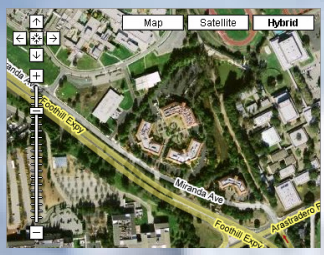
Supporting Interaction as a Secondary Task in Geo-Spatial Applications

Many geo-spatial applications are explicitly or implicitly designed with the premise that the user will be able to devote full attention to the interaction.

Unlike desktop usage, in mobile situations, there are often **primary tasks**, such as pedestrian navigation or driving an automobile.



Desktop Usage Patterns

Applications:
- Navigation Planning (Google Maps, Google Earth, Map Quest, Yahoo Maps).
- Security visualizations

Characteristics:
- Interaction monopolize a user's attention
- The user is seated with rich interaction devices.
- User is focused on the application as a primary task.

Automotive Usage Patterns

Applications ("Driver information systems"):
- Vehicle Status
- Road Conditions
- Driver Assistance (vehicle control)
- Navigation
- Video entertainment
- Audio Entertainment

Characteristics:
- Eyes on the road
- Hand(s) on the wheel
- Controls on the wheel
- Controls in "sweet spot"
- Speech interaction
- Primary tasks (driving related)
- Secondary tasks (Car status and navigation)
- Tertiary tasks (comfort, entertainment, etc.)

Design Lessons:
- Task categories
- Primary focus on core driving task
- Safety requirements
- Legal and liability requirements

Handheld & Wearable Usage Patterns

Devices:
- Personal navigation devices
- Wearable Computers

Applications:
- Personal Wayfinding
- Geocaching
- Tourist Guides
- Logging and Tagging

Characteristics:
- Occasional glances at displays,
- Long glances may cause user to run into things, trip over rocks or curbs.
- Hybrid usage patterns:
  - Overlapping mobile space and desktop space.
  - Mobile data collection in the field and with processing and access on a desktop.
  - Examples: GPS logging applications that process travel patterns and location tagged observations like field notes or photographs.

Design Lessons:
- Delayed interaction, hybrid usage
- Everyday Wearable Computing research
- Targets application usage as a secondary task.
- Small field of view screens
- One handed, chording keyboard in the non-dominant hand.

Augmented Reality Usage Patterns

Applications:
- Maintenance
- Tourist Guides (MARS)
- Entertainment / Gaming (AR Quake)
- Surveying (Tinmith Metro)
- Logging and Tagging

Characteristics:
- Stopping every so often to bring up information concerning the surroundings
- Interaction may not work well while walking
- Supervision for AR gamers who focus on the game play and fail to notice real world dangers.

Division of Attention

Users must continually shift attention between the surrounding world and the geo-spatial application.

Large changes in display content can disrupt the shifting of attention, resulting in distraction from the primary task.

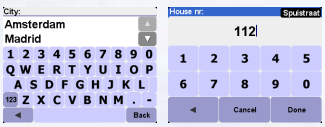
Small changes in the application's display may go unnoticed between glances. These small changes may build up over time until the user suddenly notices that the information has changed, while missing the process of how the information changed.

Cognitive Load Management

When users are making choices, avoiding obstacles, and dealing with dangers, cognitive resources become taxed.

Geo-spatial applications may need to determine the cognitive load and attention available and decide if and when a user can be asked for input.

The system could modify its interaction with the user, delaying dialog, escalating alerts, and diminishing notifications when necessary.



Text Entry

Text entry techniques needed for:
- Entering destinations
- Location tags
- Waypoint names.

Dials, joysticks, directional pads:
- Add additional, untenable steering, visual selection, and confirmation tasks to the user, who is already navigating in the world.
- Virtual keypads / touch screens also require visual selection and confirmation.

Information Legibility

Interaction as a secondary focus requires:
- Avoiding shifts in eye focal distance that induce mental and physical adaptations
- Legible displays in strong sunlight and against cluttered backgrounds.
- Information that is understandable at a glance
- Easy and infrequent decision making where choices are clear and obvious

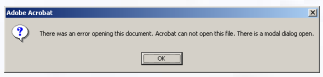
Dialog Initiative

Many desktop applications demand attention:
- Pop up dialog boxes windows
- Flashing window title bars
- Animated icons
- Status bar indications

These notification techniques attempt to bring background events to the user's primary focus of attention and may not be appropriate for secondary interaction.

The user may:
- Infrequently glance or attend to the output of the geo-spatial application.
- Neglect the application under high stress and high cognitive load

The user must be able to decide when and if a response will be given. The application could model the user's available attention and limit requests of the user's attention.



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