



# The Use of Electronic Control Systems in Road Traffic

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## Authors' contributions

*This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.*

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## ABSTRACT

In Turkey, road traffic has been increasing rapidly in province centers with the increase of the number of vehicles. The number of motor vehicles has shown an increase of 70 % within the last decade in Turkey. Inner-city traffic control is regulated by traffic lights and traffic control units. Electronic control systems have been developed to enable the control of the largest area by using the least human resource throughout all time periods.

Electronic control systems and their areas of use are discussed in this study. The characteristics and advantages of electronic control systems are presented. The present speed warning systems on Ankara-Eskişehir highway and the speed lane system in Konya province are examined. The system was set up at 5 points as 10 speed lanes round in both ways. The ten lanes with lengths ranging from 1000 meters to 3500 meters were selected from areas where accidents intensified due to high speed and where the traffic did not stop considering the last three years. The communication of the lanes was maintained through fiber optic cable network and wireless network infrastructure. The entire road was monitored by using 2 license plate reading cameras for the three lanes. The detection of the number of vehicles that pass through the zones with respect to time, the speeds of

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all the vehicles, and the detection of the wanted vehicles (stolen, seized, restrained) is possible through the system. The numbers of speed violations before and after the installation of the system was examined. It was seen that speed violations decreased from around 90% to around 1% considering the number of the passing vehicles. The decrease in speed violations was found to be parallel to the decrease in accidents. As the result of the assessment of the traffic regulation information in addition to traffic control enabled the solution of a large number of security-related cases.

*Keywords: Electronic control systems; plate reading; traffic control.*

## **1. WHAT IS AN ELECTRONIC CONTROL SYSTEM?**

ECS, is a control system developed to maintain the control of the traffic flow and the optimization of transportation, restore a regular and precise normative structure for urban life, and to maintain the safety of life and property by preventing the accidents that are caused by vehicles that disturb the traffic [1].

Road traffic has also been increasing in parallel with both the population and the economic growth of Turkey. Motorways and inner-city traffic control is regulated by traffic lights, traffic signs, and traffic control units. Electronic control systems are developed to maintain the control of the largest area by using the least human resource throughout all time periods [2].

Electronic Control Systems are used in developed countries and they not only prevent traffic violations and traffic accidents that occur due to excessive speed, but also enable the vehicles that travel at a convenient speed according to road conditions to consume less fuel compared to higher speeds and decrease the material damages caused by accidents [3]. In addition, such systems decrease the fuel consumption across the country. The contribution of ECS to traffic safety is highly important [4].

These systems yield a significant contribution when they are supported by laws. ECS provide extra revenue to the economy of the country via the institutions that take criminal action against violations in the sense that they can detect the vehicles that commit a traffic violation and also record the time of the violation in the form of images (photographs or video) and data into the database [5].

ECS improve traffic safety to the maximum level owing to the fact that they can perform instant and average speed controls, detect red light

violations, and they can also be integrated with other intelligent traffic systems and automatically inform the vehicle drivers about traffic and weather conditions via variable messages and variable traffic signs based on the data taken from meteorology systems [6].

The procedures that can be conducted on roads and highways are;

- Imaging, surveillance, recording
- Traffic density measurement and delivery to the users
- Travel time measurement
- Weather and road conditions measurement and automatic anti-icing systems
- Driver information; VTS, VMS, Radio, emergency communication, internet
- Incident detection, device, road data recording
- Toll collection, reporting, and data recording procedures.

## **2. THE AIM OF ELECTRONIC CONTROL SYSTEMS**

- To ensure that the drivers obey traffic rules to the maximum extent by using the element of deterrence, and thus reshape the culture of driving in a positive way [7].
- To detect the vehicles that endanger the safety of life and property of individuals through violating the rules by recording the images of rule violations.
- To maintain the order of traffic and ensure that the drivers obey the rules by continuously monitoring the traffic rules in a way that is independent of human factor.
- To control whether the visible features of the vehicles that pass through ECS points are consistent with the recorded registration information and to automatically inform the lawful authorities based on these detections [8].

- ECS systems are designed to prevent the rule violations that could occur due to the gaps in the entire inner-city traffic control.

The following are maintained on roads and highways through the Traffic Management System formed via ECS;

- A decrease in the number of accidents
- More effective use of road and highway capacity
- The delay of the starting point of a traffic jam
- Improvement in traffic security and road safety and accordingly;
- Decrease in travel times and more reliable travel times
- Decrease in fuel consumption.

### 3. APPLICATION AREAS OF ELECTRONIC CONTROL SYSTEMS

#### 3.1 Speed Lane Violation Detection System

The violation detection process is performed through processing the images taken from the cameras installed above the road and determining the average speeds of the vehicles throughout the lane.

#### 3.2 Red Light Violation Detection System

Red light violation detection system is a system developed to prevent the accidents that originate from red light violation and to detect the vehicles that commit the violation at signalized intersections.



Fig. 1. Electronic control system (ECS) application sample



Fig. 2. Red light violation system sample

### 3.3 Parking Violation Detection System (Parking ECS)

Parking ECS is a system designed as a deterrent factor for drivers parking their vehicles in a way that blocks the traffic at zones where the traffic flow is affected because of parking. It is an electronic control system that detects the vehicles that commit parking violation and allows for taking criminal action [9].

