

White Paper Ref 0109

Using Video Analytics to improve road traffic survey information

Introduction

The requirement for capturing data on road traffic conditions has been around for many years. The information is needed by both, local and national government bodies, their consultants, property developers and public enquiries amongst others.

The requirement to capture the information from the road side has led to the creation of an infrastructure of specialist traffic survey companies who are able to collect the data from the roadside in an efficient and safe manner.

While these companies have innovated in the services they offer in the last 5 years or so there has been little innovation in the use of technology either to improve the accuracy of the data, the speed in which it's delivered to the end client or to reduce the cost of doing the surveys.

Video Analytics (the use of computer vision software to analyse the video stream) offers a new technology which can improve the accuracy, speed and reduce the cost.

Current Methodologies

Many traffic surveys are very short term (12 hours between 7.00am and 7.00pm is common) in their scope. This is due to the cost of deploying people and equipment for longer terms and the problem is that there is usually no infrastructure at the roadside to deliver the data back to a central receiving station.

Today traffic surveys are conducted in a number of ways. Traffic counting technology, usually pneumatic tubes, can be positioned across the road. This will allow the collection of traffic counts and gives classification of the vehicles based

around their wheel base configuration. There are however a number of drawbacks with this technology: health and safety while deploying the technology and fixing the tube onto the road surface, vandalism of the equipment and the short life of the tubes themselves.

Human enumerators can be deployed at the roadside to make notes on the vehicles passing a point. This has the drawback of the health and safety of people working roadside, the fact that they need to be out in all weather conditions (which makes the job unattractive to many potential employees) and the accuracy with which they record the data due to the weather as well as the boredom factor of spending hours counting cars.

In order to overcome the problems with deploying people roadside; the traffic survey companies now often video the road during the survey period and have people count the vehicles from the video back in the warmth and safety of their offices. This video can also be passed through ANPR software as a means of automatically counting the vehicles at the specific camera location. This is an example of a video analytics technology in practice.

Improving the offline data and information

Smart CCTV has been working with other (non ANPR) forms of video analytics to identify where the technology offers advantages. By using the existing CCTV capture equipment used by traffic survey companies to collect video for ANPR analysis we can on a video frame by frame basis count the number of vehicles in the frame and track them from frame to frame. It is therefore possible to count the number of vehicles (even if the number plates are too small to read) crossing one or more lines in the field of view. This allows the enumeration of the number of vehicles entering and exiting a junction at various points to be tallied up. Because one camera can usually see more than one arm of the junction this technology requires fewer cameras to be

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deployed than using the number plate as a tag to count.

It is also possible (subject to camera position) to define the amount of time vehicles spend queuing to enter a junction.

Providing real time multiday survey data.

Video analytics can be used in a highly effective manner to provide data in real time for medium term (up to 30 days) periods. The ability to lengthen the survey time period will help to ensure that the core data is representative and the number of vehicles surveyed was not affected by an incident elsewhere on the road network.

By deploying low power smart cameras to undertake the survey work we can, with the assistance of solar power, provide battery power which will support the systems over a number of days without the need for anyone to go on site to change the batteries.

One of the key features of all video analytics software programs is that they turn a data intensive environment (moving pictures) into metadata into a data light environment. For example a single uncompressed image is about half of a megabyte but if you are only interested in the vehicle registration number shown in the image this is less than 100 bytes. This data reduction allows the system to use mobile telephony to transmit the information in real time back to wherever it is needed.

Example surveys include:

- Journey times through a complex junction
- Percentage of commuters within traffic flow
- Percentage of school runs
- Percentage of local traffic
- Number of local delivery vehicles
- Classification of vehicle type by video
- Average speed
- Headway between vehicles
- Length of time queuing to enter a junction

all of these measurands can be time sliced so that the percentages can be for the total survey, specific days and / or how the information changes throughout the day.

These kinds of surveys allow the effects of external events to be monitored and quantified. Examples of the derived data include:

The increase in traffic if a major road is disrupted (does this journey become a rat run?)

What is the change in traffic patterns between school term time and school holiday time.

What is the effect of expected but intermittent events (for example an annual county show).

The ability to have this level of detail for the end user allows them to program the addition of new infrastructure (water, gas, electricity, telecoms) and road repairs into periods where the disruption is minimised and traffic congestion is avoided, thereby saving both time and money.

Accuracy and Cost

The automation of many of the functions previously done by people allows costs to be reduced so that the cost per hour of processing is significantly below the minimum wage and the accuracy and repeatability is significantly higher than people can achieve.

How to access the information

Smart CCTV works with companies within the traffic survey marketplace

Our expertise is setting up the video analytics, dealing with the wireless communications to get the data back and mining that data to extract out the relevant information for the client within a meaningful time period so that the road network can be optimised to increase capacity and reduce congestion.

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