Video Games for Visual Interface (Eye-tracking)

• • •

17 June 2019

Presented By:

Wafaa EL HUSSEINI

wafaa.el-husseini@grenoble-inp.org

Supervised by:

Didier SCHWAB

didier.schwab@imag.fr

Outline

- Background
- GazePlay
- Added Games and Features
- Eye Tracking
- Gaze Metrics
- Conclusion and Future Work

Background

- Study Group for Machine Translation and Automated Processing of Languages and Speech
- Specializes in multilingual communication and multilingual information processing in both the written and spoken form, as well as Alternative Augmentative Communication (AAC)

GazePlay: An Overview

- Our project introduces a different form of communication: The Gaze
- An open-source platform offering a large selection of Gaze-based games
- Games are played using an eye-tracker (Tobii, EyeTribe, etc.)

GazePlay: The Problem

- A social and research oriented problem
- Targeted users: Children with motor disability who face difficulties in speaking and writing
- Benefits for these children:
  - Communication
  - Basic Education
  - Entertainment
  - Increased Autonimity

GazePlay: The Platform

- 48 Games
- Simple and easy to understand
- Three Main Gazing Skills:
  - Memorization
  - Selection
  - Action and Reaction

Added Games and Features: RTL Alignment

- The Arabic language is aligned from Right to Left (RTL)
- The focus of the Gaze should always be aligned to the right to be consistent with the language
- Additional HCI decisions related to:
  - The wordiness of the Arabic Language
  - The impact on the font and size

Added Games and Features: RTL Alignment

Added Games and Features: Identify The Letter (1/2)

- A sound-based game
- Player listens to a voice instruction of a letter
- Player should select all instances of a letter to reveal the complete picture and win the round

Added Games and Features: Identify The Letter (2/2)

- Skills achieved from the game:
  - Selection and Memorization
  - A step towards literacy through language learning and memorization
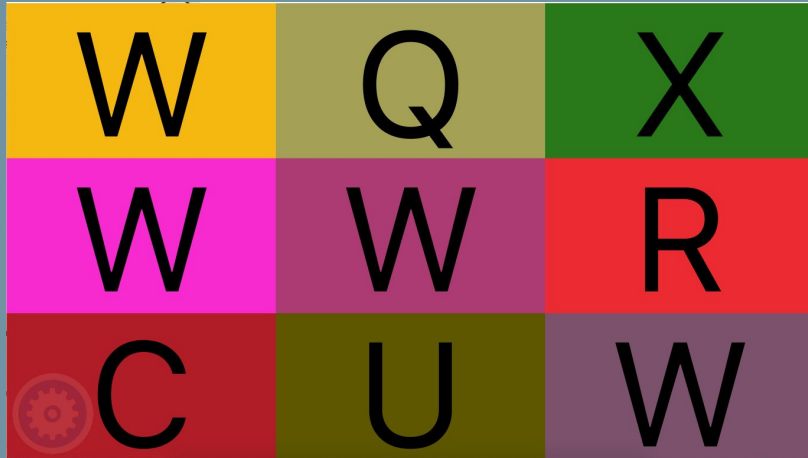
Added Games and Features: Math 101

- Added new games based on the basic math operations
- Games for: addition, subtraction, division and multiplication
- Skills achieved from games:
  - Selection & Memorization
  - New skill: Logical Reasoning
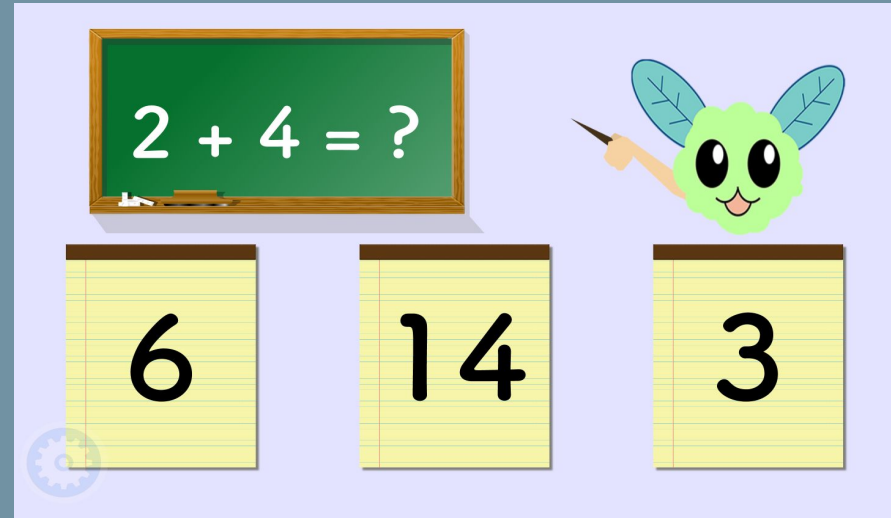
Eye Tracking

