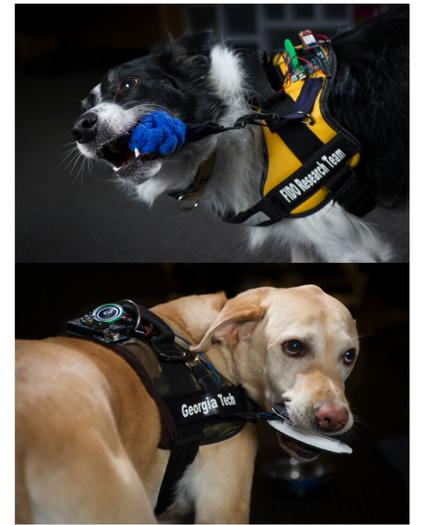


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INTRODUCTION

The *bringsel*, worn by search and rescue dogs to signal the completion of a search, was one of the first wearable devices created for working dogs. Since its adoption, the need for accurate canine operated signaling devices has only increased. As a result of this demand, we proposed wearable interfaces to support a wider range of working dog tasks. To accomplish this, an accurate way to assess the *reachability* of an interface is necessary.

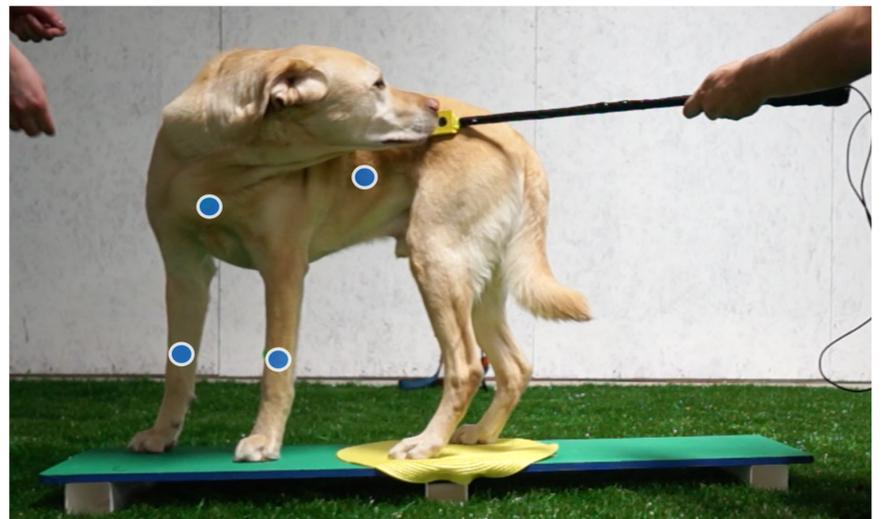


A dog signals to a human using the bringsel.

Previous experiments with wearable interfaces.

METHODOLOGY

In our pilot study, seven placements along the front legs, rib cage, hip and chest were tested with six dogs using an instrumented version of a *target stick*. The successful completion of a touch task was detected by the proximity sensor on the target stick. These sessions were video-recorded for completion, time, and error analysis.



Subject reaches a location while standing on a travel plank.

RESULTS

Any placement above the center of a particular rib was not reachable since the head is angled downwards after a bend. The path taken by the subjects as they got to the midpoint of the rib seemed to support this observation. The error rate and reach time decrease substantially with training. Reach time in milliseconds, averaged for each subject, is shown below.

| Placement | S1 | S2 | S3 | S4 | S5 | S6 | Mean |
|-----------|------|------|------|------|------|------|--------------|
| Right Rib | 720 | 590 | 1024 | 810 | 1689 | 540 | 896 |
| Right Leg | 700 | 900 | 1269 | 890 | 1000 | 946 | 951 |
| Left Rib | 640 | 910 | 659 | 1202 | 1944 | 609 | 994 |
| Left Leg | 900 | 700 | 1053 | 726 | 2269 | 392 | 1,007 |
| Chest | 367 | 502 | 1268 | 826 | 3222 | 648 | 1,139 |
| Left Hip | 1640 | 1080 | 1550 | 1900 | 2222 | 783 | 1,529 |
| Right Hip | 1210 | 2000 | 2024 | 1310 | 3538 | 1108 | 1,865 |

For inexperienced dogs, placements along the front legs had a perceptual advantage over those on the rib(s) and hips. The front legs are within view of both eyes while other placements can only be within view of one eye (for a short period of time while bending the neck). This action is less directed and results in a trial and error approach.

| Placement | S1 | S2 | S3 | S4 | S5 | S6 | Total |
|-----------|----|----|----|----|----|----|-----------|
| Chest | 0 | 0 | 0 | 0 | 2 | 0 | 0 |
| Right Leg | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Left Rib | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Left Leg | 0 | 0 | 0 | 0 | 4 | 1 | 1 |
| Right Rib | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| Left Hip | 1 | 1 | 0 | 1 | 0 | 1 | 4 |
| Right Hip | 1 | 5 | 6 | 2 | 2 | 0 | 14 |