Sonification
Introduction

To introduce sonification with a “crash”, I will refer directly to the slides kindly provided to me for this course by Dr. Thomas Hermann.
A sport for visually impaired

Goalball

Paralympic goalball
Played by visually impaired athletes using a ball with bells inside. It is among the most exciting team sports on the Paralympic programme.

The aim
To score by rolling the ball at speed into the opposition's goal, the opposition attempts to block the ball with their bodies.

9m Width
4 goal judges
2 referees
1.3m tall goal across the width of the court
18m Length

Shades worn by all players
Bells inside the ball for acoustic orientation
Padding - Players well padded for diving saves

Underarm throws at goal up to 60mph

Show video
Sounds for HCl

We will concentrate on a particular application field for sonification. In particular it will be regarding Human Computer Interaction, mainly in the sport field.

Moreover one of the main usages we make of sounds is to convey real-time or quasi-realtime feedbacks.

Sounds act differently on the brain ...
Sensors and sounds

Now I present a few applications of sensing systems, designed or modified to enable the construction of a sonification of sensed data

- SoniFeet
- PdFun
- SofiRow and PERSEO (sample video and audio)
- eMGeeA (sound events)
- SPINE-Sonifier (SPINE on Shimmer + libPD on Android)
- SeeColor Mobile (with Guido Bologna, Geneva)
- Swimming (with Bodo Ungerechts and Thomas Hermann)
Sonification of gait characteristics acquired through a sensorized (pressure) treadmill

Gait is a cyclic 2-phase act:
- contact
- oscillation
SoniFeet 2/3

The used threadmill is the Zebris GmbH FDM-T

Original GUI from Zebris
SoniFeet is now a Client – Server application:

- *server*
  - C++, using proprietary Zebris Drivers to access Hardware, Windows
  - Preprocessing (extraction of main parameters using for the sonification)

- *client*
  - PureData, on Windows, Linux or Mac
  - Sonification of parameters (dual parameter mapping):
    - Position of CoM → Panning
    - Total load → Pitch

Tests of SoniFeet being carried out in Hamburg University and Bad Sassendorf knee and ankle surgery klinik.
PureData Intro
PureData on Android

PdFun is an application developed to explore the possibilities offered by the libPD PureData multiplatform library, executing on an Android phone.

Idea: discover new ways of using and perceiving the signals coming from the sensors embedded in smartphones:
- accelerometer: Maracas, Scooter, Guess
- magnetometer: Magnetic Field
- tilt: Theremin
- proximity: Theremin

Live Demo
Rowing

Some basics of rowing ...
Where to act on humans?
Swimming

Some basics of swimming ...
Web synth

Various software and libraries are emerging in the web: HTML5 exports an API for sound manipulation

http://matt.west.co.tt/music/jasmid-midi-synthesis-with-javascript-and-html5-audio/

http://cssdeck.com/labs/2j1pofsj/

https://dvcs.w3.org/hg/audio/raw-file/tip/webaudio/specification.html

http://codebase.es/riffwave/
References

For a complete reference and introduction to sonification see:
“The sonification handbook” - Hermann, Hunt, Neuhoff

For a more neurology oriented approach to music and sounds see:
“Musicophilia: Tales of Music and the Brain” by Oliver Sacks

Papers on sports and movement oriented sonification:
“Sonification of Pressure Changes in Swimming for Analysis and Optimization” - Hermann, Ungerechts, Toussaint, Grote
“Examining effects of acoustic feedback on perception and modification of movement patterns in on-water rowing training” - Schaffert, Mattes, Effenberg
Experimenting with PD and SC

Best way to learn:
Experiment ...

Next lesson we will use PureData (and maybe) SuperCollider ...
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