Aerial Photographs with Interactive Legends

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This entry draws on some of the ideas from our VizLegends work, where we considered the role of legends for maps in an interactive environment. Here, we apply some of our ideas – and some new ones – to the UKMap 1km^2 tile to demonstrate:

- using vector map data to enrich raster datasets (aerial imagery in this case);
- presenting complex feature hierarchies, simply;
- making the map legend more reflective of the current map view;
- making the map legend support multiple modes of map interpretation.

We have produced a video to demonstrate the interactive elements of this work:
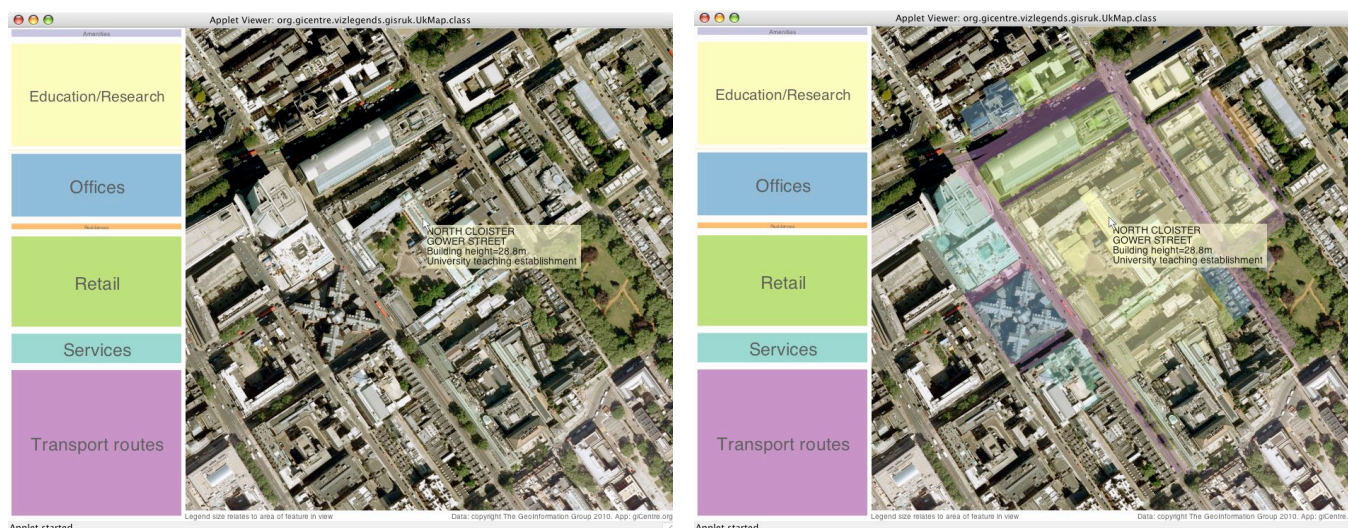
- http://gicentre.org/ukmap/ukmap.mov (8MB)

Figure 1: Details on demand.

The initial view is UKMap's high-resolution aerial imagery. Details of geographical features can be obtained by moving the mouse over geographical features of the photograph (Figure 1, left), including postal address, feature category and building height (where applicable). This lookup is facilitated by UKMap's polygon-based topographic base map. The user can choose whether to show the map feature under the mouse as a polygon on the aerial image, map features around the mouse cursor (Figure 1, right) or all map features. Map features are coloured (ColorBrewer[1] Set3) by level 1 of the feature hierarchy and are slightly transparent in order to tint the colour of the aerial image. This provides a vector mapping 'window' on the aerial imagery, where the tinting of the aerial photograph identifies how features are classified at level 1, revealing that feature types tend to occur in contiguous blocks.

The aerial photo has a legend, again facilitated by the vector mapping dataset. In Figure 2, the legend shows the level 1 features, which are *sized by the area they occupy in the current view*. As the photo/map is zoomed and panned, the *legend updates accordingly* (Figure 2 and video), showing proportions of feature types that characterise different areas. Figure 3 shows that legend items can be *sized by different characteristics*. Sizing items by feature count shows that for the portion of the tile in view, retail units are proportionally more numerous than their combined areas. Sizing items by average building height shows that retail buildings are the tallest on average.

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[1] http://colorbrewer2.org/

Sizing items equally ensure that all the features to be seen with equal prominence. In all cases, legend items are ordered consistently and alphabetically – holding this constant whilst changing sizes makes the legend layout stable and the smooth animated transitions (see video) draw attention to changes differences between views. The reconfigurable legend that responds to the current map view, allows characteristics of the mapping area to be explored, though this is rather limited with such a small map tile.
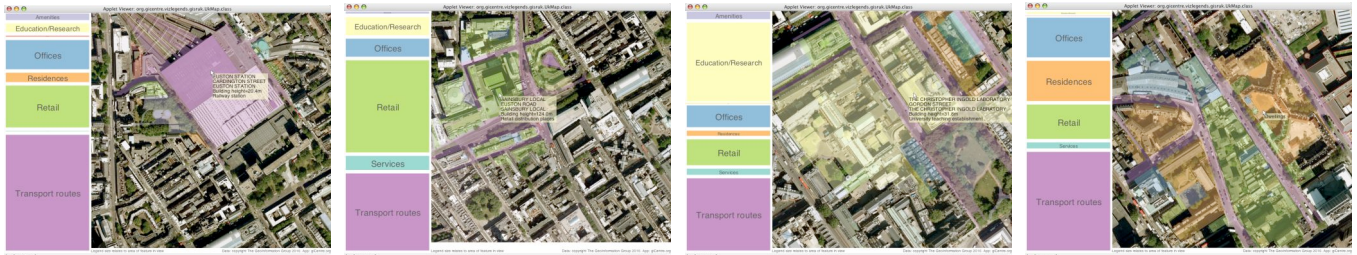

