

Design of adaptive educational games using Eye-tracking for effective personalization of learning

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Design of adaptive educational games using Eye-tracking for effective personalization of learning

- ◆ Educational game = serious game for learning
- ◆ Serious game = purpose different from entertainment
- ◆ Adaptive = system is dynamically changing over time
- ◆ Personalization = changing system to the needs of user
- ◆ Eye-tracker = device for mapping gaze to computer display



<https://www.tobii.com/learn-and-support/get-started/what-is-eye-tracking>

Motivations

- ◇ Some severely disabled people
 - ◇ cannot vocally communicate
 - ◇ cannot use physical interfaces
- ◇ Research helped
 - ◇ allowing them to access computer games
 - ◇ using adaptive approaches on serious games
- ◇ Not both...

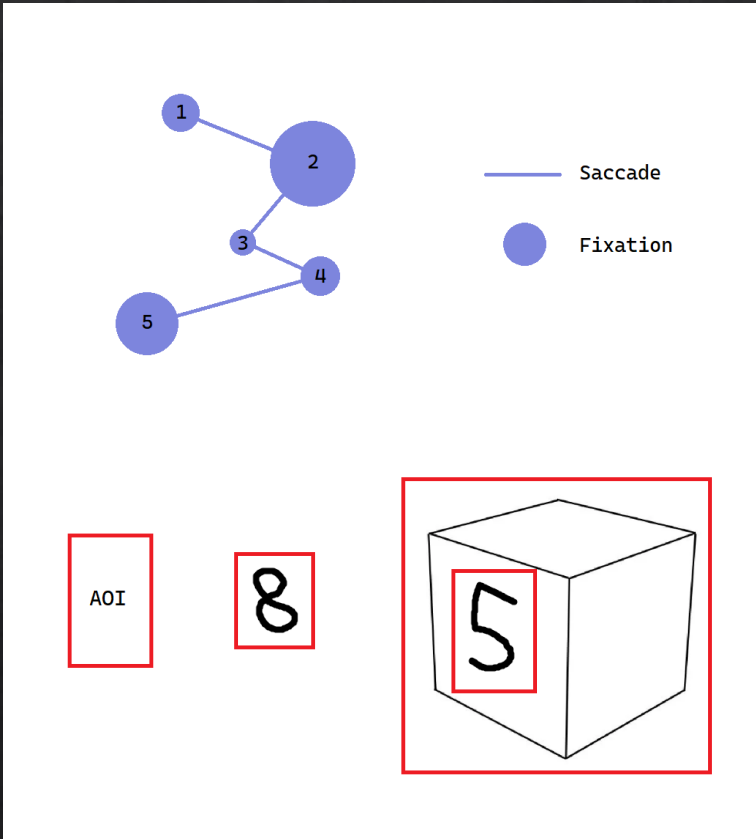


<https://newatlas.com/samsung-eyecan-eye-tracking-mouse/34927>

Motivations

- ◇ We want to
 - ◇ adjust known adaptive techniques with Eye-tracking
 - ◇ improve user experience of Eye-tracking games
 - ◇ increase learning effectiveness of educational games

