

# Loud & Clear

The VR Game without visuals

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What is it like to be blind?

There are 38 million blind people

# What kind of challenges do blind people face

- No visual spatial overview
- Identification of objects can be difficult
- Perception of objects can be difficult
- Reliance on touch for dangerous objects

# Misconceptions

But these are very capable people



But these are very capable people



How to combat misconceptions?





[versanthealth.com/visionloss/](https://versanthealth.com/visionloss/) - Diabetic Retinopathy

Sight loss simulators



How about a game?

To foster understanding

# What are the goals?

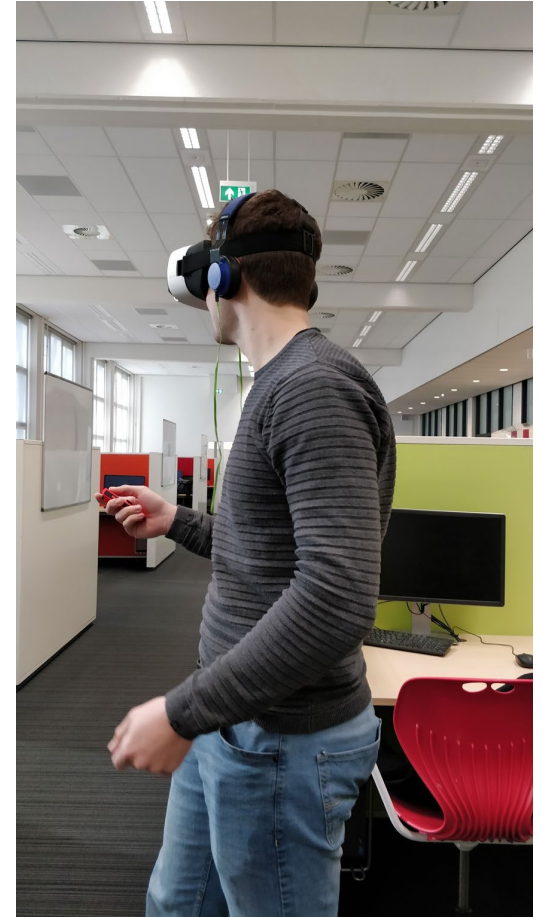
- Increasing understanding & empathy
- Illustrate the blind experience
- Prevent cognitive overload
- Make it approachable for a wide audience

A VR Game...

A VR Game... without visuals

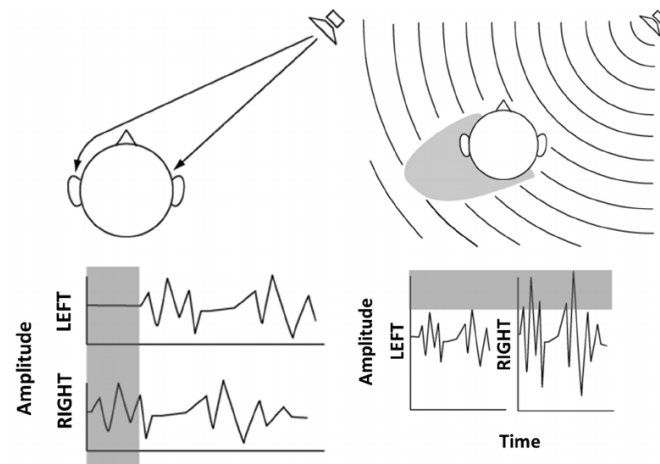
# Loud & Clear

- Audio based puzzle game
- “Escape room”
- Emulate skills & challenges of blind people
- Accessible



# How?

- Audio spatialization:
  - Head-related transfer function
- Orientation tracking
- Careful audio design





# Accessibility

- Runs on cheap commodity hardware



# Accessibility

- Runs on cheap commodity hardware
- Preventing cognitive overload



# Accessibility

- Runs on cheap commodity hardware
- Preventing cognitive overload
- No gameplay based on reflexes

