Gestures by Children and Adults on Touch Tables and Touch Walls in a Public Science Center

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Motivation: The Project

Touchscreen Tabletop Computer

Touchscreen Wall-Mounted Computer

Motivation: This Study

Touchscreen Tabletop Computer

Touchscreen Wall-Mounted Computer

Related Work: Large Display Touchscreens for Groups in Public Spaces

- Block et al, CHI 2015
- Evans et al, CSCW 2016
- Hinrichs & Carpendale, 2011
- Hinrichs et al, 2008
- Horn et al, CHI 2012
- Hornecker, Tabletops 2008
- Marshall et al, CHI 2011
- Peltonen et al, CHI 2008
- Piper & Hollan, CHI 2009
- Rick et al, IDC 2009
- Rogers & Lindley, Interacting with Computers 2004
- Ryall et al, Tabletops 2006
- Schneider et al, CHI 2012
- Scott et al, CSCW 2004
- Shaer et al, CHI 2011

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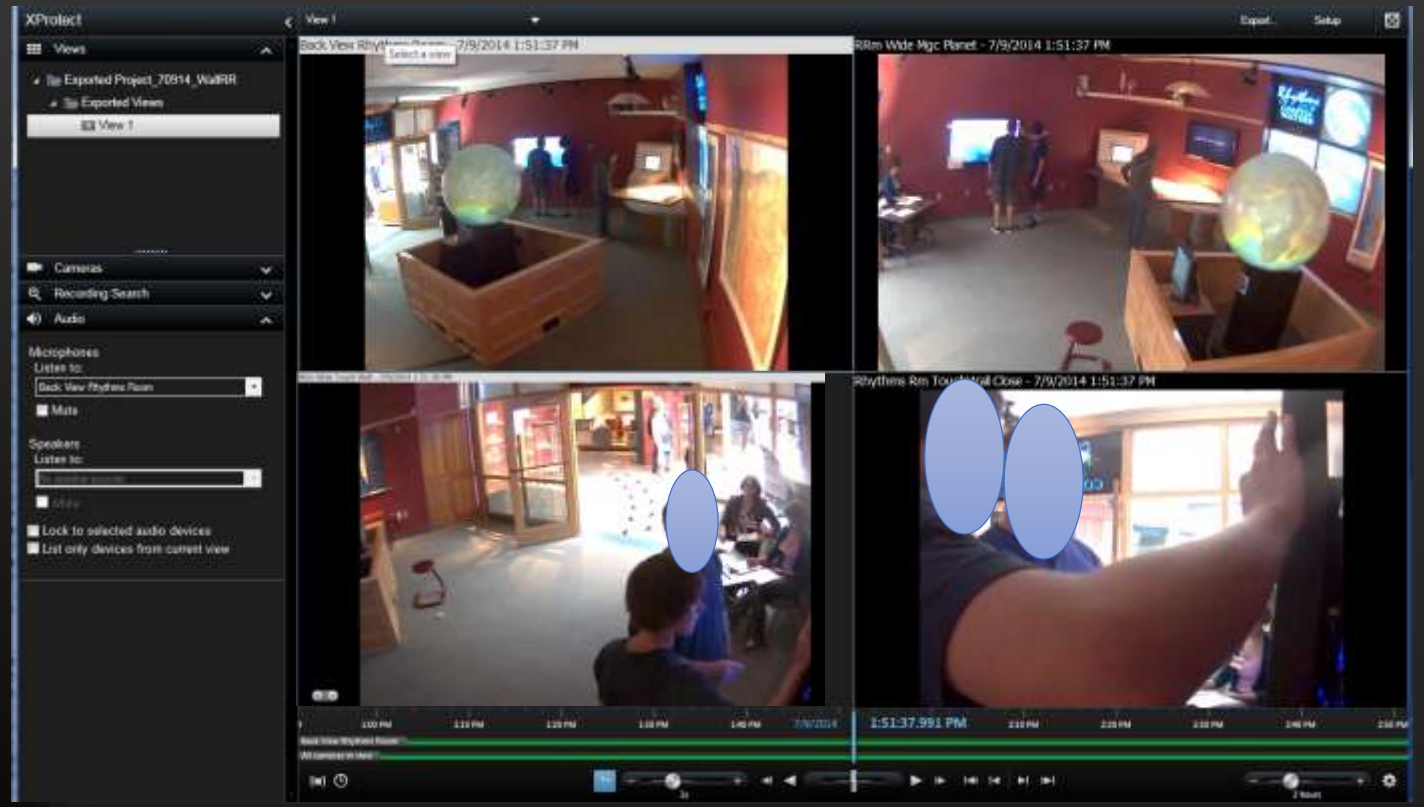
Study Design

Observation Software Interface

Camera View 1

Camera View 2



Camera View 3

Camera View 4

Study Design

Google Earth Interface

Research Questions

- What are the types and frequencies of different interactions for each platform?
- What are the affordances and constraints imposed and offered by each platform?
- How do interactions differ between children and adults?

Data Collected

Gestures by Platform and Visitor's Age Group

	Adult (N = 37)	Child (N = 24)	Teen (N = 5)	Total (N = 66)
Table (N = 37, 37 min)	573	467	29	1069
Wall (N = 29, 52 min)	534	368	485	1387
Total (N = 66, 89 min)	1107	835	514	**2,456**

7% of gestures were completely or partially occluded from view

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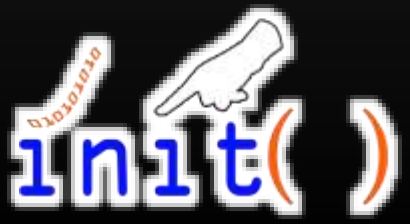
Note about recordings….