- "Eye tracking refers to the process of measuring where we look, also known as our point of gaze." [imotions]
- Based on an eye-trackers
- Valuable information can be retrieved and concluded from the gaze movement

Eye Tracking

Gaze point from participant
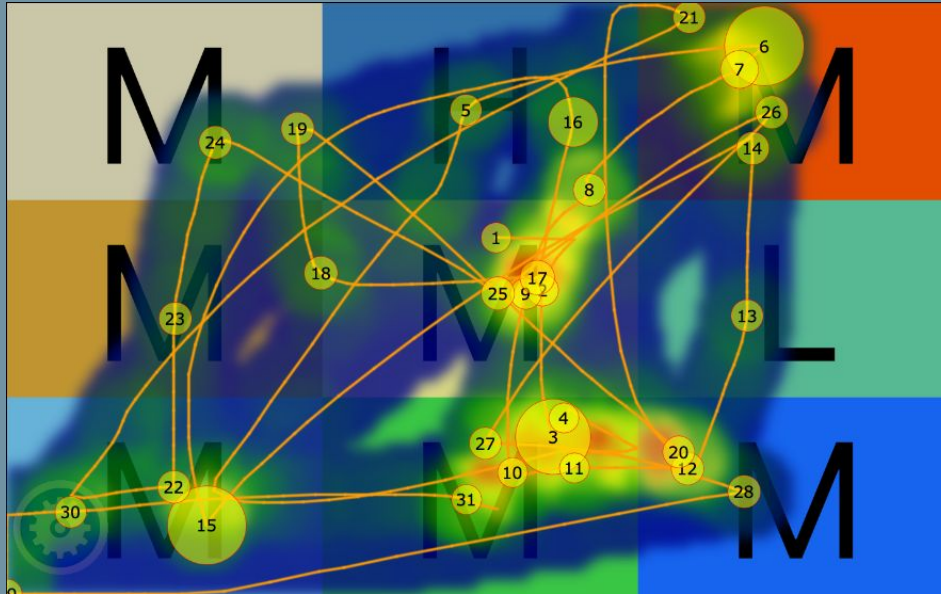
Infrared light from eye tracker
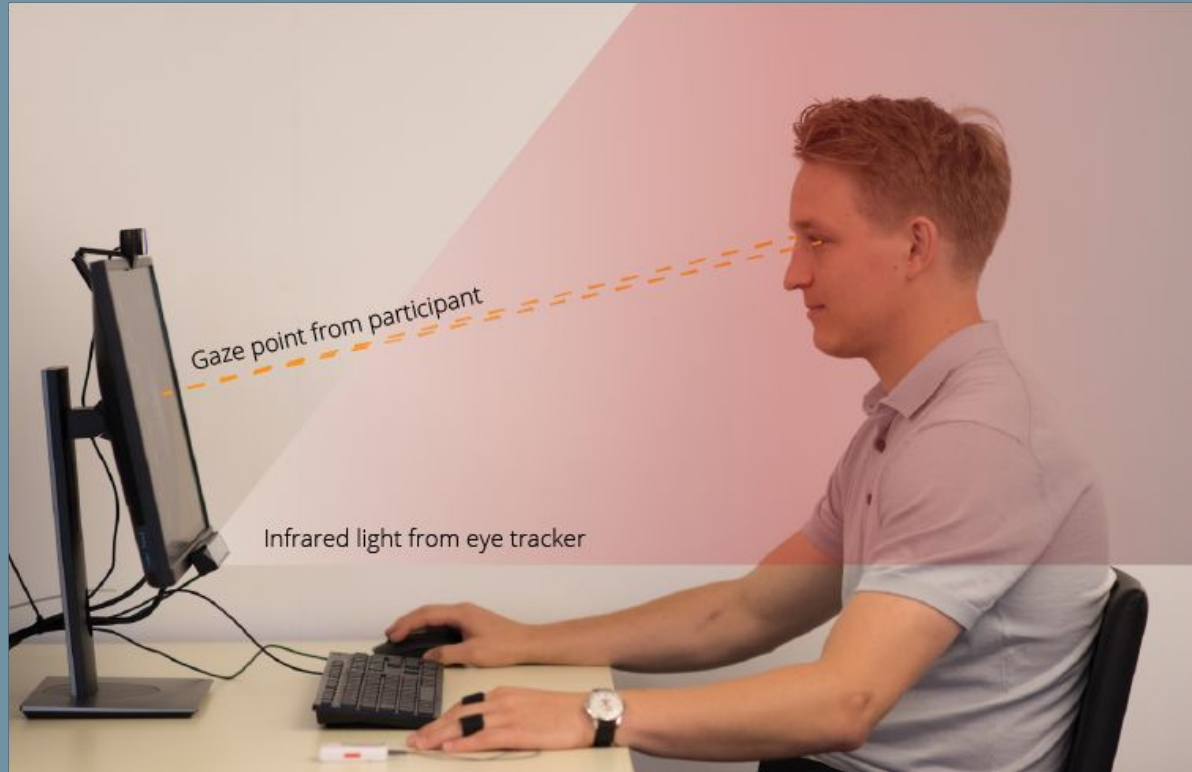
Gaze Metrics: An Overview

