



# Video games programming for visual interface (eye tracking)

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# Summary

- Problem
- Background
- Goal
- Progress
- Summary





# Problem

**Why are we interested into Eye trackers when aiming  
to create video games?**

# Problem

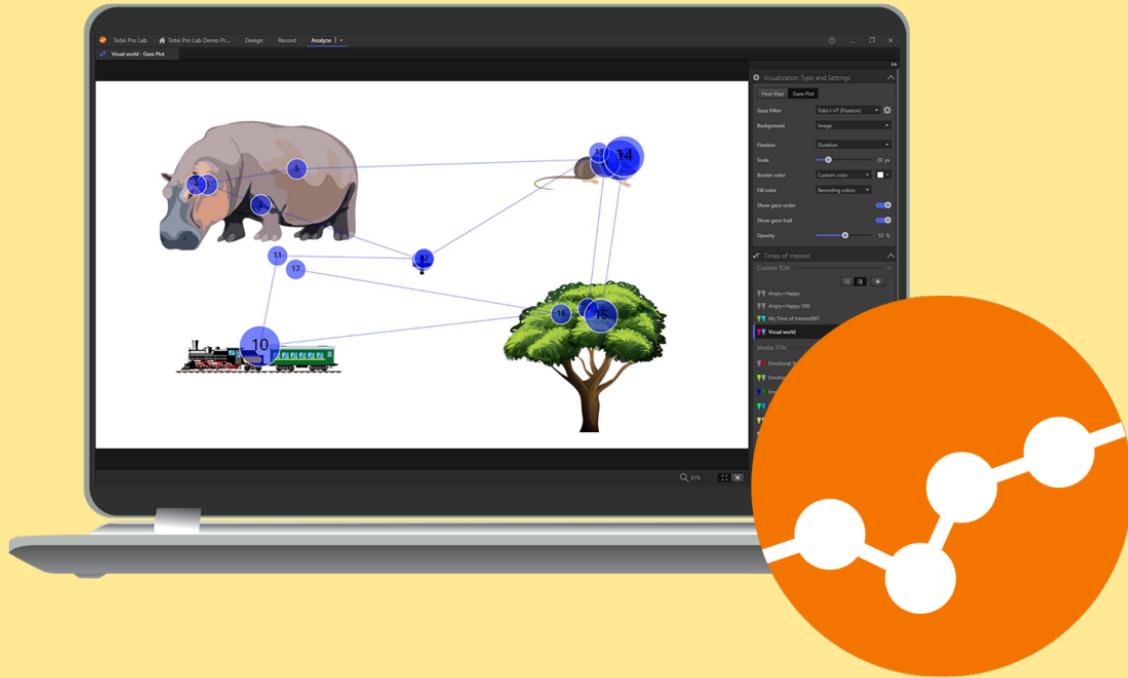
- People with disabilities have limited ability to interact with their environment.
- Traditional interfaces for interaction with the digital world (keyboard, mouse...) are unsuitable for this audience.
- Need to adapt these conventional interfaces to each individual based on his disability.
- Find a good Trade-off between fun and educational .



# Background

# Background

- LIG : Contribute to the development of fundamental aspects of Computer Science.
- Address conceptual, technological, and societal challenges.
- GETALP : Study Group for Machine Translation and Automated Processing of Languages and Speech
- Address all theoretical, methodological, and practical aspects of multilingual communication and multilingual information processing.
- In our case, communication through the Gaze.



# Goal

What are we trying to achieve ?

# Goal(1/2)

- Contribute to the development of Gazeplay (Game platform)
- Develop techniques to have a better understanding of disabled people needs.
- Study disabled users to improve the effectiveness of the platform.
- Develop educational and fun games to improve the use of the gaze.

# Goal(2/2)

- Understand eye tracking metrics ( Area Of Interest, Time to first fixation , heat map).
- Experiment : Testing on real users and analysis of their reaction and feedback using statistics.
- Study of the implication of the interaction method in the environment using statistics.