Interaction Findings

Children were more likely than adults to try new gestures

interaction video from study here – removed from public archive of slides for participant anonymity

child attempts a circular gesture on the onscreen widgets

Interaction Findings

Users prefer two-handed, multi-touch gestures on touch wall vs table

interaction video from study here – removed from public archive of slides for participant anonymity

an adult male uses both hands on the touch wall

Interaction Findings

Users prefer simple ergonomic gestures

interaction video from study here – removed from public archive of slides for participant anonymity

an adult male rotates his right hand counterclockwise

Interaction Findings

Children tend to use more fingers in their gestures

interaction video from study here – removed from public archive of slides for participant anonymity

two children use all fingers on both hands on the touch table

Interaction Findings

Others Described in Paper

- **Gesture Types**
  - Not different by platform or child vs adult
- **Gesture Directions**
  - Most frequent direction is “toward me” / “down”
  - Adults performed more circular gestures
- **Hands**
  - Right hand used more to make gestures than left hand (one-handed gestures only)
  - Right hand used more often on touch table; left hand more often on touch wall
  - Splayed hand posture more common than tucked
    - Majority splayed: “pinch-in”, “swipe-arc”, “other”
    - Majority tucked: “point to screen”, “tap-single”
  - Splayed hand posture more common on touch table, and tucked more common on touch wall
- **Contact Points**
  - Single touch interactions (one hand, one finger) outweighed multi-touch interactions
  - Multiple fingers used more often on right hand than left
  - Index finger most frequently used – over all gestures regardless of hand, number of hands, number of fingers, age, platform, etc
  - Fewer combinations of fingers or individual fingers used on left hand than right hand
  - Adults use middle finger three times more often than children in one- or two-handed gestures
- **Globe vs Widget**
  - “Swipe-straight” most common gesture on globe, “tap-multiple” most common on widget
  - Children never used widgets on touch wall (inaccessible)

Design Implications

- Provide full support for **standard touchscreen gestures**
- Consider use of "**lesser fitting**" gestures for new features
- Allow **simple gestures** to result in big actions
- Favor **vertical interactions** over horizontal
- Consider **children's tendency to explore** and try unexpected gestures
- Treat **multi-touch and two-handed gestures** similarly to single-touch and one-handed gestures

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Limitations and Future Work

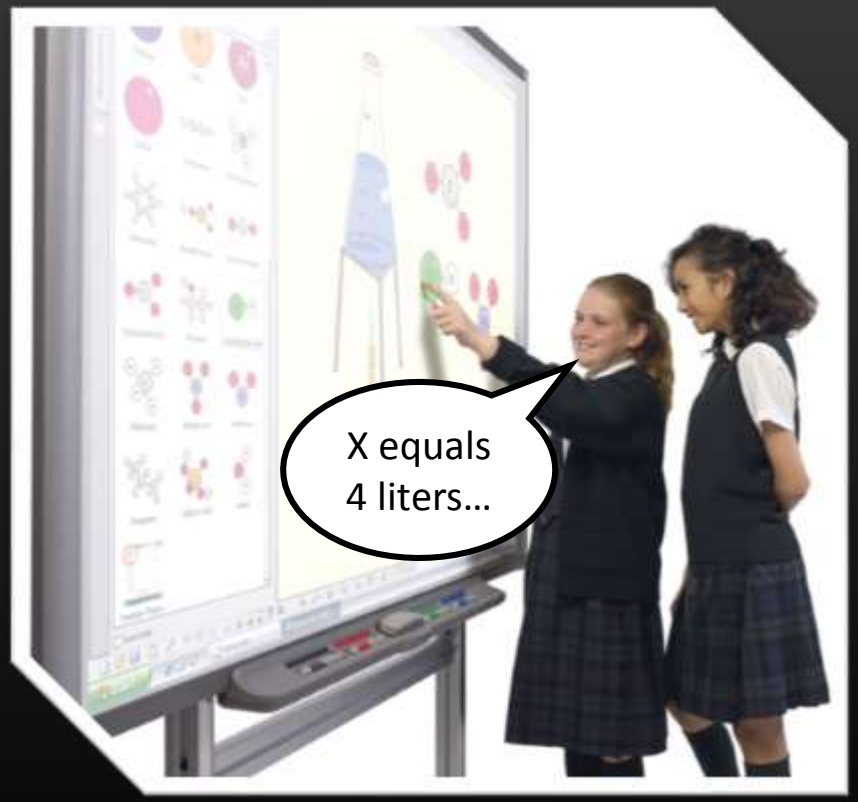
- Small number of **teens**
- Lack of **diversity** in museum visitors
- Definition of **groups**
- Google Earth **responsiveness**
- Camera angles and **occlusion**
- How users' **collaboration** affects gestures
- Digging into **users' conceptual models**

Take-Away

- Standard touchscreen gestures are the most commonly attempted, but children are more willing to explore and try new gestures.

Future Work

Touchscreens for Public Science Learning



Spherical Displays and Embodied Cognition

Thank you!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