Intelligent Data Recorder and Transmitter for Surveillance: A Survey Report

G. Sasikala and M. S. Varadarajan

***Abstract*—This paper covers review of a value added service and surveillance for a wide range of applications such as Air craft System, Road traffic signal offenders, Monitoring ship movements etc. The operation is carried out in three stages such as sensing, processing and transmitting / receiving the data. Here sensors play a major role in measurement of physical quantities such as temperature, pressure, speed etc., which can be read by an observer or by an instrument and transmit during abnormalities. Recorder is used to provide audio & video information which can be transmitted to the relevant authorities using wireless networks.**

***Index Terms*—Sensors, intelligent data recorder, black fin processor, transmitter, receiver and wireless n/w.**

I. Introduction

In 1956, the Defense Science and Technology Organizations', Aeronautical Research Laboratories in Australia Dr. David Warren designed the first proto type coupled FDR / CVR for explicit post- crash examination purposes in airplane accidents. . A Recorder is fully automatic for fit-and-forget operation with a memory mechanism that would store hours of pilot voice and instrument readings up to the moment of any accident, but would automatically erase older records for the memory to be re-used. Generally Manufacturers might want to use the data to understand how their vehicles are performing and also this device is used to Insurance companies try out auto recorders, pay-as-you-drive car insurance, and a recorder for human health. The unit is attached to the ship's main engine and works similarly to "black box" data recorders fitted to aircraft and other high-tech vehicles. Researchers in the UK believe the technology also has vast environmental and ecological benefits in reducing the risk of oil spills at sea if a ship is at risk of breaking down. In United States, today maximum no of vehicles contain some type of data recording device. Some of the published papers in this area are recent ones [1] – [9].

This paper structured in four sections (except the introduction) input section and signaling (which includes sensors like temperature, pressure and speed), output section (which includes recorder and transmitter) and processing section that includes Black fin processor and in conclusion regarding advantages of the proposed solution.

Manuscript received September 10, 2012; revised November 18, 2012.

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The main advantage of this survey is existing audio and data along with that include video concept. Once the abnormalities happen in any one of the sensor parameter immediately the data recorder start for recording and transmitting to the ground station.

II. Input Section

A. Temperature Sensor

Temperature is the most often measured environmental quantity. Many electronic components can be damaged by exposure to high temperatures, and some can be damaged by exposure to low temperatures. Several temperature sensing techniques are currently in widespread usage. The right one for our application depends on the required temperature range, linearity, accuracy, cost, features, and ease of designing the necessary support circuitry.

B. Pressure Sensor

Superior pressure sensing is required for highly efficient A/C loop systems that enable reduced fuel consumption and improved emissions .Automotive Pressure sensor is the low-cost, lightweight solution for accurate and robust pressure sensing in under-hood applications such as engine load management and compressor protection.

C. Speed Sensor

Speed sensors play a major role in this type of system, delivering important information by monitoring vehicle speed at all times when the car is running. Speed sensors rely on a relatively simply principle of electromagnetism to determine the speed of a vehicle. Most commonly they are attached to the engine itself, with the crankshaft engaging the toothed disc and the sensor relaying its information to the electronic engine control system, from which it is transmitted to other vehicle systems. Some anti-lock braking systems use speed sensors mounted inside the wheels. In other cases a speed sensor may be mounted on the rear axel. The location depends on the design constraints of the specific vehicle and the type of speed information required. In aircraft, two types of wheel speed sensors are: The AC sensor, which creates a variable frequency AC current and a DC unit, (basically a DC generator). The Antiskid systems operation in flight is generally armed by a switch in the cockpit. System will utilize the squat switch to prevent current from flowing to the system during flight. System allows full pilot control over braking at speeds below 20 mph. System will perform its function when the wheel deceleration indicates an impending skid.

A technical presentation by Carmen Eleonora Stanm, *et al.*,

DOI: 10.7763/IJMLC.2013.V3.259

[5] proposed the concept of road traffic monitoring which includes sensing section equipped with non –intrusive sensors and a camera for data collection, a central dispatching computer and connection with the traffic controllers all are supported via web portal. Oliver Schatz analyzed [8] micro machined active and passive sensor and video sensor for vehicle safety system. Along with that, in our survey DS1820 digital temperature sensor, MPXC2011DTC pressure sensor and TLE4942-1C speed sensors are used.

III. Output Section

Ming Yang' [1] presented for audio and video synchronization, DCT based high bit rate hiding information algorithm is proposed. At the receiver, the embedded audio data is extracted and played with the host video frames to achieve the synchronization. Some significant advantages in this approach is (a) the communication channel for audio data transmission is avoided; (b) The synchronization between audio and video data is robust to packet loss (c) Complex task of multiplexing, de-multiplexing and synchronization in MPEG system have been avoided.

In another study by Qiang Wu Kebin Jia Xuwen Li [3] a new type vehicle video blackbox with acceleration sensitive function was designed. Different with common blackbox on car, the system can record and store the analog video to H.264 bi stream files when acceleration exceeds the limitation value. The acceleration sensitive algorithm has been derived.

