Detecting dyslexia

Building a game for dyslexia detection in young children

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Agenda

Detecting dyslexia

Sound and dyslexia

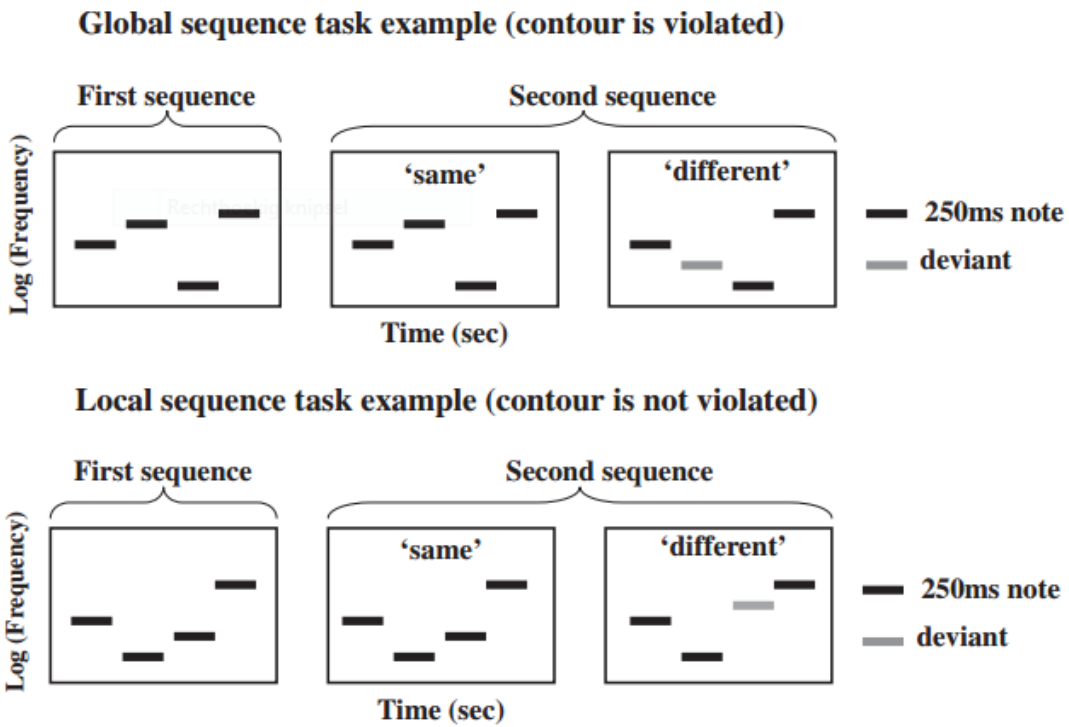
- Children between 8 and 11 years old [4]
- Ability to parse sound correlated with dyslexia

Detecting dyslexia

Sound and dyslexia

- Processing of local/global pitch in 4-tone sequences
- Local, but not global issues in dyslectic children
- Processing of local/global pitch done by different brain parts
- Left hemisphere processes local, right global
- Left hemisphere deficits correlated with dyslexia

Sound and dyslexia



Detecting dyslexia

Test

- Experiment 1: 40 pairs of 4-tone sequences (20 same, 20 different)
- Experiment 2: 30 trials of 2-tone sequences (15 rising and 15 falling)

Detecting dyslexia

Problem

Attention/interest span of young children (ePrime)

Detecting dyslexia

Test issues

- Limits applicability of test
- How about even younger children?
- How about longer/combined tests?

Detecting dyslexia

Our goal

Increase interest of children on the tests to improve focus/duration

Serious games

Serious games

- Let us shift our attention away from dyslexia...
- ...and let us focus on video games instead

Serious games

Serious games

- Let us shift our attention away from dyslexia...
- ...and let us focus on video games instead
- Video games are powerful tools for:
  - Entertainment
  - User immersion
  - Communication
  - Training (both within and without entertaining games)