Figure 2. Legend (level 1 of classification) sized by area in current view. From *left to right* (different parts of the 1km^2 tile): view is dominated by transport (Euston Station), view is dominated by retail (Fitzrovia), view is dominated by education (UCL), view is more residential (Somers Town).
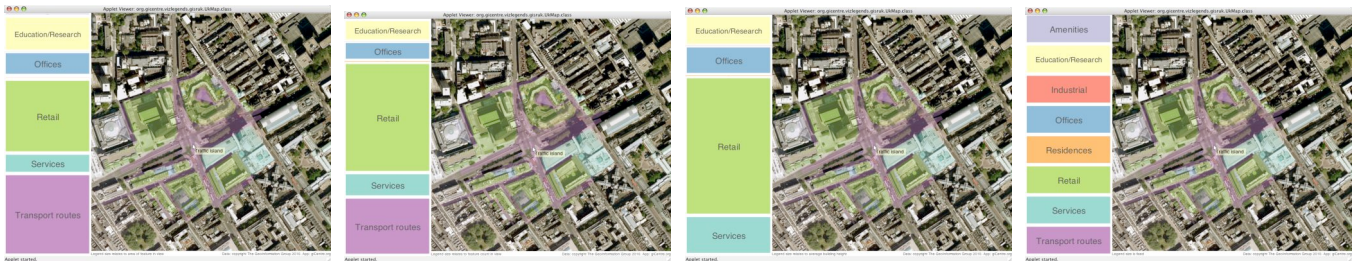

Figure 3: Sizing the legend by (*from left to right*): area, feature count, average building height and fixed size. The portion of the 1km^2 tile is held constant in these screenshots.
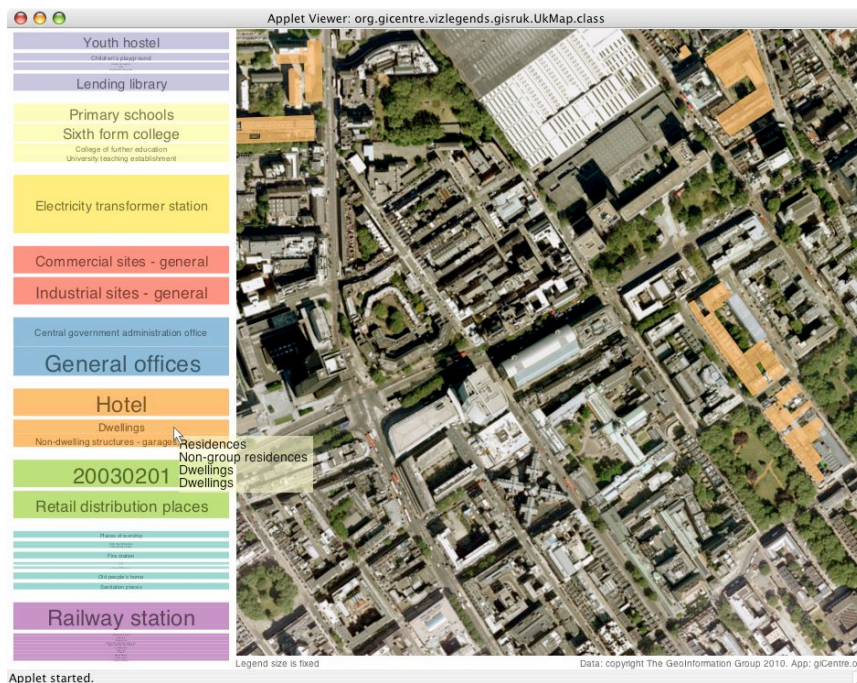

Figure 4: Level 4 of the feature hierarchy with fixed legend size, showing lookup of all 'dwellings'

The legend can be used to *explore the feature hierarchy*. UKMap has a four-level feature hierarchy and we have made it easy to change the classification granularity. The legend in Figure 4 displays level 4 of the hierarchy where each element given a fixed size. Dwellings can be identified in the current map view by moving the mouse over the

legend item and features can be identified at any level of the feature hierarchy. In Figure 5 (left), transport features are shown at level 3 (left) and level 4 (right). Level 3 roads have been split into 'road' and 'pavement'.

Technological advances that allow maps to be more interactive provide scope for creativity in the design of interactions to support interpretative map-based tasks. We hope that this work demonstrates how some of these ideas can be built into interactive map implementation to assist users in map interpretation.

Figure 5: *Left*: legend shown at level 3 of the feature hierarchy, sized by area in view and identifying railways on the map. *Right*: Level 4 of the hierarchy where 'roads' have been split into 'pavements', 'roads' and a few other categories (too small to see currently) that include road crossings. Pavements are identified in the main map.