

The GUIDE system

An example of a context-aware interactive system: Here we focus on the implications for HCI

What do we mean by Context-aware?

- The term has been defined as: "systems [that] adapt according to the location of user, the collection of nearby people, hosts, and accessible devices, as well as to changes to such things over time" [Dey and Abowd, 2000].

Dey A.K. and G.D. Abowd (2000) The Context Toolkit: Aiding the Development of Context-Enabled Applications. Workshop on Software Engineering for Wearable and Pervasive Computing, Limerick, Ireland.

Intro...

- Cheesy video...

Obtaining GUIDE Requirements...

- Requirements Capture (Lancaster TIC)
 - Observing information needs of visitors
 - Semi-structured one-to-one interviews
- What other methods could have been used?

GUIDE Requirements...

- Four main requirements
 - Flexibility
 - e.g. Guidebook vs. tour guide vs. just wander...
 - Support for dynamic information
 - e.g. Castle opening times
 - Context-aware information
 - e.g. adaptive tours (cf castle opening times)
 - Support for interactive services

Initial Configuration...

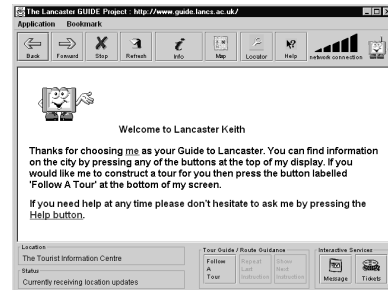
The screenshot shows a dialog box titled "GUIDE System Preferences" with two tabs: "User Preferences" and "System Preferences". The "User Preferences" tab is active. It contains the following fields and options:

- "Please tell me your name:" with a text input field containing "Fadh".
- "How can you change the name of your group:" with a dropdown menu showing "Grammar School".
- "How old are you?:" with a spin box containing "10".
- "Please specify your preferred language:" with radio buttons for "English" (selected), "French", and "German".
- "Are you interested in:" section with radio buttons for "Yes" and "No":
 - "Lancaster Architecture?": "Yes" selected
 - "Maritime Related Information?": "Yes" selected
 - "Lancaster's History?": "Yes" selected
 - "Vegetarian Food?": "No" selected
- "Save" and "Advanced" buttons at the bottom.

Issues ??

- What are some of the issues with associated with this stage??

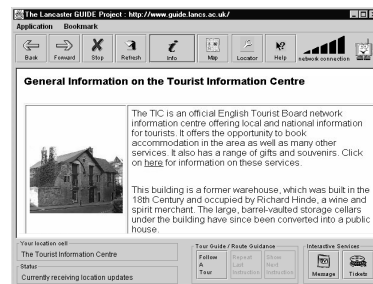
Welcome to GUIDE...



First attempt at Context-aware behaviour...

Pressing the info button...

General Information



Issues??

Issues??

- User may not want this information!!!

Problem – from HF perspective...

- System could over-constrain (filter) based on context, e.g. open/closed, previously visited etc.
 - "But I just would have still liked to have seen the priory building – open or closed doesn't matter"
- System is trying to simplify for the user the task(s) that he/she needs to carry out in order to achieve (what the system thinks...) is the his/her current goal.
 - Mismatch between user's goals and system behaviour – more on this in Suchman (1987)

Suchman, L. *Plans and Situated Actions: The Problem of Human-Machine Communication*, Cambridge Univ. Press. (1987).

Reducing complexity?

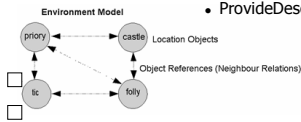
- "In effect, such systems migrate complexity away from the user to some form of intelligent agent" (Cheverst, 2001)
- Adaptation to context can be used to simplify a user's understanding of, and interaction with, interactive systems – but when system attempts to pre-empt user's goal, this is where difficulties can arise.
- Benefits of information visualisation vs filtering

Cheverst, K. *et al.* "Using Context as a Crystal Ball: Rewards and Pitfalls", *ACM Personal Technologies*. 3(5), pp. 8-11, Springer-Verlag. 2001.

The Adaptive Hypermedia Bit...

How does this AH bit work?

- Incorporation of GUIDE tags
 - Enables pages to query Information Model
 - Processed by GUIDE filter component
 - Example (nearby places)
 - <GUIDETAG INSERT NEIGHBOURS>
 - Filter calls methods...
 - ReturnNeighbours()
 - ProvideDescription() and ProvideImage()

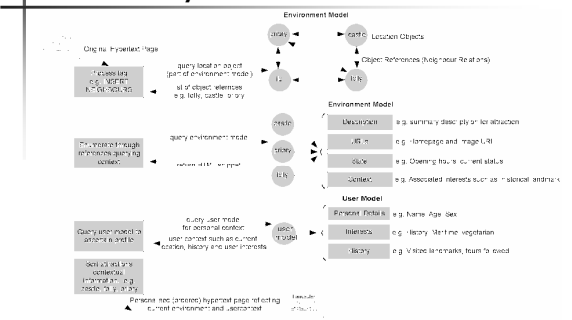


Generating the AH (2)

```

<HTML>
<P><FONT>
<GUIDETAG INSERT FULLUSERNAME>
, the following attractions are near to you at
<GUIDETAG INSERT POSITION>. </P>
<P>
Note: The list below is ordered according to
closeness and whether or not they are
open or closed. </P>
<P><BR>
<GUIDETAG INSERT NEIGHBOURS>
</FONT></P>
</HTML>
    
```

Summary of mechanism...



