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WindWalker: Using Wind as an Orientation Tool in Virtual Environments

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Problem

- Human skin is the largest human organ
- Haptics (tactile perception) is important for self orientation in the real world

- How could we use wind as an alternative way to communicate spatial information in virtual environments?

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- Approach
  - Hardware
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  - Maze
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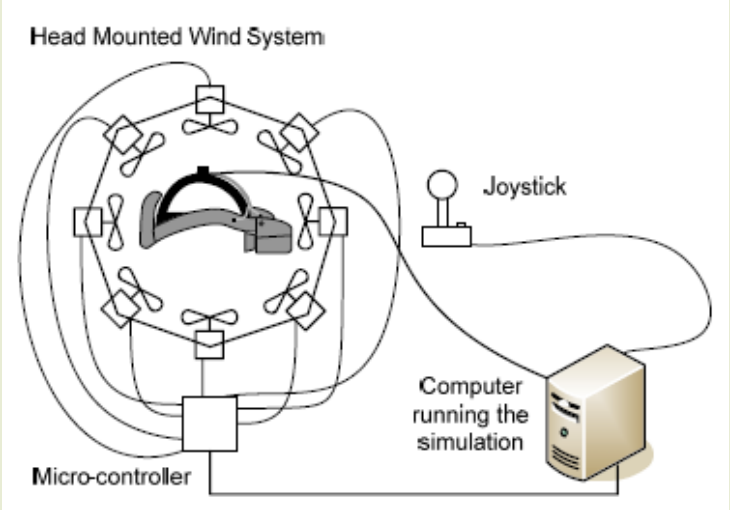
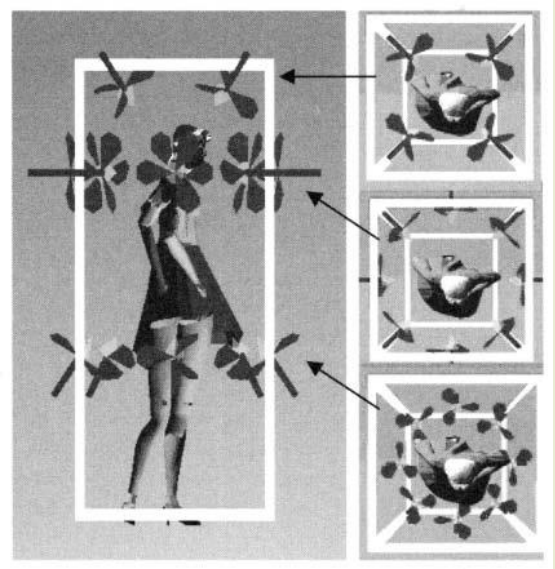
Related Work

- Head Mounted Wind
  - S. Cardin,
  - D. Thalman,
  - F. Vexo
  - 2007



- Wind Cube
  - T. Moon,
  - G. J. Kim
  - 2004



Related Work

- VR Scooter
  - L. Deligiannidis,
  - R. J. K. Deligiannidis
  - 2006

- Ambient Experience
  - PHILIPS

Goal

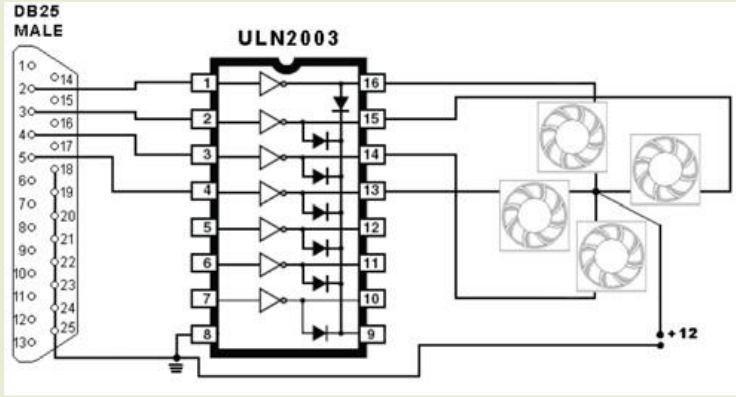
- Evaluate possibilities for the wind to act as a major transsensorial interface in a VE.

