Suggestions for Visualising Physical Hyperlinks

Pasi Välkkynen
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Contents

• Physical browsing and physical selection
• Visualisation challenges in physical browsing
• Visualisations in desktop WWW
• Visualisations in physical objects
• Some example visualisations
• Demonstration
Physical Browsing and Selection

- Physical Browsing
  - Access information and services by physically selecting the target object
  - Mobile terminal, for example a mobile phone
  - Tags, for example RFID tags
  - The user selects a link, the terminal reads a tag
  - Selection → Action

- Physical Selection
  - Touch, "this one here"
  - Point, "that one there"
  - Others, like Scan, and tag or terminal initiated selection methods
  - Analogous to "clicking a link" in a web page
Challenges Related to Visualisation of the Links

- How can the user know
  - Is there a link in the environment?
  - Where is it?
  - How can it be selected?
  - What action will be triggered?
  - Will the action cost something?
  - Are remote connections used?
  - …

- In our evaluations, the users preferred the interaction as simple as possible without unnecessary confirmations or interruptions
Visualisation Chain

1. Visualisation in the environment and physical objects (the main topic of this presentation)

2. Hovering
   - Show some information about the link before it is actually selected
   - Similar to hovering cursor over desktop WWW link
   - Demonstration at the end or during breaks

3. Visualisation in the GUI of the terminal

4. Confirmations

5. The action itself as a response
   - Something happens in the terminal
   - Something happens in the physical environment or other devices
Links in Desktop WWW 1/2

• What can we learn from existing links in desktop WWW?

• Link visualisations
  • Underline and colour recommended
  • Visited links shown differently from unvisited
  • Text links, image links, buttons

• Visualising actions
  • Typically a new page is opened and most actions can be handled inside browser
  • Some actions open new applications and change the UI: email, PDF, vCalendar entries, … → confusing and irritating to the user if not marked clearly
Links in Desktop WWW 2/2

- Context of the link
  - Link is a part of a page or a site
  - Commonly used and learned locations and actions for links, for example navigation bars
    → the context helps user to guess the action of a link
- Can we use these lessons in physical hyperlink visualisations as well?
  - Show the location of the link
  - Show what it does
  - Context will help here too, physical objects have usually a purpose of their own and the link will typically have something to do with that purpose
  - Perceived affordances of the object may support the visualisation
Visualisation and Selection

• Some implementation technologies allow only some selection methods:
  • Short-range RFID can only be touched
  • Normal Bluetooth can only be scanned
  • Long-range RFID with photosensitive sensor can be touched, pointed, scanned, …
    → The selection method should be included in the visualisation

• Current visualisations are technology-centred:
  • NFC symbols
  • Bluetooth symbols
  • Commercial venture symbols
    → The user should know how to activate the reader
    → Better visualise the selection method and not the technology
Actions in Physical Hyperlinks

- WWW links
- Phone calls
- SMS and email messages
- Sensor reading
- Download and install an application
- Connect to an external device or service
- Set the terminal state, for example silent mode
- Control an external device, for example turn lights on
- ...and whatever you can imagine
Constructing visualisations

- Should show at least location (and thus existence), selection method and action
- Possibly also show price and local vs. remote connectivity
- Any visualisation will show the location
- Limited amount of selection methods
- Virtually unlimited amount of actions
  → In our examples, the icon is reserved for action and we visualise the selection method around the action
- Action icon precision:
  - One generic icon for everything (= no action visualised)
  - Action classes?
  - Separate icon for each action?
Some examples 1/2

- Remember that these are just examples to illustrate our views!

- Selection methods: Touch, Scan, Point, All three supported

- Actions: Connect, Information, Download, Messaging, Silent mode
Some examples 2/2

- Additive use of selection and action symbols
- Touch / Download
- Touch or Scan / Connect
- Touch, Point or Scan / Information

• Remember: just examples!
Summary

• Visualisation of links in physical objects is not much studied

• Lessons from WWW can be applied, but

• Different technologies and selection methods complicate the issue a bit

• It is better to visualise the selection method than the technology

• Visualising the action will probably help (results of Riekki et al., 2006 support this)
Questions? Comments?
Demonstration

• Hovering demonstration on a Nokia 3220 + NFC/RFID shell

• Single mode: display information about the link
  • Title or name
  • Content
  • Icon

• List mode: display less information but several links at the same time, also allows "collecting" links for further study

• Conclusion: hovering can possibly help with visualising the action, but preferably it is not a replacement for a good visualisation