Training in entertainment games

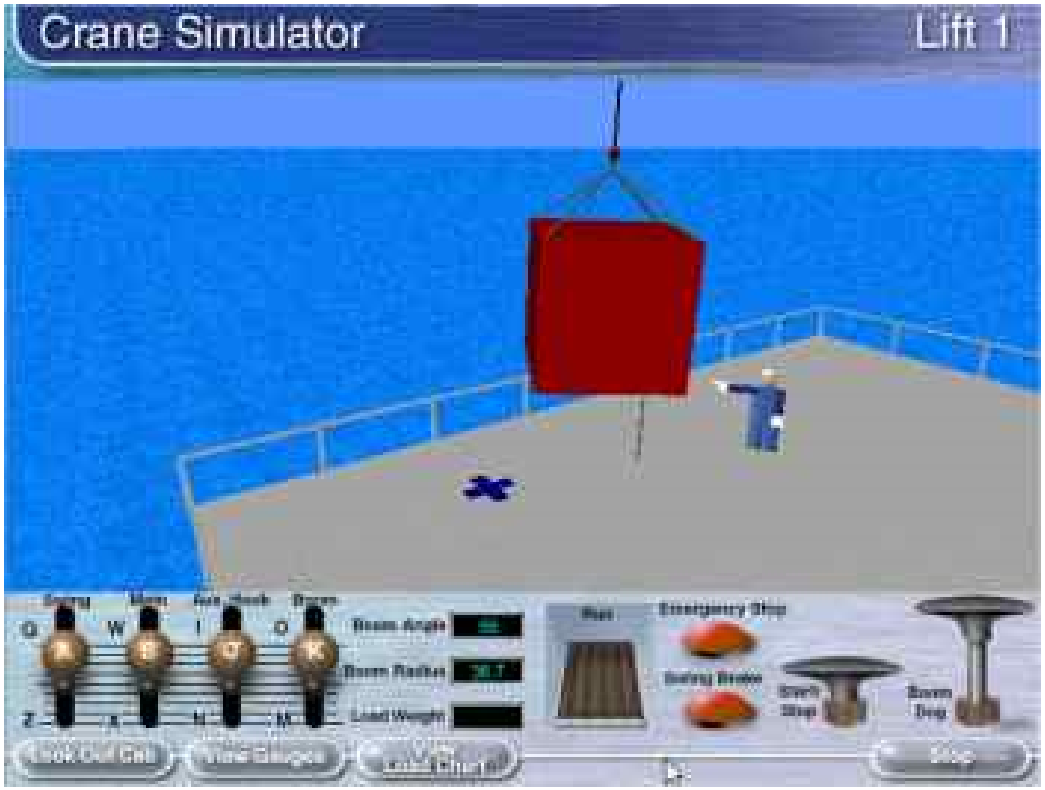
Serious games

Games for training

- As a supporting tool for training [1]
  - *military*
  - *crane operation*
  - *medicine*
  - ...

Serious games

Serious games



Serious games

Serious games

Games for education

- As a supporting tool for education [3]
  - Math
  - Chemistry
  - History
  - ...

Serious games

Serious games

Serious games

The power of games?

What makes games so powerful?

Serious games

Power of games

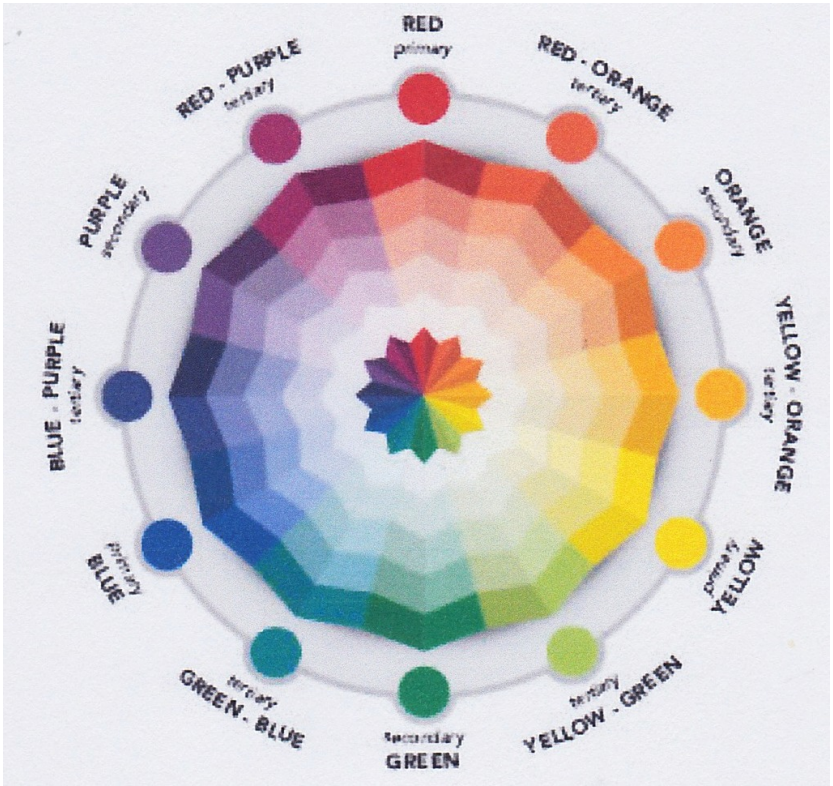
- A large field of literature on the topic
  - Visual gratification
  - Visual metaphor
  - Sense of reward and progression