A novel approach [4], for analyzing when the car acceleration exceeds the threshold value and the system can record and store the analog video H.264 stream files .This paper gives a trans coding scheme from H.264 to AVS (Audio video standard) .AVS proposes an effective trans coding method to attain high efficient and fast trans coding without losing much quality by reusing intra mode, inter mode, motion vector. Algorithm of Trans coding from H.264 to AVS is different integer and different quantization technologies do not impart much on cost and distortion while coding and gives smooth pictures.

Mehrnoush Rahmani [6] analyzed audio and video communication in vehicle with different network topology like the double star and the unidirectional ring have been introduced and evaluated from the transmission performance point of view. The analysis has been performed by simulations for an overloaded network with different types of traffic flows. Although the throughput and packet loss rate results show a better performance for the ring topology.

Dale Green mention [2] the principle drawback of existing pinger receiver system was analyzed and the following were the observations.

- Limited Range (< 1 Km)
- Poor quality control on transmit frequency
- Pings are severely impacted by ocean conditions
- Ambient noise / inference

Given that the present pinger is only detectable to about a kilometer, a crash in a 6 Km deep ocean would require the receiver to be positioned at a minimum depth of 5 Km. Such an acquisition system can easily be carried by even a modestly sized unmanned underwater vehicle which can operate autonomously without the risk and expense of a towed remote operated vehicle.

Further Masahiro Miyaji's. [7] research was conducted into a large number of on-board driver monitor systems as a means of reducing traffic accidents. In order to improve the effectiveness of these systems, it is necessary to detect the driver behavior and mental and physical state immediately before an accident, and to inform or warn the driver of the danger, or else to send an Intervention signal to the pre-crash safety system and other advanced vehicle safety systems.

Pendse and Ali [9] analyzed the communication channel between the air craft and ground station. In addition, the internet connectivity could also be used for other safety mechanisms like video surveillance and remote control of the flight. Security is one of the major concerns that affect the successful deployment of aircraft data networks and other safety measures.

IV. Proposed System

In this paper, based on the surveillance system the recorder continuously stores the video streams and it also transmit the recorded information, when abnormalities occur in the system. Initially sensors sense the physical parameters of temperature, pressure and speed .The A / D converter converts the incoming input into the digital output. The processor has the predetermined threshold value of the sensors. If the incoming data is varied from the threshold value, it indicates the output to the display as well as the output of the sensors. The audio and video streams are given to the processor via A/D converter. Finally monitor displays the video streams and audio is produced by loud speaker. Now, the recorder transmits the recorded information to the base station. The block diagram of such system is shown in Fig. 1.

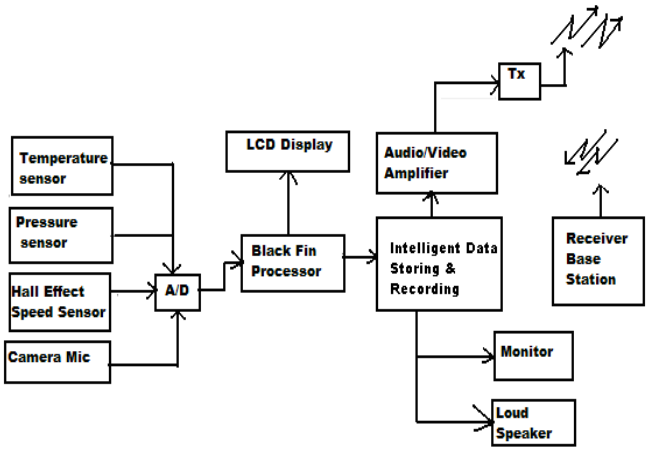

Fig. 1. Functional block diagram.

A brief explanation of the components used in the design is given below:

A. Processor

Blackfin-BF533 processor is up to 600 MHz high-performance processor. This processor combine a dual-MAC state of the art signal processing engine, a rich set of industry leading peripherals and memory. The

ADSP-BF533 processors are completely code and pin-compatible on-chip memory.

1) Features

- Performance to 756MHz / 1,512MMACs enables multi-channel audio plus VGA/D1 video processing in multimedia applications.
- Enhanced Dynamic Power Management with on-chip core voltage regulation allows operation to 0.8V extending battery life in portable applications.
- 16-32 bit processor.

2) Applications

- High performance web camera
- Digital Video Recorders
- Broadband Wireless Systems
- Multi-Channel VOIP
- Security and Surveillance
- Video Conferencing

B. Transmission

Transmit the recorded signal via satellite. Normally satellite uplink ranges of 147 MHz and down link of 437 MHz. It performs the following tasks: global navigation support of planes under accuracy of coordinates definition better than 100 meters; precise navigation support in airport areas; communications services between regional air/road traffic control centers and system (mobile telecommunications); automatic dependent tracking of system flights; and voice and data communications between components of the air/road traffic control system.

V. Conclusion

Intelligent Data Recorder with Transmitter is one of the devices in car/ship/aircraft wireless network systems. This paper summarizes different approaches that help accident investigation. A prototype has been designed and developed which enables the data acquisition and interfaces to the processor and transmits the data.

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