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Smart Traffic Management System Conceptual View in a Smart City Using Computer Vision Concepts

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Abstract: *In this paper, we propose a method for the design of an expressway using various types of instrumentation devices such as cameras, speed limiters and thus, try to avoid the accident rate.Smart traffic management system conceptual view in a smart city using computer vision concepts is being presented in this paper.*

Keywords: *Express way, Instrumentation Device.*

I. Introduction

This paper deals with the design and implementation of a car sitter mechanism for a driver for efficient driving. This paper deals with the design and implementation of a car sitter mechanism for a driver for efficient driving. The paper is organized as follows. Section 1 deals with a brief introduction to the paper. Section 2 deals with the electroencephalogram, driver steering methods and the eye detection techniques for efficient driving. The implementation of the hardware is discussed in section 3 followed by the outcome in section 4. The paper concludes with the conclusions in section 5 with the appendix.

II. Expressway

Expressways is an initiative to modernize and automate the present day roadways with state of the art technologies thus promising to be a breakthrough in the existing state of roadways. It employs a microcontroller driven architecture which monitors every section of roadways communicating with various levels of the design. The design supports a web and mobile client based interface which extends the accessibility of the system.

Expressways monitors every section of road on real time for excess traffic, parking of cars in non-parking area, pedestrian crossing on a busy lane, accidents, over speeding of vehicles & under speeding on different lanes. In an urgent situation it also serves requests for Special Service vehicles like Ambulances to give them a clear lane for immediate transport. This on a whole provides an effective remedy for safety of the public.

III. Benefits Of The Work

The prime beneficiaries of the design are all the civilians as the purpose of the project is to efficiently manage traffic and enhance the traffic sense on roads thus resulting in lower number of accidents, leading to better and safer roads. Express Ways also serves an upper hand for handicapped people by providing a voice based interface in addition to visual indication intimating them when to access the roads.

IV. Innovation Done

The present day roadways require some enhancements with automation in mind. In an attempt to do so, we enhanced the functionalities of roadways by a broad extent. Smart Traffic Management is the need of the hour especially where the roads are busy the entire day. A small accident which can result in heavy time loss on these roads has to be avoided. The design implements this system by monitoring the number of cars in each section of road. Alongwith, the design supports immediate alerting in case of breakdown or accidents on the roads thus enhancing the response time.

V. System Design

Express Ways efficiently utilizes various software as well as hardware technologies for achieving the required features. The system block diagram gives the overview of the design. Following are the features of Express Ways:

VI. Handicap Support

The design aids the handicapped people by providing a server based Voice System which guides them when to cross the roads. The design provides this arrangement at all the zebra crossings and traffic signals.

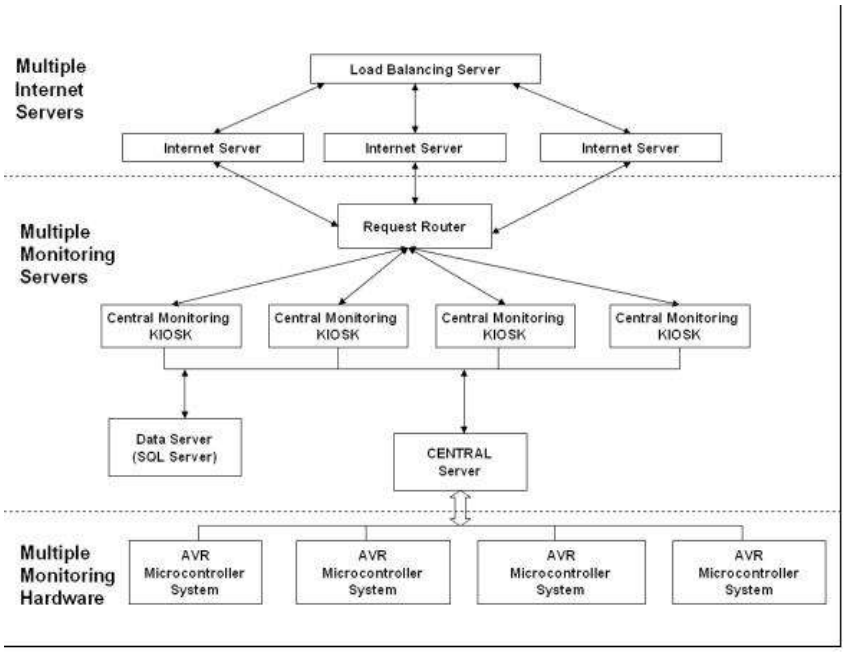

Fig. 1: Multiple internet servers

VII. Smart Traffic Management:

Express Ways utilizes AI methodology to analyse the road traffic behaviour for a specific lane. If its required to modify any traffic rule (maybe traffic signals) which may result in balanced traffic on this lane during peak hours, the system takes care of this. Data Warehousing and Data Mining are the software technologies which go alongwith this feature.