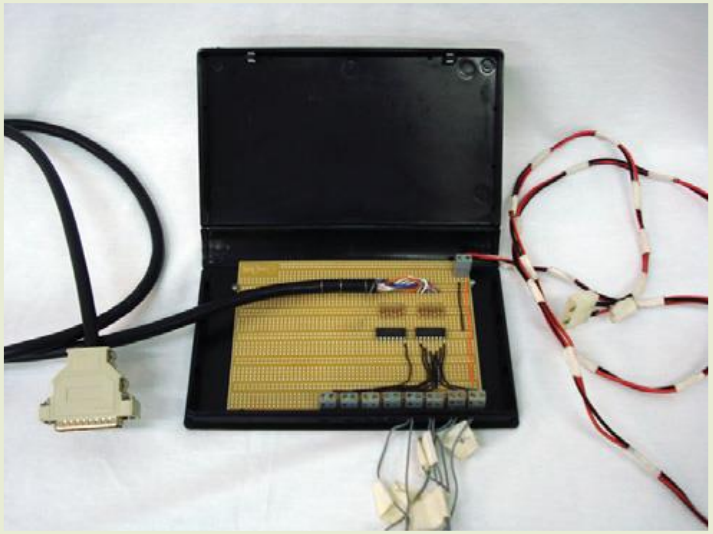
Approach

- Hardware and Software Development
- Tests and Evaluation

Hardware

- Construction
- Operation
- Lowcost / off-the-shelf





Software

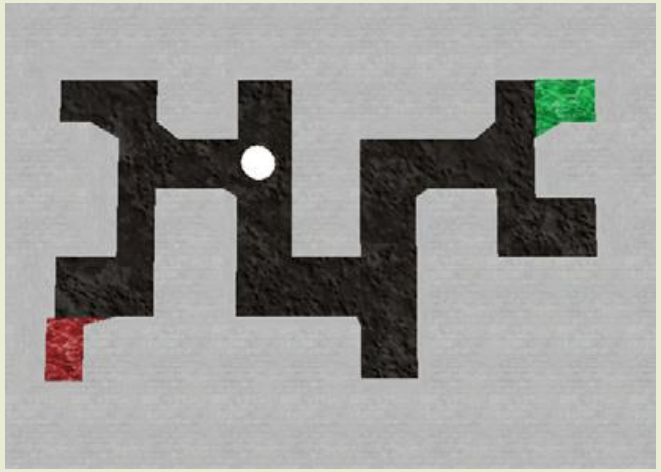
- Board Control

Simple software to control the io library, delivering binary signals to the board *through* the parallel port.

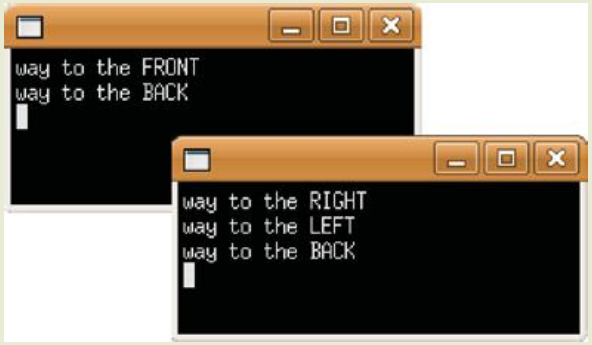
Binary signals are interpreted as pulse/no pulse, setting the fan on/off.

Application

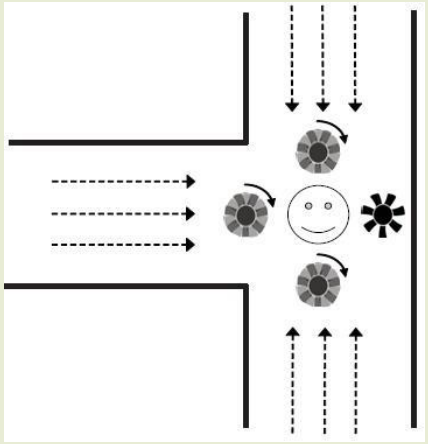
- Game: Find your way out of the maze
  - Three independent interaction modes



Visual (map)



Text



Windwalker

Interaction Evaluation

- User tests (12 volunteers)
- Task: find the way out of the maze
- Independent variable: interface mode
  - **WIND** vs. **TEXT**
- Constraints:
  - Eyes covered (opaque glasses)
  - Ears covered (playing music or talking)