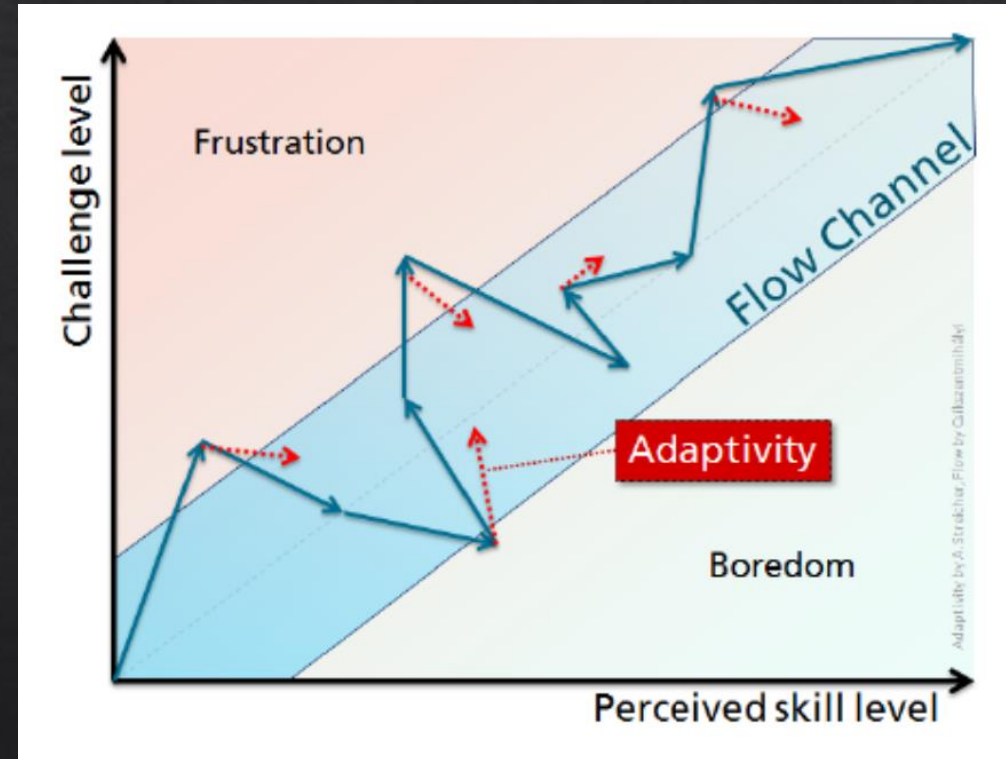
Eye-tracking metrics



- ◇ Area Of Interest (AOI), from the scene
- ◇ Gaze points, as screen coordinates
- ◇ Saccades and Fixations
- ◇ Time spent
- ◇ Visits and Revisits
- ◇ Tracking, ect.

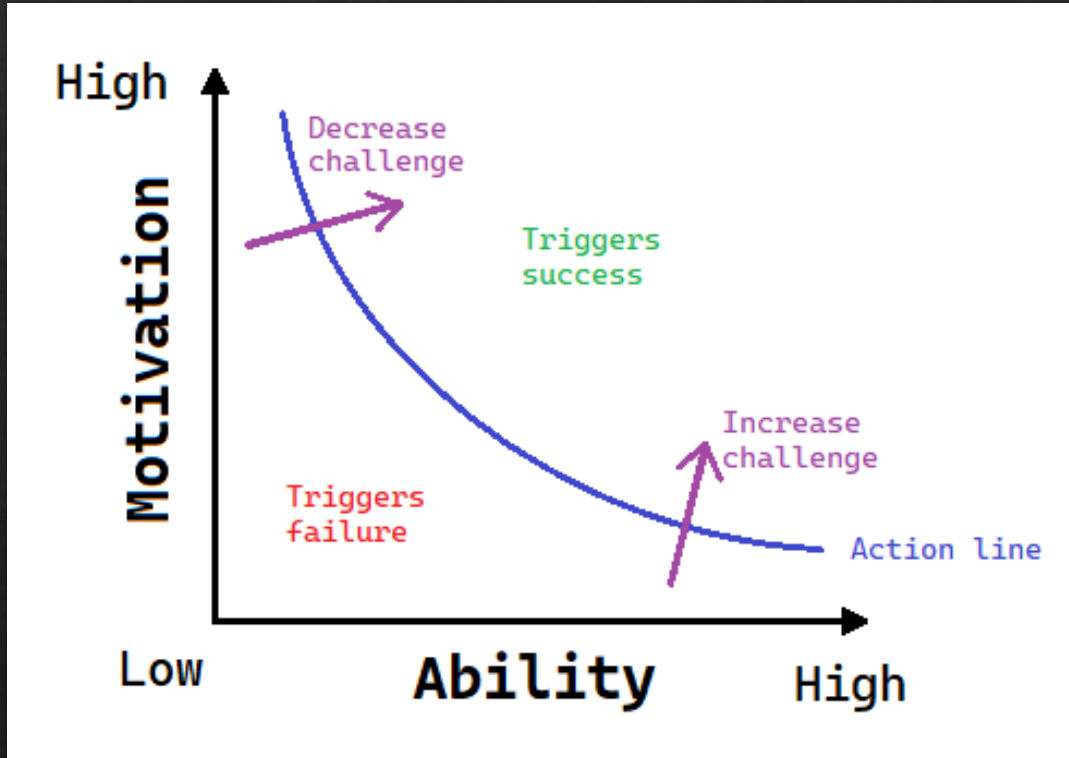
Adaptivity, Flow, and Player engagement

- ◇ Player engagement
 - ◇ Level of immersion to the game
 - ◇ Retaining the player attention longer
- ◇ Challenge the player
 - ◇ Estimate his abilities (heuristics, ect.)
 - ◇ Adapt
 - ✗ Too much → frustration
 - ✗ Not enough → boredom