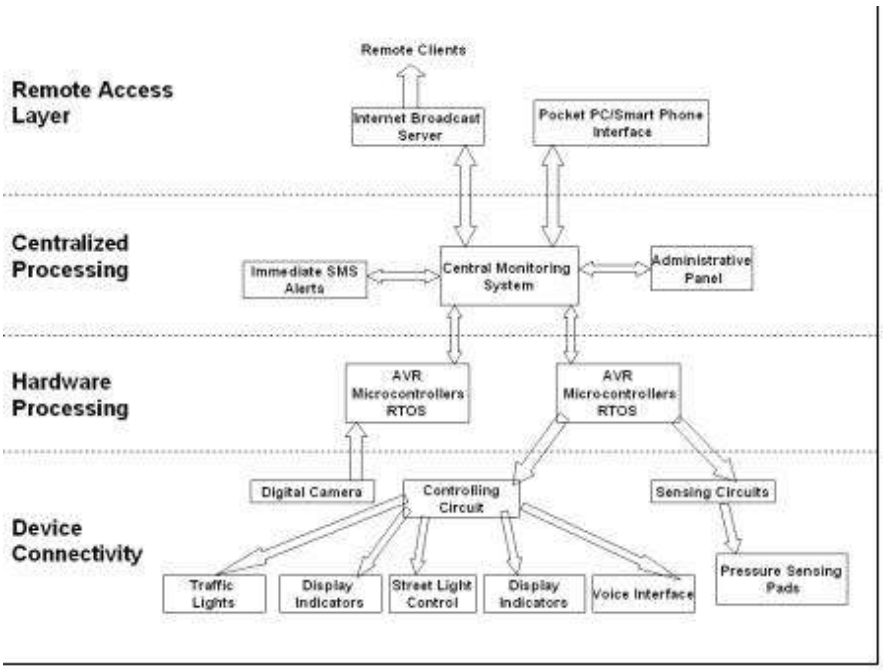

Fig. 2. System block diagram

VIII. Minimal Response Time In Accidents

In case of an accident where a car crashes with the sideways of the road, accident pressure sensors sound the required alert to the central server. The very next step is to send a sms alert to the emergency rescue team to resume back the road conditions and to take any injured to the nearest hospital for first aid.

IX. System Mobility

The design supports Pocket PC/ Smartphone based monitoring and controlling, from virtually anywhere in the world. The remote access layer of the design even extends the scope of the system to serve the queries of users for determining the best routes for a specific destination with the details of source and time of travel. The result is in accordance to the traffic on the roads at that instant.

X. Image Processing:

The design implements higher level of image processing for efficient detection of any rule breaking event. It implements an aerial image scanner who passes the output to a high speed microcontroller. The microcontroller processes the image maps on real time basis and detects any incorrect/ unexpected happening. In such a case, the microcontroller informs the central server about the problem, responding to which the server determines the action to be taken.

XI. RTOS (Real Time Operating System)

The design employs a custom RTOS implemented for the microcontrollers. The OS serves all the requests from the server and the devices connected to it. The OS can be configured for either image processing or for monitoring and controlling devices. The OS also features aself update architecture, enabling the microcontroller OS to be updated from server end as and when required.

XII. Display Indicators

The design supports dynamic displAy indicators which can be used for parking / non-parking indicators for smartly managing the use of road sides for lower traffic. The display indicators can be multiplexed to display the further route / optimal time for covering the lane / advertisements, thus providing a public interface for showcasing the functionalities of the design.

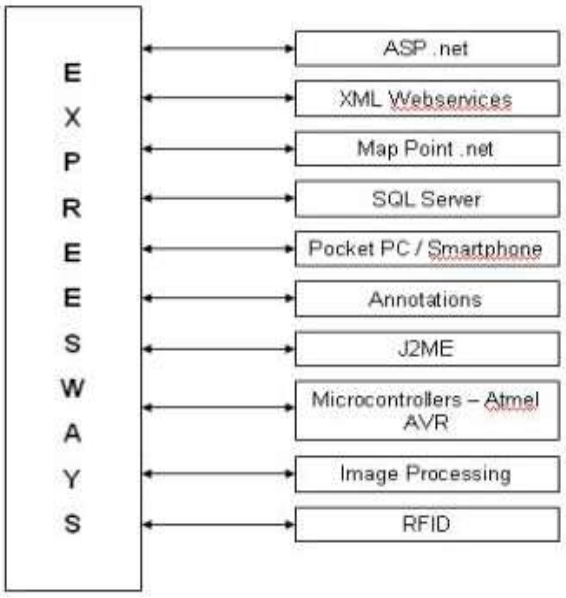

Fig. 3. Expressway design

XIII. Future Upgradation

The design supports future upgradation to a higher system or upgrading to a new technology. The cars available today do not carry any technology with them. If tomorrow there is a common technology installed in the cars, the system can be programmed to communicate with the new technology.

