Supporting Object-level Exploration of Artworks by Touch for People with Visual Impairments

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INTRODUCTION

Goal:

- To enable people with visual impairments to explore and understand artworks independently

Our Approach:

- A touchscreen-based mobile application which plays object-level verbal descriptions upon users' touch

RELATED WORKS

- Location-based audio guidance [1-4, 6]
  - Requires users to visit the exhibition sites in person
- Multimodal exploration with 2.5D tactile representation [5, 7]
  - Requires a custom device per painting

PROTOTYPE

Figure 1. The original and its visualization of segmented painting examples with 'The Starry Night' by Vincent van Gogh which was used in our study.

- Main feature: Provides object-level information upon touch
  (e.g., "A cypress tree, painted black, located on the left side of the painting")
- Supported VoiceOver gestures
- Implementation
  - Manual object segmentation and descriptions
  - Developed as a web application using
    - HTML, CSS, JavaScript, and D3.js

VoiceOver HTML CSS Javascript D3.js

USER STUDY

- Semi-structured interview study using our prototype

Participants

- Eight participants with visual impairments
- All participants were male, age = 41.8 on average (SD = 10.7)

PID	Age	Visual Impairment (best eye)	Onset Years	Screen Reader Use
1	44	light perception	2	N
2	53	light perception	6	Y
3	59	low vision	3	N
4	30	light perception	7	Y
5	32	totally blind	30	Y
6	47	low vision	8	Y
7	35	light perception	1	Y
8	34	low vision	32	N

Procedure

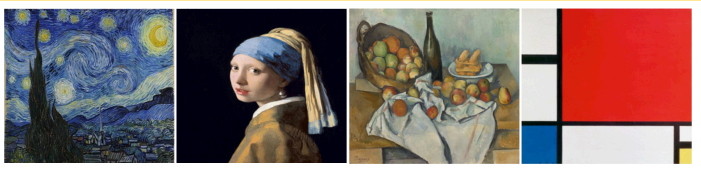

Figure 2. Four paintings used in our study with varying genres (landscape, portrait, still life, and abstract)

- Participants were asked to:

1. freely explore different genres of paintings using our prototype
2. describe each painting and provide their personal opinions

FINDINGS

Exploring Objects in Paintings by Touch

- Exploring paintings by touch while listening to verbal feedback was highly appreciated (P2 & 5-8), and enabled participants to understand the shape (P4 & 7) and location of objects (P6 & 7)
  "*It is hard to imagine what it (painting) looks like just by listening to descriptions. [But with this] I can grasp where things are by touching them with my finger.*" (P7)

Painting Encyclopedia

- Participants felt like they have gained knowledge of the painting as if reading an encyclopedia (P3 & 5)

Greater Access to Paintings

Participants valued our prototype as it enables them to:

- Save time and money since visiting a museum is not necessary (N = 5 and 4, respectively)
- Imagine what each painting looks like without sighted person's help (P4-8)
- Access paintings at any time they want and as much time as they need at their own pace (P3, 5 & 6)

Suggestions for Improvements

Participants wished our prototype to provide:

- Relative attributes of each object such as position and size (N = 5)
- Distinguishing features, painting styles and textures, overall mood (N = 2), and experts' opinion (N = 1) of paintings
- Links to relevant artworks (N = 2)

CONCLUSION

Our prototype can help people with visual impairments to freely explore and learn various paintings more in detail with object-level descriptions as well as spatial information such as position and size.

Future Work

- Multimodal interaction
- Collective intelligence by crowdsourcing
- Automation of segmentation through machine learning

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