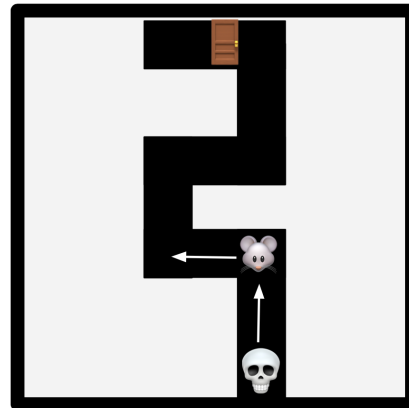
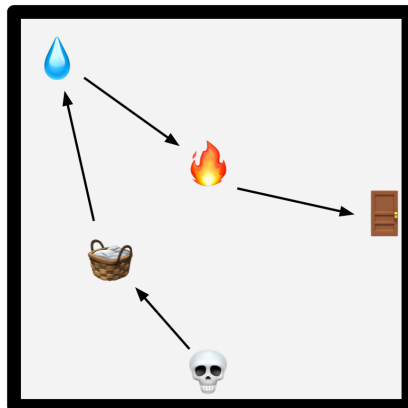
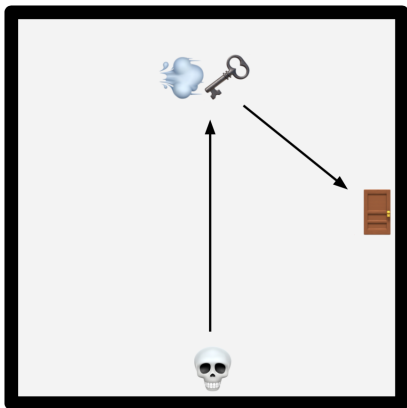


# Skills

- Localization
- Identification
- Spatial awareness

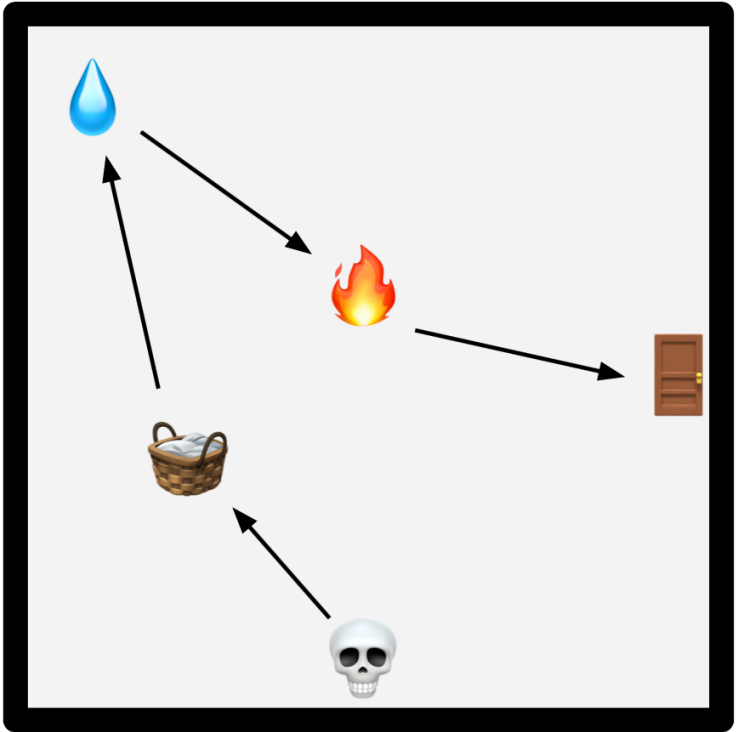
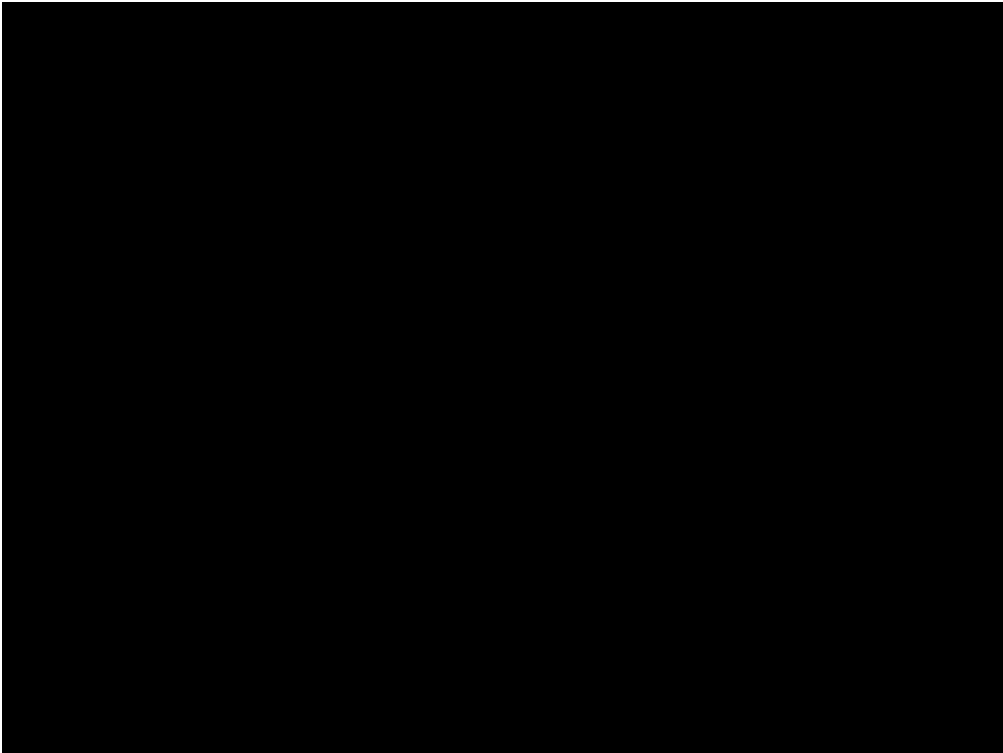
# Levels