Serious games

Visual gratification

- Colours
- Shapes
- Visual coherence

Serious games



Serious games

Visual metaphor

- Recognizable items
- Recognizable scenes
- Recognizable actions

Serious games

Serious games

Sense of reward and progression

- Actions have some (meaningful) effect on the world

Serious games

Serious games

Serious games

Our goal

Build a game for testing dyslexia in children

A game for dyslexia detection

Hazards

- **Do not influence the outcome**
  - Avoid rewards for success ("feel bad for being dyslectic?")
  - Avoid implicit bias towards some options and solutions

A game for dyslexia detection

Core idea

- Fable-like theme
- A “generically magical” stroll in the woods

A game for dyslexia detection

Core idea

- Anthropomorphic fox with a trumpet

A game for dyslexia detection

A game for dyslexia detection

Core idea

- Birds try to imitate the sounds

A game for dyslexia detection

A game for dyslexia detection

Core idea

- Determine if the bird imitated the sound correctly or not

A game for dyslexia detection

A game for dyslexia detection

Core idea

- A stroll in the woods (sense of progression)

A game for dyslexia detection

A game for dyslexia detection

Core idea

- Example tasks for initial tutorial session
- Non-verbal, very quick
- Use simple animations

A game for dyslexia detection

A game for dyslexia detection

Additional items

- Touch input for immediacy

A game for dyslexia detection

Additional items

- Touch input for immediacy
- Gathering data for analysis

A game for dyslexia detection

Additional items

- Touch input for immediacy
- Gathering data for analysis
- Customizable experiments

A game for dyslexia detection

Demo

Let's see it in action

Game technologies

Standard technologies

- Support for typical game structures
- Very powerful at capturing typical solutions to graphics, sound, input, and physics issues in games

Game technologies

Standard technologies

- Support for typical game structures
- Very powerful at capturing typical solutions to graphics, sound, input, and physics issues in games
- Unfortunately, they do not really apply to research games

Game technologies

Research games

- Atypical mechanics
- Unclear requirements
  - It is still a research process
  - Researchers expert in their field, not games (opposite applies to us)
  - Even if they sign, they cannot envision product from specifications
  - Even if we make a proposal, we do not fully understand the research

Game technologies

Research games

- We have built Casanova, a programming language for extremely fast prototyping of games [2]
- A different way of engineering games
- When compared with existing engines like Unity 3D, it does not excel in:
  - Performance
  - Physics
  - Graphics
- What it excels in, is development time and flexibility
  - Lots of iteration
  - Strange/unusual requirements

Game technologies

Research games

- **Three whole prototypes**, two entirely thrown away
- Capture the mechanics *by showing them to the researcher*
- Iterative refinement of the requirements
- Art created and integrated only last
- Final price tag was ridiculously low
- Very positive final feedback on *product and process*

Conclusions

Serious games for testing and children

- Testing conditions such as dyslexia is hard...
- ...especially when the subject is an impatient child
- Turn the test into something fun and living through games
- Make such a test really cheap and accessible (home, at school, etc.)

Conclusions

Serious games for testing and children

- Building research games does not match well with existing technologies
- Unusual requirements, intrinsic communication issues with researcher
- We have built our own technology centred around this process
- Make building such games really cheap and accessible

That's it

Thank you!

That's it

With heartfelt thanks to Aske and Pieter for all their support so far.

References I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