LiveLayer
Real-time Projection of Traffic Video onto Maps

We present our work-in-progress for a novel new approach to visualising and interacting with real-time traffic data. The system provides for the projection of a number of camera video streams to their corresponding projections on a map so that viewers may see live traffic in real-time.

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System Architecture

The system is developed using Qt, with both synchronous and asynchronous interaction between it and Google Maps achieved using the JavaScript communication model supplied by QWebFrame. OpenGL is used for rendering and OpenCV for homography matrix computations.
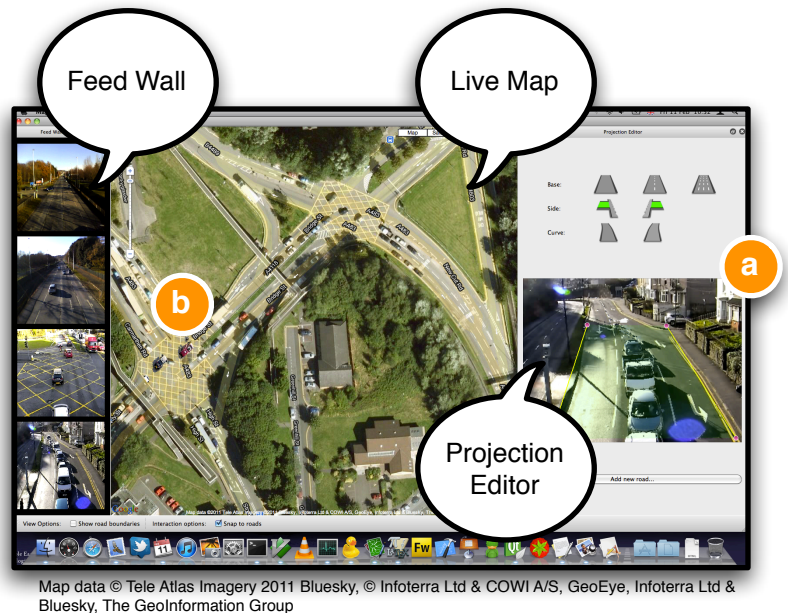
Specifying a Projection

The projection editor **(a)** allows the user to quickly specify the areas of road to be projected onto the map using a combination of a template system for common road designs and a `freehand' mode for more complex layouts.

The system builds a knowledge base of the surrounding roads from the Google Maps API, and uses this data to assist the user in placement of the roads.

Future Work and Objectives

The objective of our system is to provide the user with intuitive visualisations of traffic conditions to facilitate decision-making. To this end, we are developing semantic modules that plug into the pipeline to extract and infer semantic data.

We are also investigating intuitive and helpful methods of assisting the user in clustering and listing the active cameras in the system using different visualisations of the local systems.

Feed Wall

Live Map

Projection Editor

Map data © Tele Atlas Imagery 2011 Bluesky, © Infoterra Ltd & COWI A/S, GeoEye, Infoterra Ltd & Bluesky, The GeoInformation Group

Rendering

The computed homography matrix is passed to a fragment shader that backward-maps the texture coordinates of the map's projected roads into the frames of the video stream.

Assisting the rendering process is a foreground mask computed using a Gaussian mixture model on the incoming video to remove the background road, leaving only the moving vehicles. Morphological operations clean the result, along with connected components analysis for removing small components.

The system uses a multiscale adaptive refinement system on most CPU-heavy components to ensure that the most suitable quality of rendering is provided given the current viewing parameters.

Traffic Video Stream

Projection onto Google Maps

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