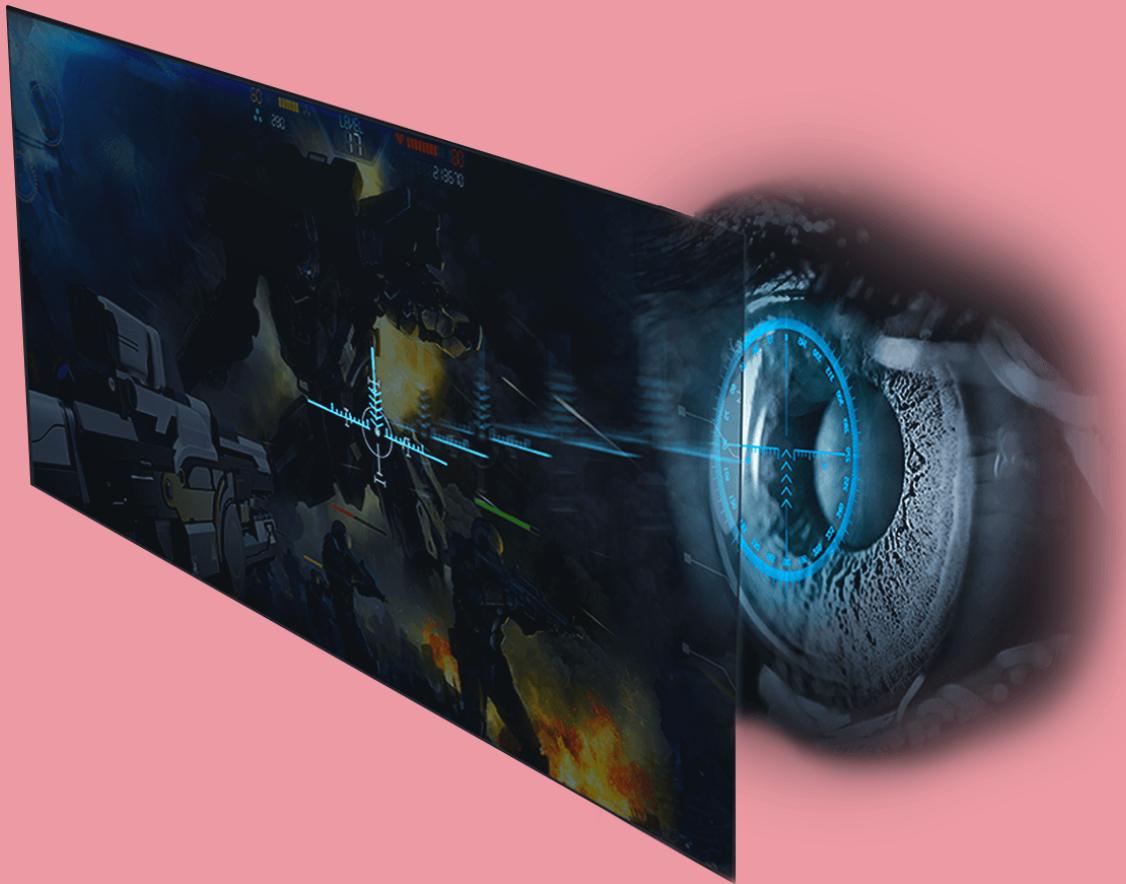
# Gazeplay

# Gazeplay(1/2)

- Free and open-source software which gathers several mini-games playable with an eye-tracker.
- The gaze is the most direct way that enable them to interact.
- Simple and direct interactions to help individuals understand and assimilate the consequences of their action.
- We can imagine games consisting of shooting targets, bricks, card games, memory etc.