https://www.researchgate.net/figure/The-Flow-model-based-on-Csikszentmihalyi-24-Adaptivity-dotted-arrow-lines-can_fig9_308901673

Adaptivity, Flow, and Behavior



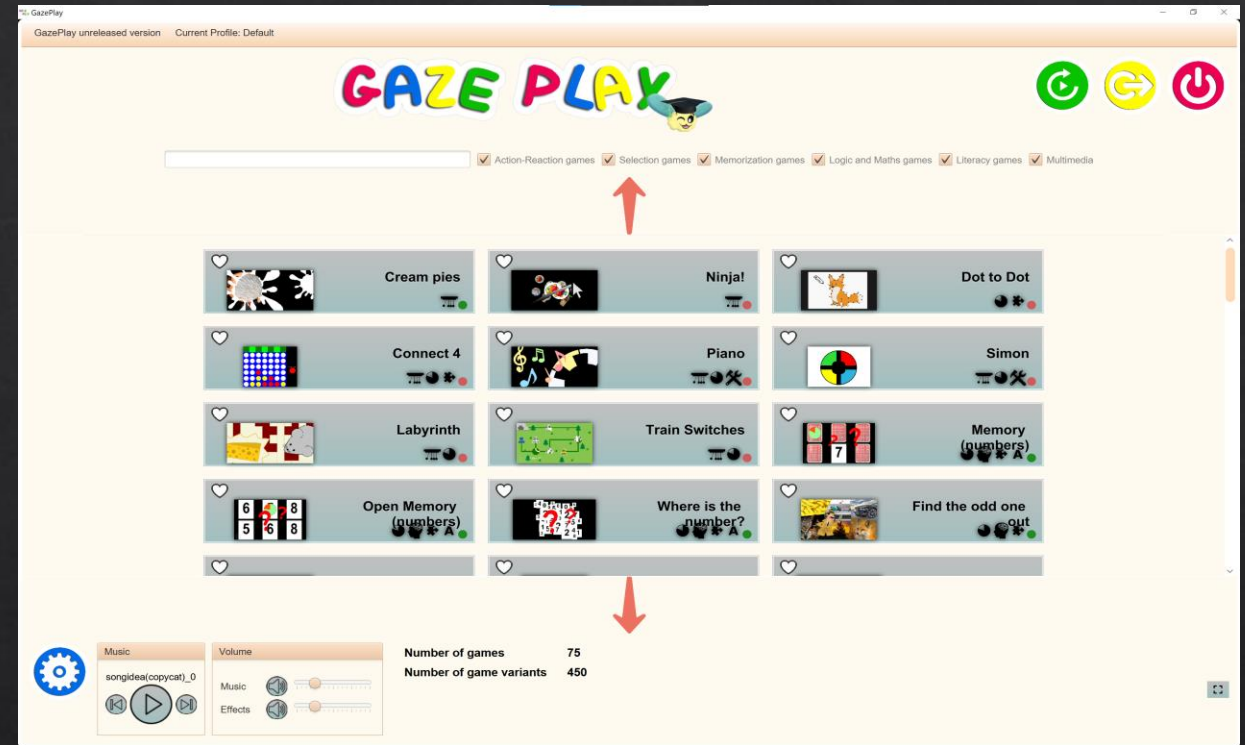
- ◇ Player's behavior towards the game
- ◇ Changing environment
- ◇ Nature or amplitude of the challenge
- ◇ Motivation → player engagement

Some adaptivity techniques

- ◆ Adaptive difficulty
 - ◆ Speed
 - ◆ Spawn
 - ◆ Artificial Intelligence
- ◆ Difficulty trials (proposed)
 - ◆ Short section of peak challenge
 - ◆ Player reaction (Overwhelmed? Calm?)
- ◆ Procedural content
 - ◆ Creating game content through algorithms
 - ◆ What is the favorite feature of the player?
 - ◆ → create more of the sort with variations

