Abstract
How do we provide hands-on interactivity with an exhibit that one cannot touch? We consider this question when designing for a means of interaction with a garden exhibit housed within a science museum. Our approach leverages mobile phones ubiquity, supporting group interactions and gamification in approaching this conundrum. We then designed GardenHunt -- a mobile application that leveraged visual recognition in a scavenger hunt game that we deployed and tested in-situ at the museum with children in field trips, teenagers in self-guided explorations, and parent-child dyads in a day-long showcase. We find that compared to non-participants, our design approach notably improved interactions with the garden exhibit and best used the (limited) time available for exploration. We also discuss new insights learned from this atypical exhibit, together with implications on how interaction patterns and group dynamics are changed in the presence of technology.

The GardenHunt Mobile Application

Mobile Application Framework

Game clues are made from the garden customized by season and species availability
User takes a picture of the as a means of answering the clue.
Clues are made of species found in the garden.
“Grades” picture submitted by matching the clue.

The use of Levelling to provide for similar interactions while catering for cognitive levels

<table>
<thead>
<tr>
<th>Level Characteristics</th>
<th>Clue Output to Player</th>
<th>Clue Input to Machine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginner</td>
<td>Straightforward clue</td>
<td>&quot;Find a Butterfly&quot;</td>
</tr>
<tr>
<td>Intermediate</td>
<td>Indirect clue</td>
<td>&quot;I fly, I flit, I flutter from flower to flower...&quot;</td>
</tr>
<tr>
<td>Advanced</td>
<td>Indirect clue</td>
<td>&quot;King&quot; of the flitters</td>
</tr>
<tr>
<td></td>
<td>Narrow Answer</td>
<td></td>
</tr>
</tbody>
</table>

Table 1: Characteristics of "levelling": providing a level of challenge for each

Findings: App (Mis)use

- Privacy: Taking selfies with the application without understanding the privacy implications.
- Permissions: Children using parent's phones was common, and this has design implications about parental informed consent
- Attention: App allowed for a balance between time-on task and exploration

Other Findings

- Children with app interacted more with the garden than those without
- "levelling" allowed for same interaction across age groups, but at different cognitive levels
- The use of timers made for race-against the clock conditions, undermining self-explorations.
- Children tended to explore in groups, even as each had their own mobile phones.
- Modularity in App design made for an easier process of encouraging and allowing application re-use.
- When considering interactions, fun trumps learning as a primary goal/focus.

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