# Gazeplay(2/2)

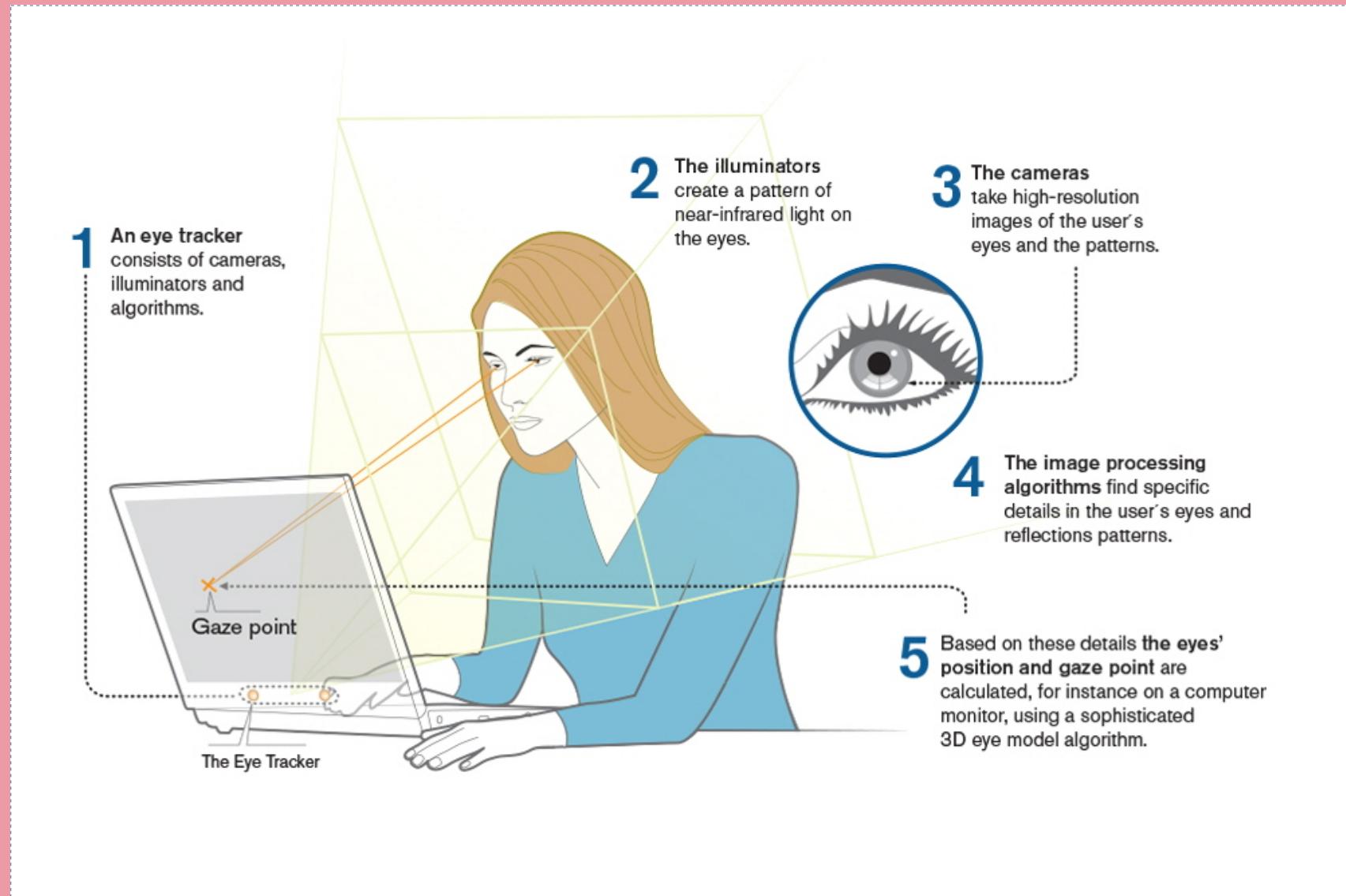
- These games should offer at least two advantages to the user:
  - 1) Allowing him to train his gaze in order to offer him the possibility of acquiring more complex interactions.
  - 2) To entertain him
- More optional advantages of those games could be:
  - Teach him how to aim
  - Teach him Math
  - Train his memory



# Eye tracking for communication

How do we track the gaze using the eye tracker ?

