

Edward Davies project brief

Project name: vehicle speed tracking using low level image processing

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There exist several methods for tracking the speed of vehicles using automated stationary devices, but the most common method in use is a radar-gun method. The basis behind this method is to use radar emitter/detector device to fire radio pulses at passing vehicles, and detect either the doppler effect, or the time taken for a return pulse, to determine speed.

This method has the drawback however, of being detectable by the targeted vehicle, which could result in drivers installing radar scrambling devices on their vehicles to render the measurements false.

The cost and complexity of this technology is also an issue, while radar-guns are within the budgets of many law enforcement agencies, members of the public often wish to deter speeding vehicles on under-monitored rural and residential roads. The cost behind these devices (often in excess of £200) makes them prohibitively expensive for the general public.

Another issue is that these devices can only gather a single point of data on the vehicle, its speed. In order to capture registration, an extra camera module needs to be set up to automatically take a picture in the case where a vehicle is detected as speeding.

The basis behind my project will be to create a low-cost system (<£50) that is capable of automatically calculating the speed a vehicle using only images captured as the vehicle passes the device's camera view. This would solve all of the problems listed above; using only camera images would make the device nearly undetectable, if processing can be kept minimal then the computation could be done by a cheap microcontroller, and the images captured would automatically contain a large amount of information about the vehicle.

As recognizing a vehicle from an arbitrary image is a complex task, requiring a high degree of computation, I have elected to use a simpler method. The license plate of a vehicle is a highly controlled element, legally required to be a specific colour, size, and design. Reading the licence plate may be too far for a microcontroller level system but detecting a specifically shaped rectangle using edge detection is a relatively light task.

Once a vehicle is detected, several images can be taken as the vehicle passes. These images can then have a licence plate detection algorithm run on them to find the relative sizes of the plates across all images. This information can then be compared to a pre-calculated lookup table of pixel height to distance, and a distance from the camera created for each image. Once this is done, using the images taken per second, the speed and potentially acceleration of the vehicle can be calculated.

Once the speed has been calculated, the images could be either deleted or saved based on a threshold setting for the local speed limit. As a microcontroller will be used to do only basic processing on the images, the images will have to be kept relatively small (likely 720p at most) and any more complex processing be left to more powerful devices using the saved images.