Rapid Prototyping of Map Collaging on Smartphones

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Analogue mobile mapping enable location-based services (LBS) on analogue map images on smartphones. It combines advantages of analogue maps and mobile mapping. However, it is inconvenient to make content for analogue mobile mapping, which make it difficult for rapid prototyping.
Rapid prototyping of analogue mobile mapping content is important to incent ordinary users to contribute content. This paper proposes a method of rapid prototyping of map collaging on smartphones.
Map collaging collages multiple analogue map images to provide LBS with rich topics of information. We divide map collaging content into three hierarchies: raw data, single geocoded map, and map collages.
Raw data is the data without explicit geo-information. Three kinds of raw data are used for map collaging: image, text, and audio. Raw data can be input with smartphone or imported from computer files.
A *single geocoded map* provides LBS with one analogue map image. Main blocks of functions of single geocoded map are: map browsing, positioning and directing, POI browsing, and dairy making.
Map browsing enables panning and zooming of an analogue map image. Map image browsing function needs a map image. Users can add map image by taking photo, pick from album, or import from raw images, and clip map image to remove margin parts. Users can also set the maximum and minimum scales of the map image.
Map images should be geocoded to enable positioning and directing. We apply polyline-based geocoding to ensure positioning accuracy. To make geocoding easy and fast, we integrate the editor part and browser part of the application to enable real time and progressive geocoding. Users can geocode progressively from parts to parts of the map image when they are travelling. Users can observe the positioning results of their current places and footprints immediately to adjust and revise geocoding. A trajectory managing and simulating function is added. Users can review their footprints, and can simulate virtual moving trajectory to test and revise geocoding.
POIs need to be registered to be viewed and searched. Positions of POI can be registered on map image or on base map. POIs registered on map image can be presented even if the map images are not yet geocoded. One kind of POI, e.g. public toilets, can be registered at many positions. When POIs are registered, their icons will be presented on the map image. Users can tap the icon to preview the POI or view details of the POI. If the map image is geocoded, a preview of a POI can be automatically shown when the user is near the POI.
Users can take photos, record audios and input texts to make travelling dairies. Icons dairy contents will be displayed on map images. Also, users' moving trajectories are recorded, and users can view and play their historical trajectories.
Map collages groups multiple maps to provide services with richer content and wider covering area. Two main functions of map collages are map collaging and map switching.
Single geocoded single maps will be collaged together, with consistent scale, direction and position relations among each other. Users can manage the map list of map collages by adding new maps from geocoded map list, remove maps from map collages, and rearrange orders of maps in map collages. The maps in map collages will be automatically collaged according to users' locations.
Triggers are used to automatically switch main map among maps in map collages. A trigger is a polyline or a polygon with each side linked to different geocoded maps. When user goes across the

border of a trigger, the main map of map collages will be changed accordingly.
Hierarchies of map collaging content enable ordinary uses to make simple content. It also enables cooperation of material-collectors and map geocoding experts to make high quality content.

Keywords: Rapid Prototyping, Map Collaging, Map Geocoding, Spatial Trigger, Location-based Service