More on the User Model...

The User Model...

- Visitor profile, including:
 - name
 - group name (if applicable)
 - age
 - dietary preferences, e.g. vegetarian food
 - specific interests, e.g. maritime history
- current (or virtual) location
- list of attractions already visited
 - "Welcome back..."

Updating the User Model (1)

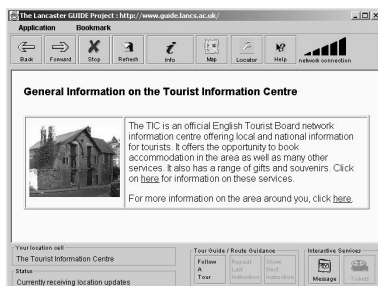
- Pages can be tagged in order to enable the 'Interests' part of the User Model to be updated...
- For example, if user requests information from pages with a high history content then 'History' rating could be increased.
- Issues??

```
<GUIDETAG INTEREST (HISTORY GREATER 0)>  
-- Additional History Text --  
</GUIDETAG>
```

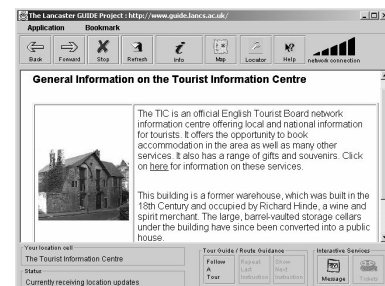
Updating the User Model (2)



With Low History Interest...



With High History Interest...

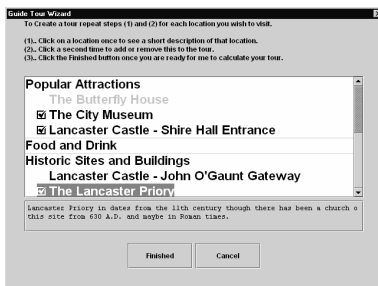


Issues ??

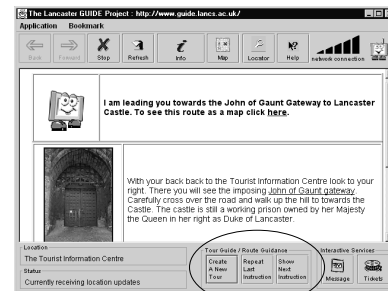
- Predictability??

The tour GUIDE part...

Picking a Tour...



Following a Tour...



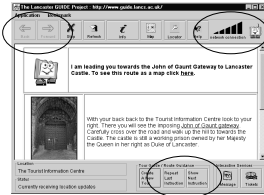
Issues ??

Issues...

- Virtual vs Real...
 - Allows me to virtually navigate but at what cost?
- Stepping back
 - What sort of 'interaction paradigm' does this reflect?
 - What are alternatives?

Metaphors used in the GUIDE UI

- GUIDE uses metaphors to leverage from anticipated familiarity/understanding of users
- Browser Metaphor
 - Benefits?
 - Drawbacks?
- Bars of Connectivity



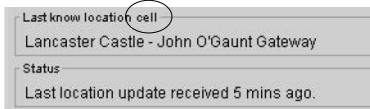
Implications of disconnection from the network...

- GUIDE units can lose network connectivity
- Certain functionality becomes unavailable
 - Reception of dynamic information, Bookings, etc.
 - Concern to reduce apparent anomalies in behaviour
 - Unpredictability could affect a visitor's trust of the system
 - Encourage an appropriate mental model for understanding the role of connectivity
- Leverage from common understanding of the mobile phone
 - Bars of connectivity metaphor

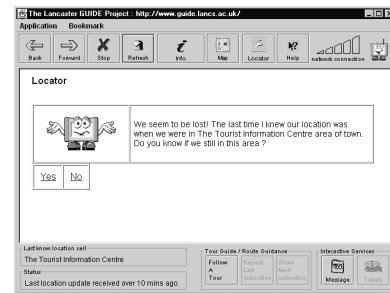


Conveying Uncertainty...

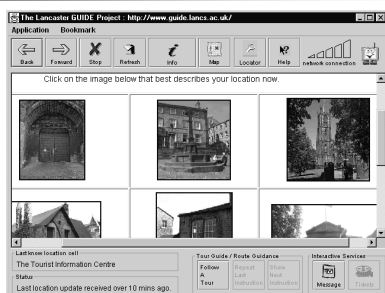
- Again linked to notion of helping user to appreciate that the system does not know 'exactly' where the user is.
- Why?
 - Implications for predictability/perceived reliability.
- What if time passes with no locations updates



Solving Location Problems: A GUIDE and Visitor Partnership



Selecting from Thumbnails...