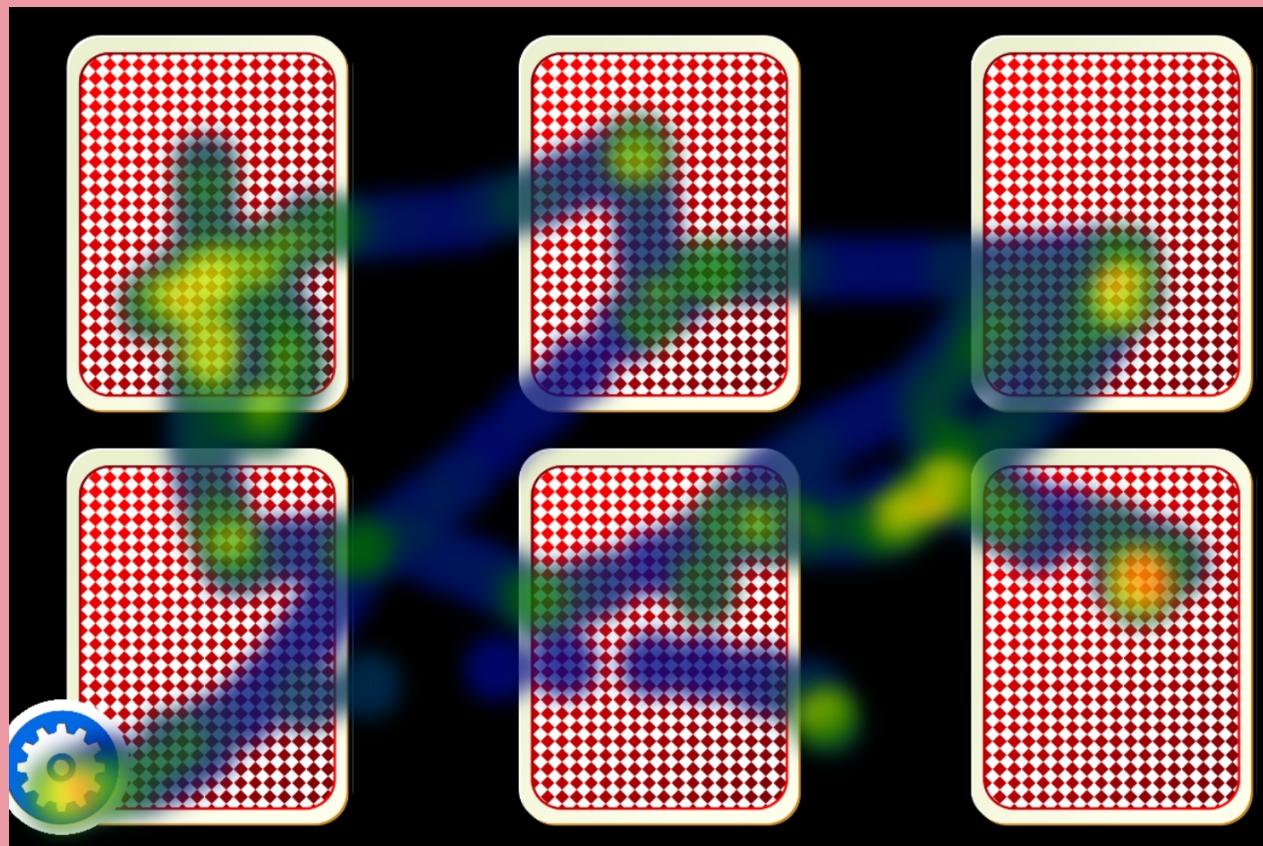
# Eye tracking for communication(1/4)



