

Design and Development of an Evidence Collection Black Box for Automobiles



K. R. Nithin

nithinkr.1724@gmail.com
Ph. No: 0 98441 83101

Student's Name K. R. Nithin AEL (FT-2012)

Academic Supervisor(s) Z. Tracy Austina and V. Deepak

Industrial Supervisor(s)

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Abstract:

As the number of on-road vehicles rises, there is a proportionate increase in the accidents. Black Box technology is a tried and tested technology used in the aircrafts in order to detect the cause of an air crash. The same technology can be incorporated in the on road vehicles for detecting the cause of an accident and also to identify the offenders. Monitoring and recording the driver behavior can aid the police departments as well as insurance agencies. Hence there is an imperative need for building Black Boxes in the on road vehicles.

In this work, a low cost ECU for Black Box is designed and developed using LPC2148 ARM controller, different sensors to monitor crash, accelerator pedal pressure, brake pedal pressure, vehicle speed, alcohol detection and seat belt. It also has a memory card interfaced that stores the data from these sensors. Apart from this the system stores the required driving data of car comprehensively and accurately in real time. A chip recorder IC interfaced to the ECU records voice clips of limited duration inside the cabin. The ECU also has a GSM and a GPS module interfaced. In case of accident, the location of the vehicle is sent through GSM to a preset mobile number for immediate rescue and treatment. Recorded data can be used for forensics, revealing the problems that caused accident. The control algorithm for this system was developed using Keil uVision IDE in Embedded C. Working status of all the sensors is displayed on LCD screen.

The Black Box system was prototyped and checked for its various functionalities by generating various test cases. This low cost Black Box system can be integrated as an after-market fitment in low segment vehicles. As a part of the future work, a microphone can be interfaced to the ECU and enhance the duration of recorded messages further reducing the size and cost of the Black Box.



Black box prototype setup



Results obtained from black box displayed on LCD