### 3.4 Pedestrian Road Violation Detection System

It is a control system implemented for creating an awareness among drivers regarding the priority of pedestrians in traffic. Pedestrian priority in traffic is clearly stated and this culture is properly

pursued in various developed countries around the world. In our country, drivers do not generally pay attention to the issue of pedestrian priority, and they use the priority themselves by ignoring the pedestrians especially at pedestrian crossings where there are no signalized traffic lights. Pedestrian ECS is a system that enables the pedestrians to cross the road especially in front of schools, shopping centers, and at points where the pedestrian traffic is heavy and primarily ascertains the right-of-way of pedestrians [10]. The recording of the violation that occurs as pedestrians start to walk on the pedestrian crossing at uncontrolled pedestrian crossing points and vehicles violate the rule of pedestrian priority and do not give the right of way to pedestrians is automatically maintained by the system.



Fig. 3. Parking violation detection system (Parking ECS) sample

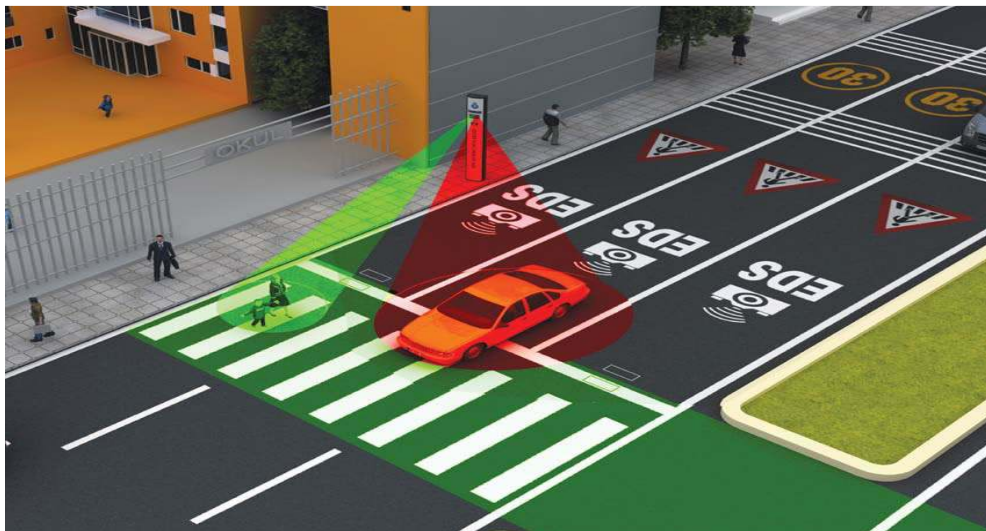


Fig. 4. Pedestrian road violation detection system sample



#### 4. CONCLUSION

Every 30 seconds, a human dies in road traffic. Over 80% of all accidents are caused by human error. (Excessive speeding, unskilled drivers, misestimation or overestimation of capabilities, violation of traffic rules). While the number of deaths that occurred in road traffic accidents was 1.3 million globally, this number is projected to increase to 2.4 million in 2030. Excessive speeding is by far the 1<sup>st</sup> cause of traffic accidents. Road traffic accidents and their consequences cost governments approximately 2% of their gross national products [11].

In March 2010, the UN (United Nations) proclaimed the years from 2011 to 2020 as the "Decade of Action" to indicate the importance of road traffic safety at the global level. It is highly necessary that the authorities take immediate action to decrease the damage caused by traffic accidents and to improve the traffic infrastructure.

All these negative data reveal the necessity of Electronic Control Systems and the importance of their development.

#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

#### REFERENCES

1. İSBAK (Istanbul Transportation Telecommunication and Security Technologies). Available: <http://www.isbak.com.tr/tr/icerik/elektronik-denetleme-sistemi>
2. Abaloğlu Açık Kart Technologies and Payment Systems Inc. Available: <http://acikkartkamu.com/default.aspx>
3. Öncü Security Systems Company. Available: <http://www.oncuguvenlik.com.tr/html/eds.html>
4. Ortana Electronics Software Contracting Industry and Trade Inc. Fact Sheet.
5. Konya Province Security Directorate TEDES (Traffic Electronic Control System) Fact Sheet.
6. Maeda Y, Ueda F, Namekawa M, Satoh A. Road information input model. Proceedings of 23<sup>rd</sup> Simulation Technology Conference. 2004;61-64.
7. Namekawa M, Ueda F, Hioki Y, Ueda Y, Satoh A. General purpose road traffic simulation system with a cell automaton model. Proceedings of International Congress on Modelling and Simulation. 2005;3002-3008.
8. Namekawa M, Ueda F, Hioki Y, Ueda Y, Satoh A. The vehicle junction model and its verification in traffic simulation. Proceedings of 2<sup>nd</sup> International Conference on Asian Simulation and Modeling; 2007.
9. Dr Steffan Datentechnik, PC-Crash. Available: <http://www.dsd.at>
10. IbB Expertisen, CARAT. Available: <http://www.ibb-info.de>
11. Press WH, Teukolsky SA, Vetterling WT, Flannery BP. Numerical recipes multi-language code CD-ROM Cambridge University Press, Cambridge; 2002.

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