Increasing of the urban traffic surveillance by automatic information device

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Abstract: Our work consists in the development and setting of an electronic information panel designed to monitor road traffic informational characteristics (velocity, vehicle length and flow density). This information is available using two displays installed above the monitored traffic line. Wishing a “just in time” warning for the driver, the display of the instantaneous speed was represented by the green light if it falls within the legal speed and red light if it is over the legal speed. Our aim was to develop an informing, monitoring and data storing equipment, able to record the time, the speed and the length of crossing vehicles. A test version, which consists of three main modules: the detection module, a programmable controller and an information panel, was designed and a complex hardware and software equipment was manufactured. The efficiency, reliability and stability in operation were the chosen criteria for the detection module. The programmable controller processes the data collected from detectors and displays it. In the future, the hardware platform will allow the connection to other devices (eg. GPRS modem), aiming to achieve the possibility to operate independently or integrated into a system of remote macro-monitoring (idea for further development).

Keywords: vehicle count • speed • vehicle length • traffic safety • traffic flow • surveillance technology • information panel.

1. Introduction

The main goals of intelligent tutoring systems of modern traffic management are the safety of road users, improving the access in crowded urban areas and reducing congestion and accidents. In this context, several detection ways were improved and various technologies for traffic control were also ameliorated in order to inform (warn) the road users. Speed display panels are one of the many ways to increase the traffic safety. Their use encourages drivers to slow down by measuring vehicle speeds and displaying them, being also an alternative accident prevention measure to those carried out by the police (fixed and mobile radar). Speed display boards are particularly effective with drivers who do not pay attention to their speed. Comparative research has shown that when in use, speed display boards reduce speeds and crashes, seem at least as effective as speed cameras and are more cost-effective [1, 2]. Starting from these results, our aim was to develop a complex device, which would also be able to continuously monitor the speed and length of the vehicle that passes through the detection zone. When installed in different areas usually at some distance upstream junctions, these equipments can be integrated into a local data
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Figure 1. Inductive loop detector principle

Figure 2. Example of loop in the roadway section

Figure 3. Image details of inductive loop

collect traffic system, in addition to their classic aim of informing the drivers. Thus, a map of traffic flow rate for all the monitored area is available, helping to solve the traffic congestions that may be encountered (the redistribution and optimization of the traffic). Vehicle identification and traffic surveillance technologies are part of the modern intelligent transport. The technique of detection and monitoring has been continuously developed to ensure: detection, counting, monitoring the speed of the vehicle and classification. For different sensor classes, tests were made in laboratory conditions. The comparative research on detection techniques (also found in other sources [3,4]) has revealed the optimal choice for identifying the presence of a vehicle determining its speed and length. The assessment criteria were efficiency, reliability and cost. In tables 1 and 2 we compare the intrusive and non-intrusive detection technologies.

Inductive detectors were selected as a result of previous analysis, but the quickly evolution of efficiency -reliability / cost ratio for some sensors (e.g. video detection), has led us to design the compatibility of controller connection, with several types of detectors.

2. Research method

2.1. Inductive loop detectors

Inductive Loop Detector technology has been in use for the detection of vehicles since the early 1960’s. The first loop detector designs were based on solid-state analogue technology [5]. The first digital controllers were released between the 1974 – 1975 (the beginning of the digital age). In this way the detection of small motorcycles and bikes became possible and safe. As the development of processors had been fast during the 1980’s, the new generation of loop detectors which were equipped with microprocessor controllers were released. These have the advantage of a simple calibration using the front panel mounted switches [7, 8]. At the end of 1990’s the digital controller called ‘programmable hardware-based’ is released. This has significantly reduced the number of required switches, while the calibration (programming) could be performed by simply pressing a push button switch. Calibration values were stored in an internal memory, so after a power failure the controller would restore automatically these values. In addition, the new software is able to adjust itself the calibration when slow disturbance appears (e.g. small variation of magnetic field). Being the most reliable detection device nowadays, the last generation of loop controllers can run continuously more than one year without manual reset. Electromagnetic inductive equipment called frequently ‘Inductive Loop Detector’ is consists of a loop and an electronic unit generically called

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