Tactograms for Vibro-tactile Route Guiding

Route Guiding:

Today's electronic navigation devices use either graphical interfaces, voice, or a combination of them for feedback to the guided person, and mostly incorporate GPS technology for position tracking. For walking scenarios a hand-held device is too intrusive, for blind people it is also important to freely use their ears for orientation purposes (no earplugs!).

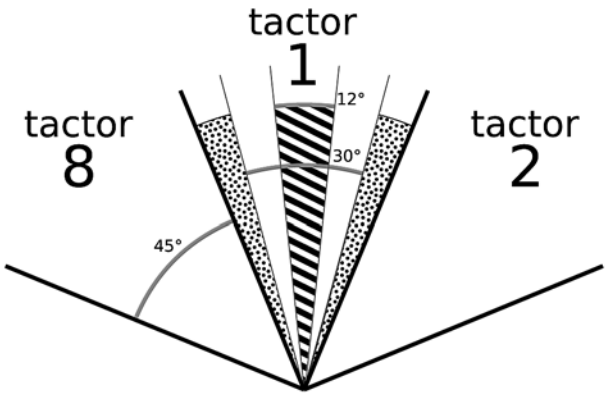
We want to improve the current situation by using the **tactile channel** to provide guidance information with a vibro-tactile belt. This has the key advantages of being 1) **hands-free**, 2) **ears-free**, 3) **intuitive**, 4) **private** (vibrations can only be felt by the person wearing the belt). Traditionally, vibro-tactile guidance system do not provide **situation awareness**, because the user is only informed about the direction of her/his goal. We also want to tackle this problem with encoded **distance information**.

A detailed description is given in "*Time-lag as Limiting Factor for Indoor Walking Navigation*" - 4th European Conference on Smart Sensing and Context (EuroSSC 2009), pp. 24-37, September 16-18, 2009 (to appear)

System Description:

We used the ultrasonic indoor-tracking system InterSense IS-900 and a vibro-tactile waist belt composed of 8 C-2 tactor elements from Engineering Acoustics Inc. Vibro-tactile cues were created using the following parameters, where spatial location encodes direction in all cues:

- ➜ **spatial location** (around the waist)
- ➜ **intensity** (attenuation in dB)
- ➜ **frequency** (Hz)
- ➜ **pattern** (or on/off-rhythm)



Areas for the front tactor (1) where special notification patterns are used in III

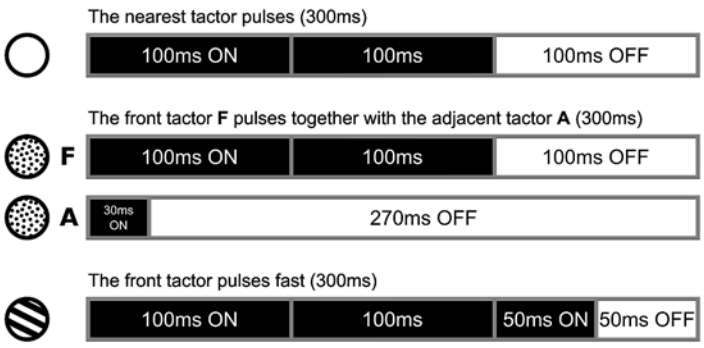
Demonstration:

A simple cue without distance encoding (I), and one simple (II) and one complex (III) cue with distance encoding.

I – Fixed Frequency & Intensity
- ➜ intensity: -0dB
- ➜ frequency: 250Hz
- ➜ pattern: none (continuous vibration)

II – Varying Frequency & Intensity
- ➜ intensity: -24dB – -0dB
- ➜ frequency: 200Hz – 300Hz
- ➜ pattern: none (continuous vibration)

III – Varying Frequency & Pattern
- ➜ intensity: -0dB
- ➜ frequency: 250Hz – 320Hz
- ➜ pattern: complex (see illustrations)



Special vibration patterns for III. In segments with a b/w gradient the tactor state (on/off) depends on the distance to the next waypoint (1.9m are linearly mapped to 100ms).

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