Found Again...



Evaluation...

How would you evaluate the GUIDE system?

Evaluation...

- Two approaches...
 - Expert Walkthrough
 - Field-Trial

Expert Walkthrough

- Crude first pass at usability
 - Experts asked to test functionality (in-the-field) using a talk-aloud protocol
 - They would effectively be performing their own heuristic evaluations while using the system 'as a typical user'.
- Findings
 - User interface
 - Consistency with other browsers
 - Position of buttons, feedback mechanisms
 - Appropriate mental model back/forward etc

Evaluation by Field-trial

- Aims
 - Validate (or improve) our initial requirements
 - Ascertain quality of the visitor's experience
- Constraints
 - Imposing upon leisure time of visitors
- Approach
 - Visitors free to use the system in their own way
 - Direct Observation
 - Time-stamped log of interaction
 - Subjective opinions
 - gathered using semi-structure interviews

Key Findings (1) ...

- In general, visitors enjoyed using the system...
 - Visitors appreciated location-awareness
 - Found navigation reassuring
 - Visitors trust of the system was dynamic
 - Increased when shown detailed descriptions e.g. 'watch the step when leaving the path'
 - Decreased when information could not be retrieved or appeared inaccurate/incorrect

Key Findings (2)...

- Some concern over missing information
 - Based on automated retrieval
- Majority appreciated system's flexibility
 - But for some 'Less is More' (Information Appliance)
- High acceptance for the end-system
 - Could be lighter...
- Young visitors revelled in the technology
 - Explored approximately twice as many links per minute as other age groups

Interaction Approaches...

Push vs. Pull

Cheverst, K. *et al*, "Exploring Context-aware Information Push". *ACM Personal and Ubiquitous Computing*. 6(4) pp. 276-281. Springer-Verlag. 2002.

Push vs. Pull

- Current emphasis is on user...
 - Trade-off between effort and control
 - Changing context... correctness of info?
- Investigating Push (really Push+Pull)
 - On approaching Castle user is automatically presented with info
 - Appropriate Notification, audio, graphic
 - Disturbance
 - Surprise vs. expectation
 - Reassurance
 - Overwriting current info



Investigating 'push'...

- Appropriateness of pushing info to tourists...
 - Situation of the user
 - Type of end-system
 - Teampad/iPAQ/Phone...
 - Quality of context used
 - e.g. location (place), preferences of user
 - Way in which information is pushed
 - e.g. notification techniques
 - What is pushed,
 - e.g. audio, graphics

Approach...

- Wizard of Oz type trials
 - Developed versions for Teampad and iPAQ
 - Currently no appropriate infrastructure
 - 20 visitors over 2 weeks
 - Problem imposing on visitor's time
 - Time given ranged from 10 mins to 1 hour
- Semi structured interviews
 - Allow user to suggest issues...

Findings...(1)

- In general visitors were very positive about the 'PUSH' approach
 - Emphasis on Ease-of-use
 - Reduced functionality, 'pick up and use'
 - But majority also wanted 'some' ability to pull
 - Surprise not mentioned as a problem
 - Disturbance...
 - Majority wanted ability to 'silence' the unit
 - Overwriting of info
 - Not a major concern...
 - 'Back button' one option

Findings...(2)

- Notification sound important
 - Not hard to find an acceptable sound
- All wanted 'pushing' of tourist related events
 - e.g. 'Punch and Judy - 3pm - Lancaster Priory'
 - Some wanted such info filtered to their profile, others didn't
- Pushing of non-tourist info
 - This was fine for some people if they could see a clear benefit

General Comments...

- "We are lazy"
- "Don't want hassle..."
- "Reassuring"
- "Let the system follow me"
 - Only tell me if I take a wrong turn!
- "I don't want to appear as a tourist in a non-tourist location"

Regarding the end-system...

- iPAQ form factor very popular
 - Splitting the screen
 - Map-based interface
 - "You are here..."
 - "Take me there..."
 - Ticker-tape like display
 - Audio capability
 - Users extremely positive about audio descriptions
 - Still wanted choice



Quality of Context

- Required location granularity varies...
 - "You are approaching Lancaster Castle"
 - Fine with current WaveLan cells
 - "This is one of the oldest signs in Lancaster"
 - Needs GPS, low-power/range transceiver etc.
- Future Work...
 - Create smaller cells, supplement with GPS

'Push' vs. 'Pull'...

- 'Context-aware Push' has great potential for reducing effort required by the user
- Work illustrated the need for successive user trials and the fact that assumptions/results of previous trials age rapidly!
- If 'push' is triggered by location then does the user's environment become the user interface for the user to 'pull' information.