### Mobile devices transforming the museum experience: Opportunistic User Interfaces (O-UIs)

#### Problem Statement

How can learning technologies — tools, spaces, and places — be designed to support learners within and across environments?

#### How can technology-based exhibits be designed to support groups of learners within museum environments?

- **Computer kiosks** have gradually been giving way to large shared displays to better support groups of visitors.
- **Trackball**
- **Touchscreen**
- **Sensor/Camera input**
- **Kiosk input**

Preserving richness of input difficult when scaling up for groups: input complexity is reduced or limited to one visitor at a time

- Large shared displays
- Replicated kiosk opportunities

#### How can mobile devices be designed to support groups of learners within a museum exhibit?

Collaborative/cooperative learning in museums requires interaction with both exhibit and companions.

Other work with mobiles in museums:

- **Mobile Guides**
  - On-demand mobile tour guides to exhibit
  - Touchy-feely digital labels/handouts
  - Visual (e.g., videos, augmented reality)

- **Mobile "Treasure Hunts"**
- **Mobile "Workshops"**
- **Mobile Poll/Tags**

#### How might these uses of mobiles support collaborative learning in museums?

- **Task interdependence** promotes collaboration
- Game motivates visitors
- No visitor can succeed alone

- **Conversational**
  - Supports group collaboration

- **Conversation Inequity**
  - Not all roles can be supported equally

- **Input Modality**
  - Not all visitors can access all input types

#### 3 Studies of Opportunistic User Interfaces

Incorporated aspects from prior work in museums (large shared display, ample seating) with questions concerning effect on collaboration raised by mobile research (impact of heads-down effect, impact of task interdependency, impact of input ease)

### Does UI complexity affect collaboration?

**Activity:**

- **Shared simulation of complex system cancer growth**
- 3 cellular automata: healthy cells, cancer cells, blood vessels
- Automata obey rule sets that result in tumor growth, metastasis
- Visitors fight cancer using interventions derived from medicine
- Goal is to work together to eliminate cancer

**Scenario:**

- **Interdependent Roles:**
- Roles have different effects
- No visitor can succeed alone

- **Visitors free to approach & join**

**Findings:**

- Complex interface does promote heads-down behavior

**Implications:**

- Heads-down behavior doesn’t impede task execution in this case
- More complex interfaces promoted more equity & collaboration

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<th>Mobile Input Modalities</th>
<th>Keypad</th>
<th>Directional Keypad</th>
<th>Tilt</th>
<th>Multitouch</th>
<th>Geometric</th>
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**Findings:**

- No significant differences in collaboration measures

**Implications:**

- Perhaps input friction not responsible for higher participation equity in high IO condition (first study at left)
- Perception of privacy should be investigated
- Perception of O-UI as a "workspace" versus "control conduit" should be investigated