# Eye tracking for communication(1/4)

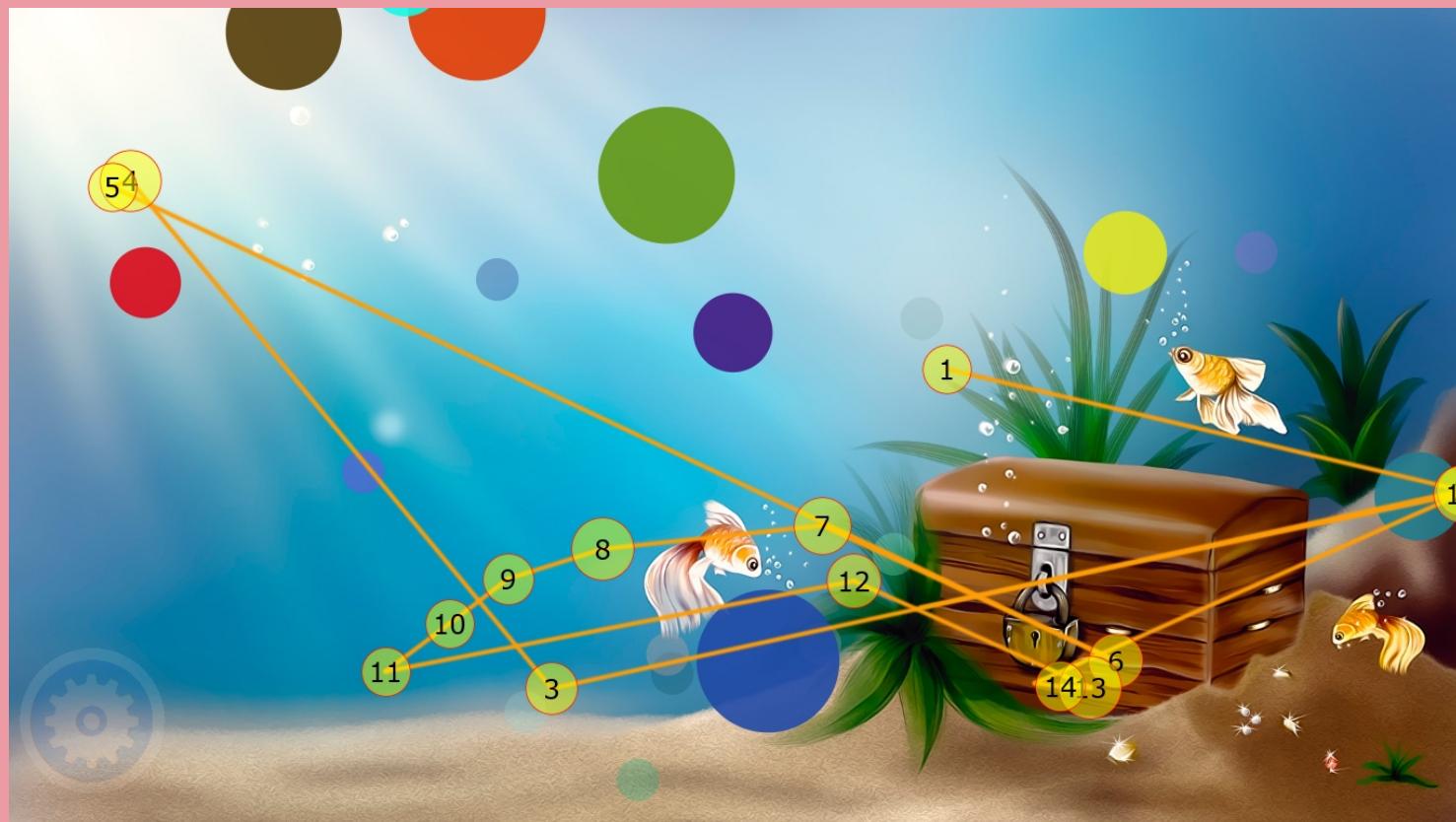
- The data we get through the eye tracker can be analyzed through different metrics:

## 1) Heat Map



# Eye tracking for communication(2/4)

## 2) Fixation Sequence



# Eye tracking for communication(3/4)

## 3) Area of Interest





# Video games for learning

How did we implement our games and why?

# Video games for learning(1/4)

- Create intuitive, logical and coherent games to achieve our primary goal, which is help disable kids in their process of growing up by teaching them basic and vital skills.
- Different tricks used such as instant gratification, challenging games with increasing difficulty.
- 2 Games were implemented for different reasons:
  - 1) Find the odd one out
  - 2) Sliding Puzzle

# Video Games for learning (2/4)

- 1<sup>st</sup> Game Development : Find the odd one out.



