Usability Evaluations and Improvements for an Online Volunteered Map Feedback Application

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Introduction

- Web 2.0: dynamic platform allowing real-time content creation and collaboration
  - Results: “Volunteered Geographic Information” (Goodchild 2007)
    “Geoweb” of online mapping applications (Haklay, Singleton, & Parker 2008)
- Basemaps used in online “map mash-ups”
- Government mapping data available for public use
- Increasing use of smartphones for spatial data collection and VGI applications

How to harness this for basemap updates?
The “Feedback App”

- Developed by Esri Canada
- Suggest corrections to data from Canada’s Geofoundation Exchange (GFX)
  - Supports Community Map of Canada project
  - Users can draw points, lines, and polygons; attach files (e.g., photographs); and view and comment on other users’ feedback
  - Suggestions are forwarded to a “custodian” for each participating community
- Built using HTML5, ArcGIS API for JavaScript
  - Beta version using new Web AppBuilder for ArcGIS
What is Usability?

• “A quality attribute that assesses how easy user interfaces are to use” (Nielsen 2012b)

• Defined by Nielsen (2012b) as being dependent on five factors: Learnability, Efficiency, Memorability, Frequency of user error, User satisfaction

• Important for VGI and public participation, when non-GIS professionals are involved (Jones and Weber 2012)

• Common usability evaluation methods (Marsh and Haklay 2010):
  – Cognitive walkthroughs
  – Heuristic evaluations
  – Field testing
Methods

• Usability inspection
  – Devices used: Google Nexus 7 tablet, Google Nexus 5 smartphone, HTC Desire C smartphone, third-generation iPod touch, desktop computer, touchscreen laptop
  – Similar to cognitive walkthroughs, heuristic evaluation

• Field test
  – Undergraduate class participation activity, March 17th 2014
  – Task: logging winter tree damage on UW campus
  – Tests conducted using mobile data connections
  – Qualitative questionnaire, evaluating task success and user satisfaction
Results – Usability Inspection

**Issue #1**

- “Show/Hide” buttons for map layers
- Button labels changed on click, in addition to change in background colour (and checkmark in IE)

  - Heuristic: “Visibility of system status: the system should always keep users informed about what is going on” (Nielsen 1995)
  - “Flip-flop” buttons (Cooper et al. 2007)

- Changed to checkboxes, which are recommended for selection (Microsoft, n.d.-b; Google, n.d.-a)
Results – Usability Inspection

**Issue #2**

- Visual feedback needed for buttons
  - Appearance changes on mouse-over ("hover") and click
- Provides sense of “pliancy” (Cooper, Reimann, & Cronin 2007); recommended by Microsoft (n.d.-a), Apple (2013), and Google (n.d.-b)
  - Important on mobile (lower performance)
- Heuristic: “Visibility of system status” (Nielsen 1995)
- Button states added using CSS
  - "hover" and "active" selectors
Results – Usability Inspection

**Issue #3**

- Map did not zoom to user’s GPS location during GPS-based point creation
- Required additional panning and zooming by user
  - Costly on mobile (performance, mobile data costs)
- Heuristic: “Flexibility and efficiency of use”: actions should be “accelerated” where possible (Nielsen 1995)
- Fix: `map.centerAndZoom()` method in ArcGIS JS API
  - No new interface elements
Results – Field Test

Questionnaire

- Likert-scale questions ("Strongly Disagree", "Disagree", "Neutral", "Agree", "Strongly Agree") and open-ended questions, for each area of functionality
  - Map functions, feedback creation/viewing, email and PDF reports, general ease of use
- 25 responses
- Operating systems: Android (11 users), iOS (9 users), BlackBerry (4 users), Windows (1 user); 14 devices purchased in 2013
- Android users more likely to report dissatisfaction with application performance (4 users vs. 0 users for iOS)
Results – Field Test

Issue #1

• Low accuracy of points created “automatically” (i.e., point placed at mobile GPS location)
• Likely due to GPS signal occlusion from campus buildings, low accuracy of mobile GPS sensors
• Workaround: app now uses GPS only to zoom to user’s location; points must always be created manually
Results – Field Test

**Issue #2**

- Full-screen feedback form did not close after point creation
- Result: users inadvertently submitted multiple feedback points for the same ground observation
  - Unclear whether feedback submission had completed
- Fixed: bug where the code to close the form was disabled when the form was created
Recommendations

• Ensure that interface elements provide sufficient feedback on the status of their function
  – Visual feedback especially important on mobile

• Use mobile GPS location to support manual feature creation but not replace it
  – “Locate” button available in ArcGIS API for JavaScript

• Consider providing native mobile applications (Nielsen 2012a, Budiu 2013) and/or allowing offline map access
  – Functions for browser “LocalStorage” available in ArcGIS API for JavaScript
References

apple_ref/doc/uid/TP40012857-UIButton-SW1


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Thank you!