- Distinguish two types of metrics
  - Path based metrics
  - Area of interest based metrics

Gaze Metrics: Path-based

- Relating to the path taken by the gaze throughout the gameplay
- Fixation Sequence or Scanpath
- Heatmaps

Gaze Metrics: Area of Interest based

- An Area of Interest (AOI) represents an Area on the screen that is of particular interest
- Several metrics can be computed based on these areas
- We distinguish two types of AOIs:
 - Dynamically computed (Dynamic)
 - Pre-computed (Static)

Gaze Metrics: AOI - Dynamic Vs Static (1/2)

- Dynamically computed at play time
- Needs to be analyzed after playtime to determine AOI function
- Result is a video
- Fit for games with randomly generated layouts or constantly changing layouts

- Pre-computed at game initialization time
- Each AOI has a specific function that is predefined
- Result is an image
- Fit for games with static layouts that do not change over time

Gaze Metrics: AOI - Dynamic Vs Static (2/2)

- Example for the same round of Math 201 AOI definition
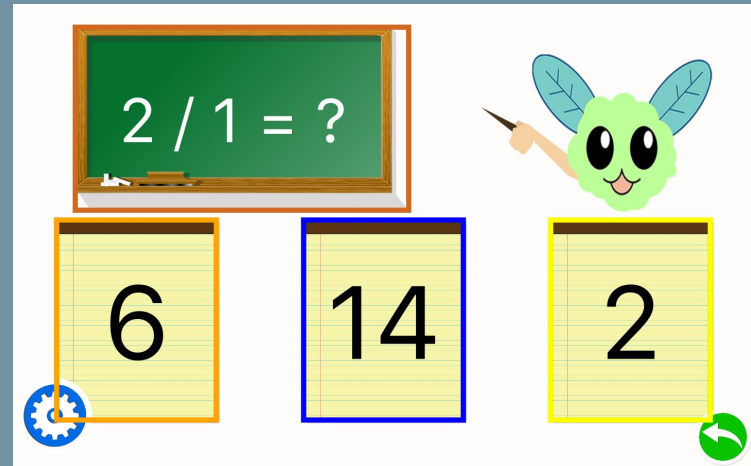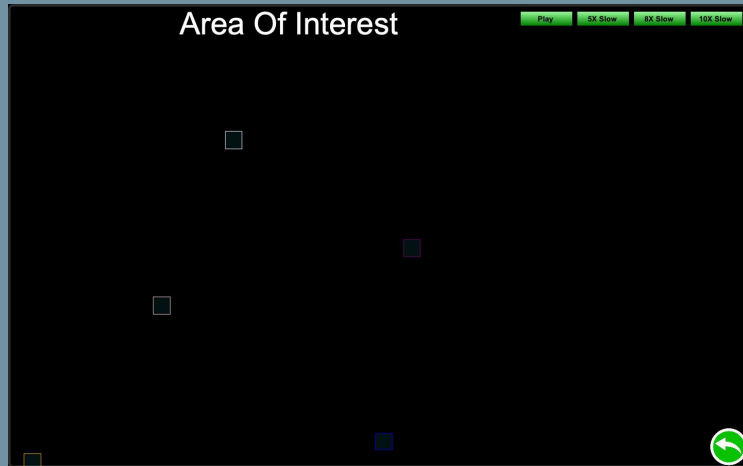
Gaze Metrics: Static AOI