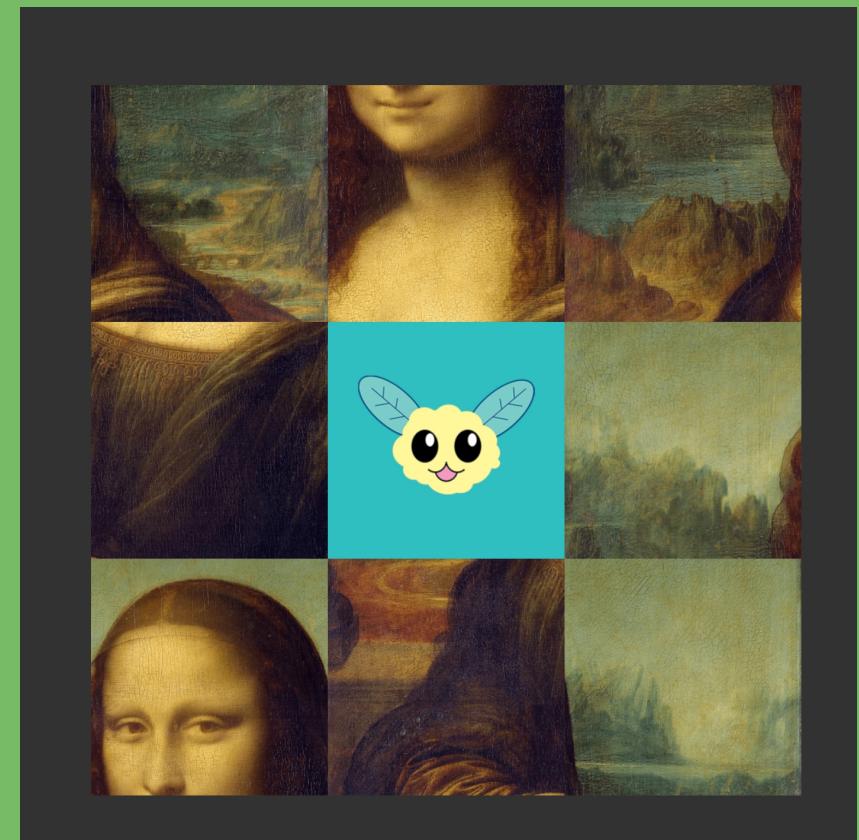
Find the Odd one Out

# Video Games for learning (3/4)

- 2<sup>nd</sup> Game Development : Sliding Puzzle
- A game that could help people attained by Autism spectrum disorder (ASD), develop skills that are hardly attainable in their situation.
- Lack of play skills, Severe ASDs may never progress past the sensory-motor play stage.
- Repetitive play and lack of creativity and imitation.
- ➔ Puzzles, especially computerized “puzzle games,” are quite popular because of being constructive games.

# Video Games for learning (4/4)

- 2<sup>nd</sup> Game Development : Sliding Puzzle



VS



## Gaming stats: Eye tracker Vs Mouse

What input interface is more usable and effective ? Why?