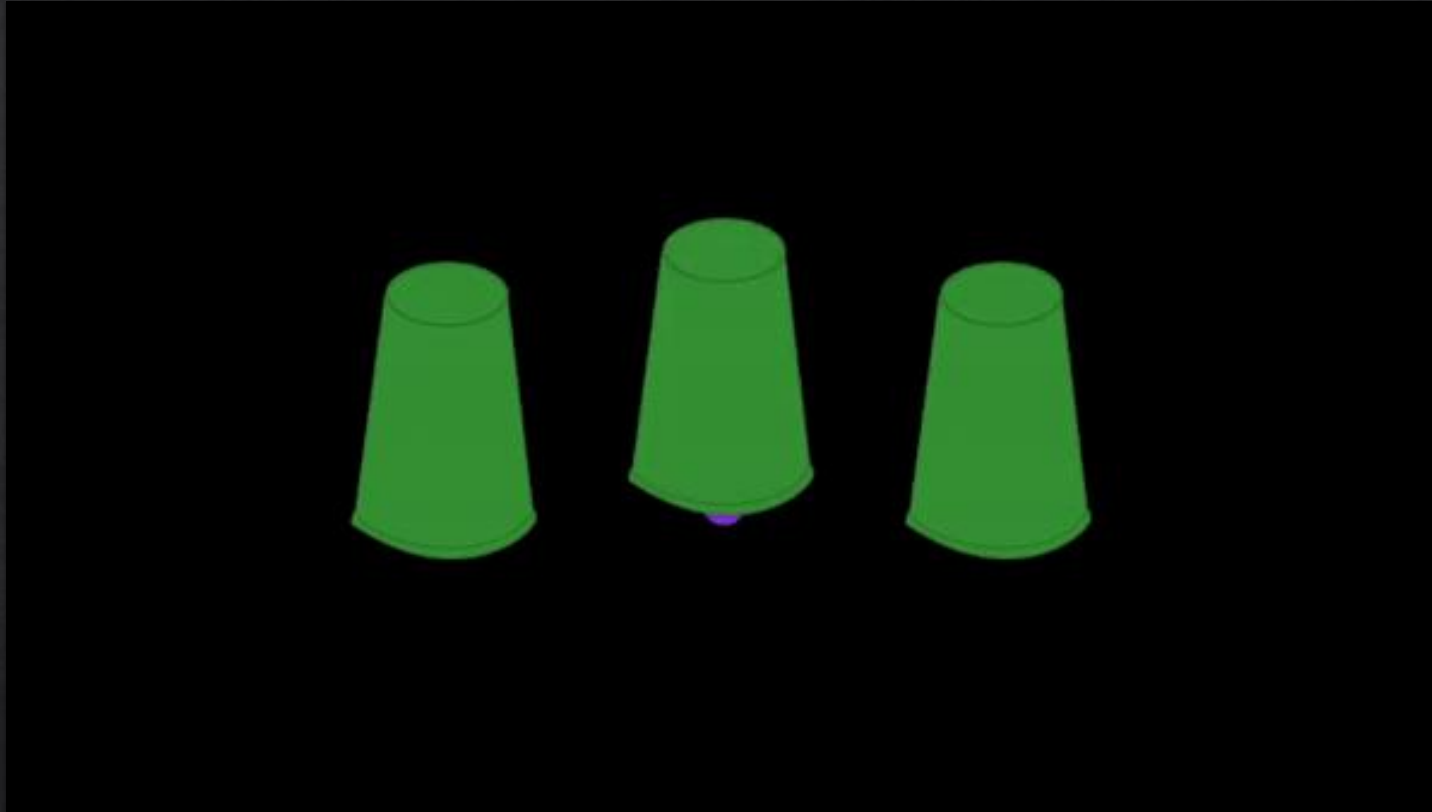
GazePlay

- ◆ Free and open-source software
- ◆ Mini-games playable with Eye-tracking
- ◆ Initiated by Didier Schwab
- ◆ Environment of this work



Screenshot of GazePlay's main menu

Prototype: Cups and Balls



Recorded from the game loaded in GazePlay

Thank you