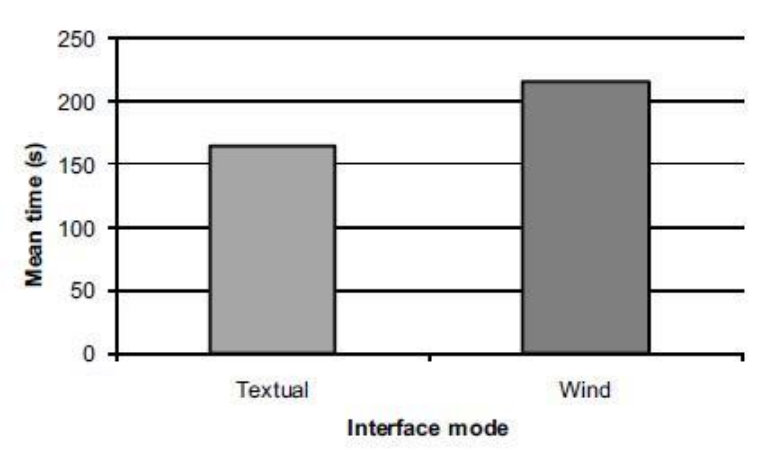
Hypothesis

- The common user is able to orient himself in the environment using only wind feedback.

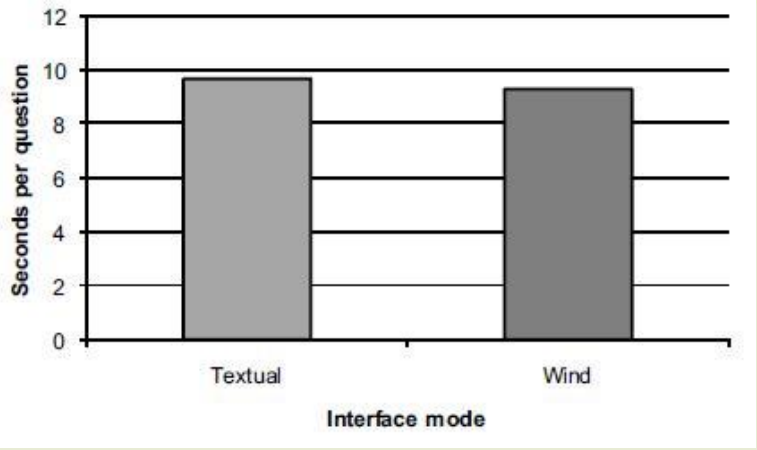
Tests

- Isolated **Text** and Isolated **WindWalker**
  - Cognitive overload test
    - Simple mathematical questions asked while interacting (with either interface)
- Procedure:
  - Select a random maze pattern
  - Free practice with all interfaces
  - For each interface
    - Select a different random maze pattern
    - Perform the test
  - Fill up a questionnaire

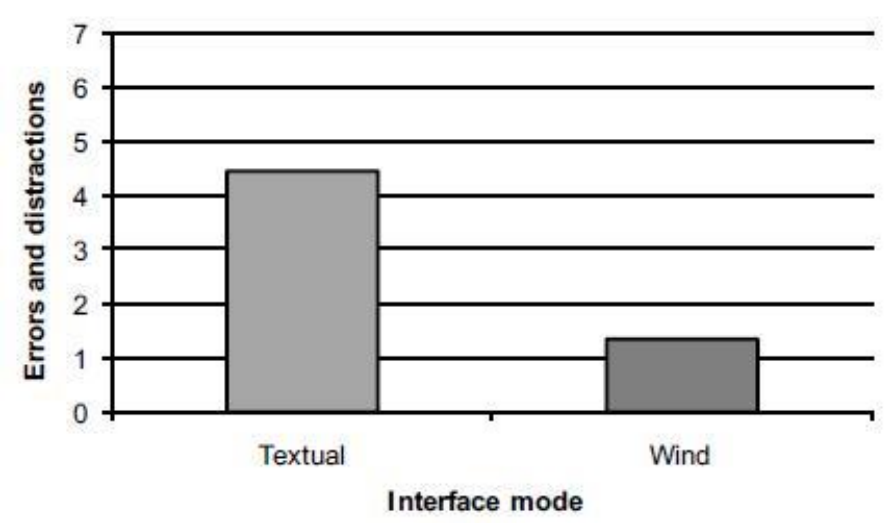
Results



Mean Time to complete the task



Mean time for each mathematical question



Average cognitive errors while performing the task

Future works

- System improvements (H/S accuracy)
- Combine with other non-conventional interaction modes
  - Motion tracking (instead of keyboard)
- Applications for visually impaired people
- Explore other accessibility issues

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