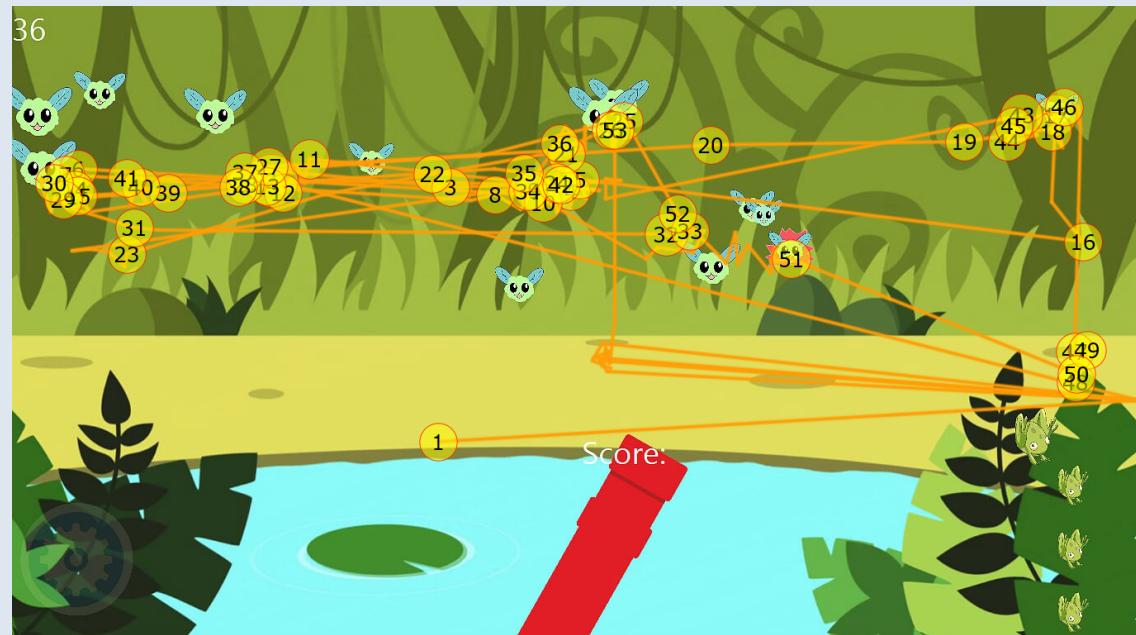
# Gaming stats: Eye tracker Vs Mouse(1/2)

We tested multiple games with the two different interfaces(Mouse and Eye tracker), and got different statistical results :

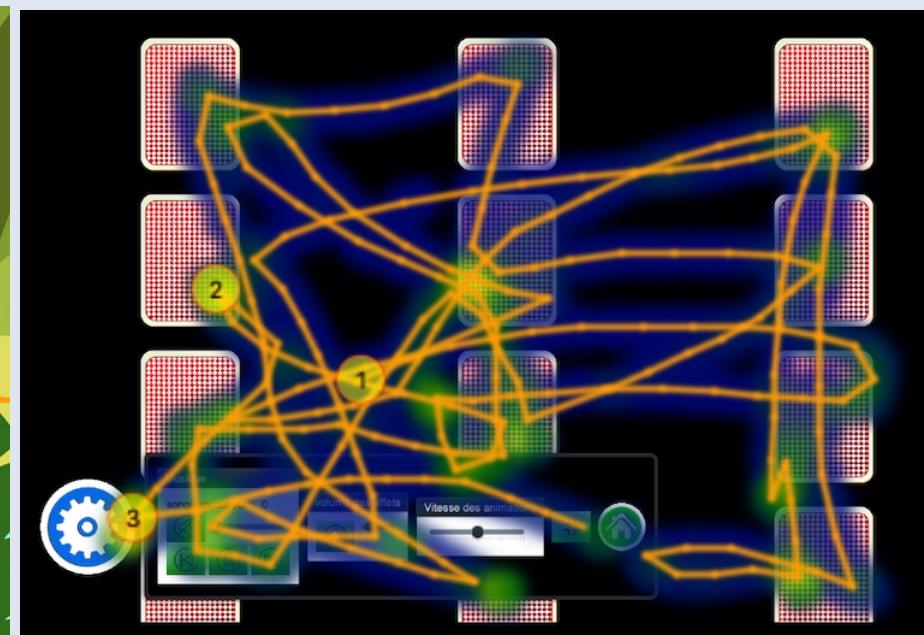
Eye Tracker	Mouse
<b>Game:</b> Biboule <b>Playing time:</b> 1m59s <b>Shots:</b> 313 <b>Success rate:</b> 98% <b>Average reaction time:</b> 375ms <b>Median reaction time:</b> 382ms <b>Standard deviation:</b> 301ms	<b>Game:</b> Biboule <b>Playing time:</b> 2m26s <b>Shots:</b> 533 <b>Success rate:</b> 98% <b>Average reaction time:</b> 271ms <b>Median reaction time:</b> 263ms <b>Standard deviation:</b> 207ms
<b>Game:</b> Memory <b>Playing time:</b> 1m1s <b>Average time:</b> 9s <b>Median time:</b> 6s <b>Standard deviation:</b> 6s	<b>Game:</b> Memory <b>Playing time:</b> 42s <b>Average time:</b> 5s <b>Median time:</b> 3s <b>Standard deviation:</b> 3s
<b>Game:</b> Ninja <b>Playing time:</b> 54s <b>Shots:</b> 15 <b>Success rate:</b> 100% <b>Average reaction time:</b> 1s438ms <b>Median reaction time:</b> 797ms <b>Standard deviation:</b> 1s982ms	<b>Game:</b> Ninja <b>Playing time:</b> 51s <b>Shots:</b> 18 <b>Success rate:</b> 100% <b>Average reaction time:</b> 669ms <b>Median reaction time:</b> 578ms <b>Standard deviation:</b> 229ms
<b>Game:</b> Math <b>Playing time:</b> 42s <b>Score:</b> 4 <b>Average time:</b> 2s271ms <b>Median time:</b> 2s67ms <b>Standard deviation:</b> 608ms	<b>Game:</b> Math <b>Playing time:</b> 1m30s <b>Score:</b> 9 <b>Average time:</b> 1s665ms <b>Median time:</b> 1s898ms <b>Standard deviation:</b> 869ms