- Localization  $\Rightarrow$  Find the key
- Identification  $\Rightarrow$  Extinguish a fire
- Spatial awareness  $\Rightarrow$  Path following puzzle





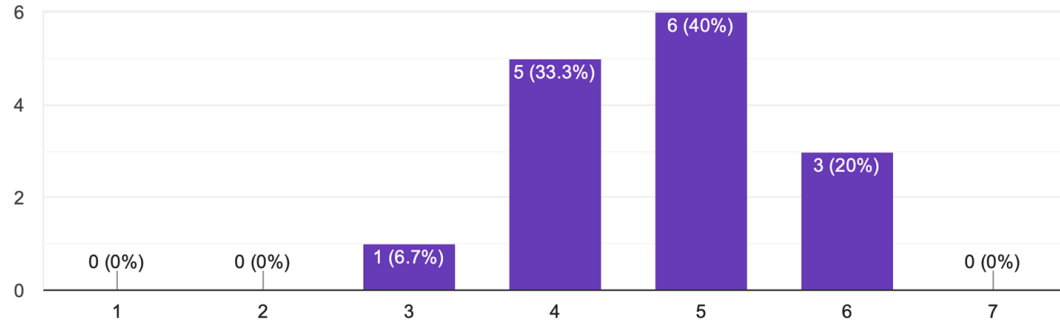
# Demo



# Survey results

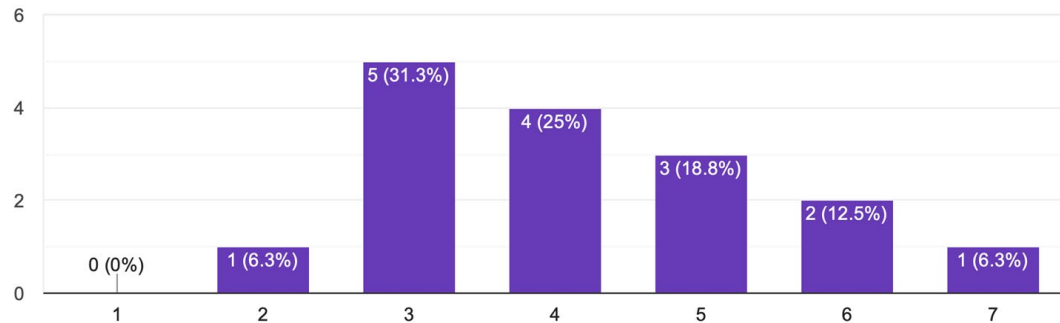
How difficult do you think it is to locate objects only by sound?

15 responses



How difficult was it to locate sounds within the game?

16 responses





# Player remarks

- A new way of experiencing an environment
- Easier than expected
- Estimating absolute distance remains difficult

# Conclusions

- A VR Game for empathizing with blind people
- Puzzles are challenging, but solvable
- Play time: 10 - 25 min
- Sufficient feedback is key

# Future work

- More intuitive control schemes
- Incorporating audio occlusion
  - (Project Triton) “Ambient Sound Propagation” - Zechen Zhang et al.
- Measuring player performance
  - Path walked, Time to goal, Head angle
- Adaptive guidance
  - Need to be careful with Dynamic Difficulty Adjustment

Games can change sighted people's  
perception on blindness

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