Road Detection in Images Using Probabilistic Graphical Models

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Superpixels

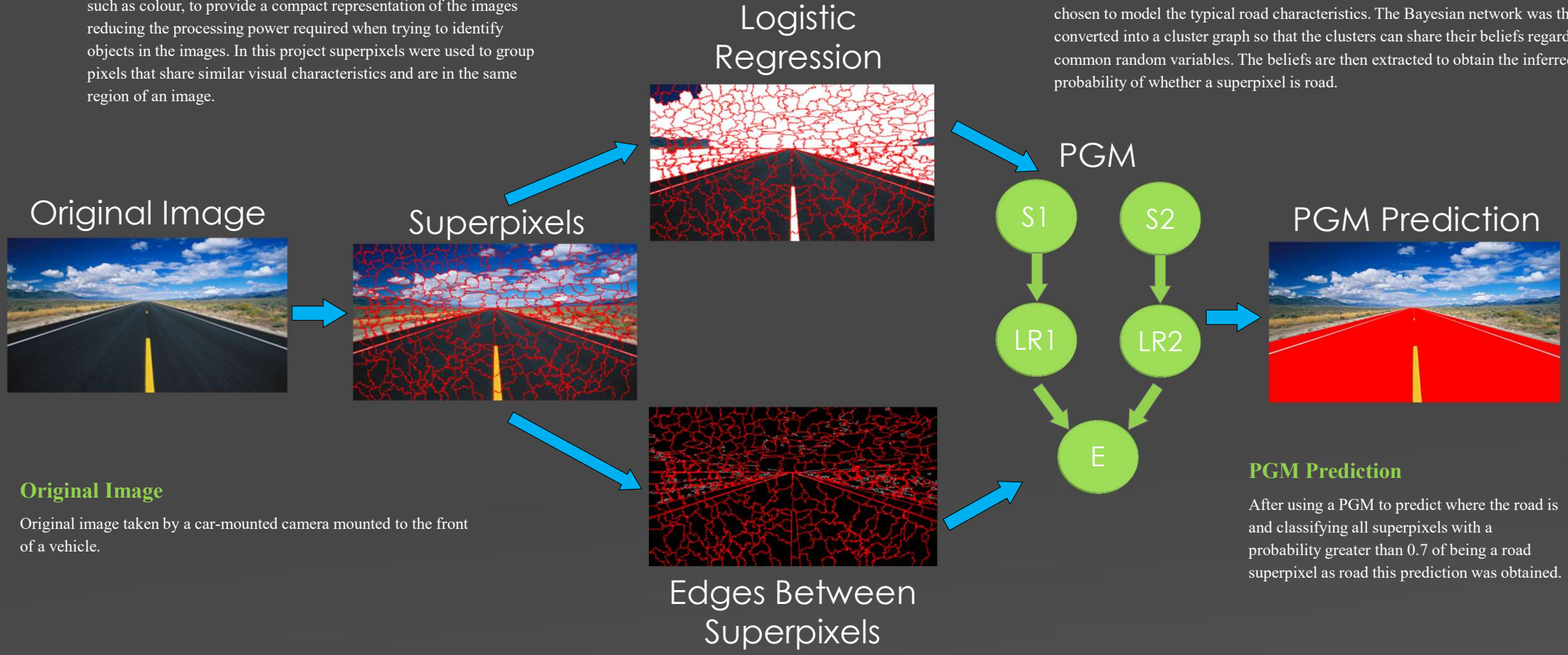
It is very useful to group pixels that share similar visual properties, such as colour, to provide a compact representation of the images reducing the processing power required when trying to identify objects in the images. In this project superpixels were used to group pixels that share similar visual characteristics and are in the same region of an image.

Logistic Regression

A logistic regression model was trained to predict which superpixels in the image are road.

Probabilistic Graphical Models

A probabilistic graphical model was used to combine the uncertain characteristics and relationships previously obtained. In this project a Bayesian network was chosen to model the typical road characteristics. The Bayesian network was then converted into a cluster graph so that the clusters can share their beliefs regarding common random variables. The beliefs are then extracted to obtain the inferred probability of whether a superpixel is road.



Original Image

Original image taken by a car-mounted camera mounted to the front of a vehicle.

PGM Prediction

After using a PGM to predict where the road is and classifying all superpixels with a probability greater than 0.7 of being a road superpixel as road this prediction was obtained.

Edges Between Superpixels

The Canny edge detector was used to detect sharp changes in brightness of the image, these sharp gradients in colour intensity are known as edges. Detecting edges in images is very useful since it often indicates discontinuities in depth or a change in material properties. The binary image indicating where the edges in the image are, was then used to determine whether there is an edge between two superpixels.