# Gaming stats: Eye tracker Vs Mouse(2/2)

Fixation sequence graph for two different interfaces(Mouse and Eye tracker):

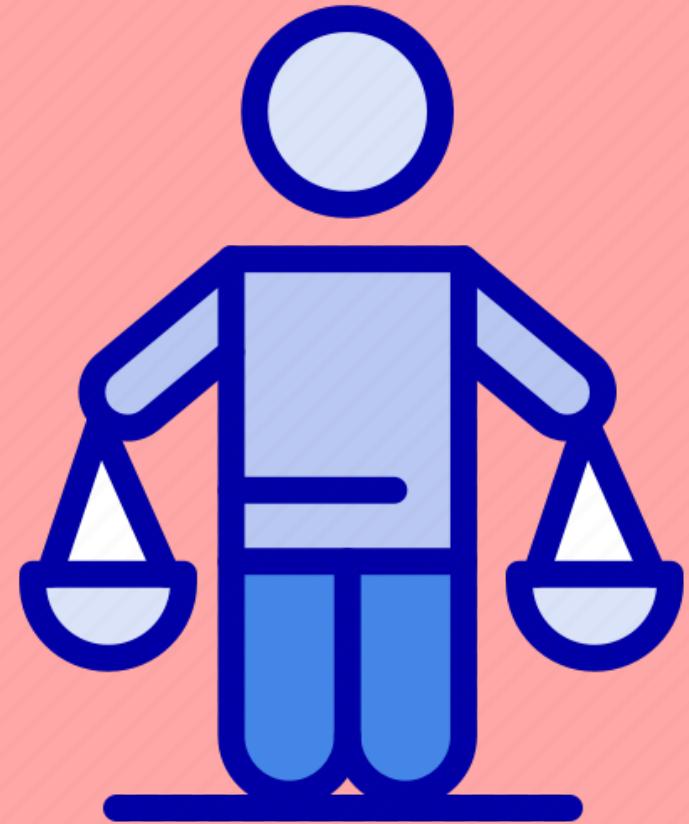


Fixation Sequence (eye tracker)



Fixation Sequence (Mouse)

# Summary



What did we learn ?

# Summary

- Gaze study plays an important role in the understanding of humans interactions.
- Deep study and analysis of eye trackers metrics to understand the complex behavior of the gaze.
- We learned how to understand disabilities to create pedagogical and playful games.
- We understood why the mouse tracking is more user friendly and spontaneous than the eye tracking.

**Thank you for your attention !**