- Some metrics are not relevant for Dynamic AOIs but are relevant to Static AOIs (and vice versa)
- Advantage of static AOI:
  - Automates the analysis process of the extracted data
  - Our users (and their helpers) may not be technologically advanced
  - Allows to better understand the gaze movement of motor disabled children

Gaze Metrics: Static AOI - Example
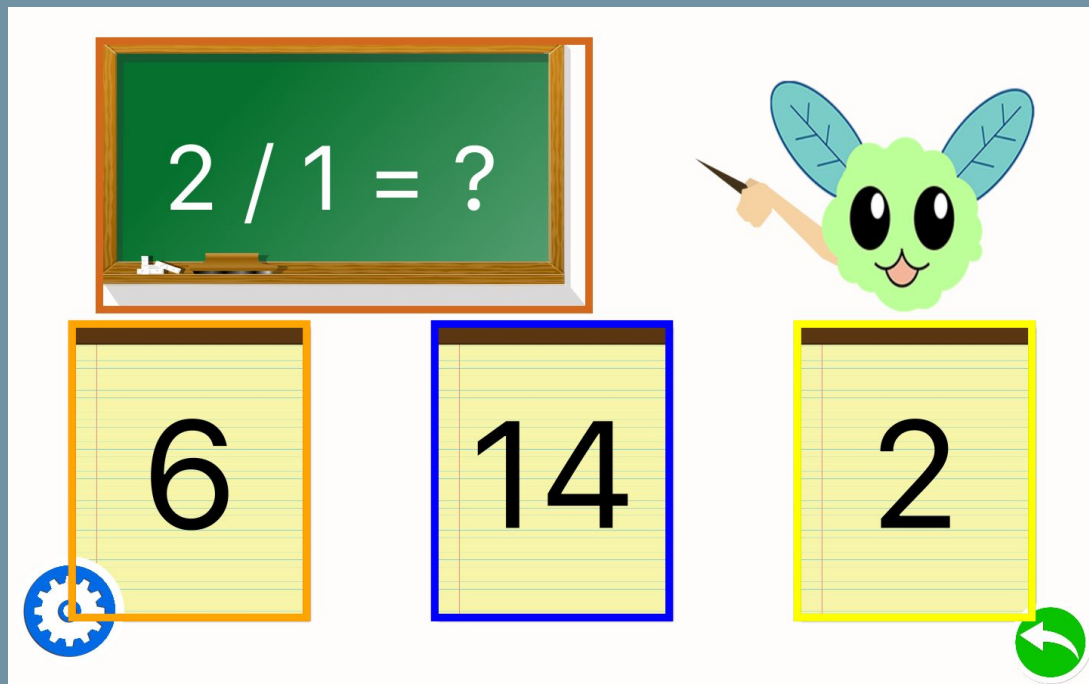
Conclusion

- Importance of GazePlay for motor disabled children
- Importance of Gaze metrics for research and for better understanding GazePlay's target users
- The need for more accurate algorithms for gaze analysis

Thank you!

Questions?