers could

not explain this behavior either. In the end we didn't get an answer to the famous song of the Jacksons "Can you feel it ?".

## Conclusion and Discussion

In this paper we present our prototype of a haptic harness to reward dogs. However, this experiment highlights the question exposed by Mancini [7]: "How are we going to develop a user-centered design process for animals ?". We must think differently when we work for animals than when we work for humans. For our future experiments we will work with ethologists and veterinarians.

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