XIV. Street Light Management

The design smartly manages the street lights depending on the requirements of the roads. If there are no cars on the road, the system determines to switch off the street lights or switch to a minimum amount of light. Thus the system not only provides safety but also enhances the efficient use of power.

XV. Road Administration

The system generates a data warehouse which stores precise information on the number of cars passing through each lane and at what times. The system provides an interface for the management to take up any decision on road addition and expansion. The system acts as a decision support system for expanding and adding up new roads to the current roadway system. The management can analyze every lane in the map on screen graphically by number of cars, peak hours, peak hour traffic and so on.

XVI. Over Speeding / Under Speeding

In case of a speeding limit on the road lanes, it becomes necessary to follow these speeding limits. On higher speed lanes under speeding is important and on lower speed lanes higher speeds is a problem. The design takes care of both the things. In case of breaking the speed limit, the police personnel are informed via sms alerts or via a centralised communication system.

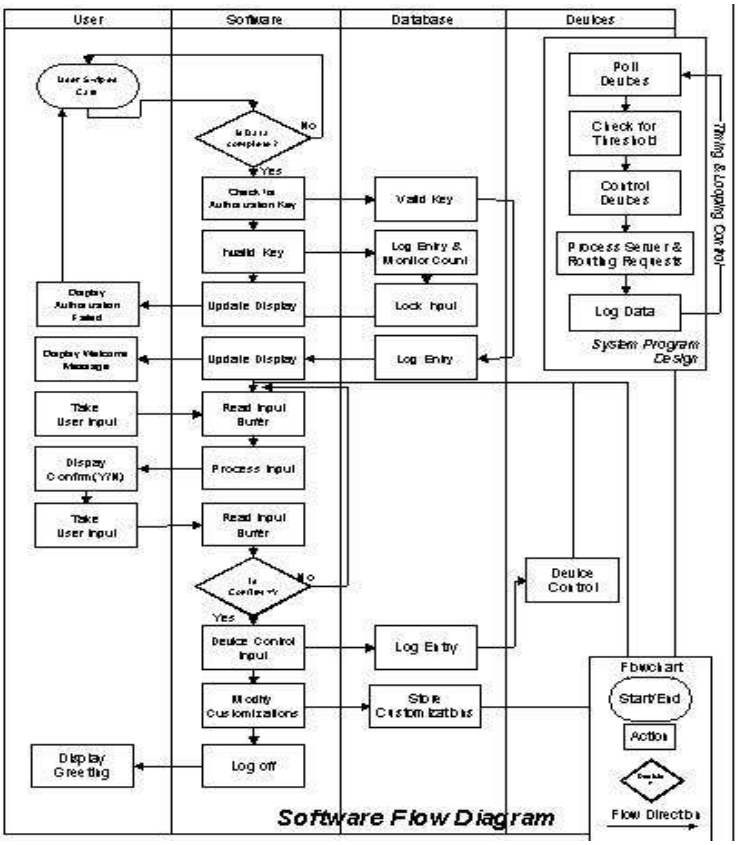

Fig. 4 : Software flow diagram design for the expressway

XVII. Special Service Requirements

In an emergency if a vehicle demands special lane requirements, it would be granted to the vehicle and the traffic signals would manage the traffic to take up other lane and keep the highest speed lane for the vehicle. An ambulance may demand this lane electronically with the required authorization.

XVIII. Development Plan

The development plan for the system is to split the complete project by the technologies being implemented. Everyone works on individual technologies at an early stage and then all the technologies will be linked together to one interface. The interface development will be in parallel to the technological research so that there is not much of difference at a later stage. The planning of the database architecture, interface, system design have been done.

XIX. Software Implementation

The software for the system is developed on the latest platform '.net' along with various other additional software technologies. The flow diagram of the software architecture is shown.

XX. Outcome

With enhanced Traffic Management & Public safety functionalities Expressways will demonstrate the efficient use of electronic and computational power for making the world a safer place.

XXI. Conclusion

A novel scheme for the implementation of an full-fledged expressway is being proposed. A software flow diagram was designed for the expressway.

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