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A Real Time Embedded System for Monitoring Of Cargo Vehicles by Using Controller Area Network

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Abstract: *This paper presents the creation of a CAN network for monitoring parameters route of cargo vehicles. By decree of law, all cargo vehicles must contain tachograph device that collects and records all information practiced during the trip, such as speed, distance, RPM (rotations per minute), among other parameters. The data provided by the tachograph are sent to the CAN network, collected and interpreted by the microcontroller and sent to the monitoring station by serial communication by the receiver. Thus, the central monitoring company will quickly follow the route of its drivers, and the characteristics of travel practiced by them.*

Keywords: *Controller Area Network, Raspberry Pi 3, ARM 7 (LPC 2148) Microcontroller.*

I. INTRODUCTION

The project is aimed at evaluating the performance of an operating system on an embedded system. Before delving into its implementation, an introduction is needed to the parts involved in the project. The whole description is centered around the field of embedded systems and the use of Linux to run applications on them. Hence an introduction to Embedded Systems and using Linux as an OS in them is provided.

CONTROLLER AREA NETWORK:

Controller Area Network (CAN) was first created by German car framework provider Robert Bosch in the IR, and so on. With this adaptability, notwithstanding, comes the likelihood of interoperability concerns. To facilitate some of these worries, the International Standards Organization and Society of Automotive Engineers (SAE) have characterized a few conventions in light of CAN that incorporates the Media Dependent Interface definition with the end goal that the majority of the lower two layers are determined. The CAN protocol is an international standard defined in the ISO 11898. Besides the CAN protocol itself, the conformance test for the

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CAN protocol is defined in the ISO 16845, which guarantees the interchangeability of the CAN chips. A principle of data exchange CAN is based on the “broadcast package mechanism”, which is based on a message-oriented transmission protocol. It defines word contents rather than stations and station addresses. Every disclosure has a message identifier, which is incomprehensible within any network since it defines blithe and also the priority of the message. This is important when several stations race for bus access (bus arbitration).

CAN Standards & Specifications:

The Controller Area Network (CAN) convention is broadly utilized as a part of minimal effort installed frameworks. CAN utilizes "Non Return to Zero" (NRZ) coding and incorporates a bit-stuffing system. The CAN is equipped for giving rapid and high limit information for an extensive number of parameters with more effectiveness. Most network applications follow a layered approach to system implementation. This systematic approach enables interoperability between products from different manufacturers. A standard was created by the International Standards Organization (ISO) as a template to follow for this layered approach. It is called the ISO Open Systems Interconnection (OSI) Network Layering Reference Model. The CAN protocol itself implements most of the lower two layers of this reference model. The communication medium portion of the model was purposely left out of the Bosch CAN requirement to certify system designers to adapt and optimize the communication protocol on multiple media for maximum flexibility (twisted pair, single tap, optically isolated, RF).

II. PROPOSED SYSTEM

This undertaking presents the formation of a CAN arrange for checking parameters course of freight vehicles. By pronouncement of law, all payload vehicles must contain tachograph gadget that gathers and records all data working on amid the excursion, for example, speed, separate, RPM (revolutions every moment), among different parameters. The information gave by the tachograph are sent to the CAN arrange, gathered and translated by ARM7 and sent to the observing station by serial communication by the receiver. In this way, the focal observing organization will rapidly take after the course of its drivers, and the qualities of travel rehearsed by them.

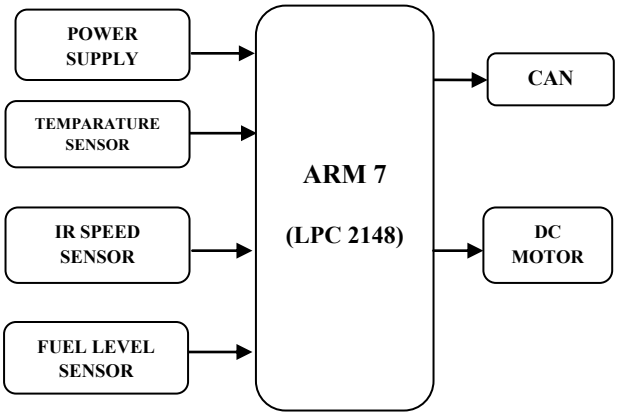

Fig.1: Transmitter Block

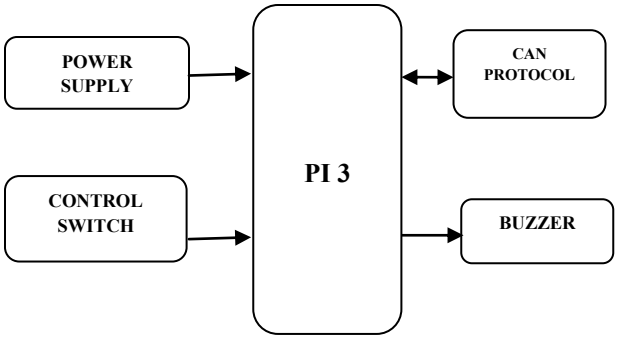

Fig.2: Receiver Block

III. HARDWARE DESCRIPTION

Raspberry Pi 3:

The Raspberry Pi 3 Model B is out and it's astonishing! With a redesigned ARMv7 multi center processor, and a full Gigabyte of RAM, this pocket PC has moved from being a 'toy PC' to a genuine desktop PC. The enormous redesign is a move from the BCM2836 (single center ARMv6) to BCM2837 (quad center ARMv7).

Fig.3: Frontal View of Raspberry Pi 3 Model B

ARM 7 (LPC2148):

ARM is a 32-bit RISC processor architecture extended by the ARM Corporation. ARM processors consume a unique combination of features that make ARM the approaching popular embedded architecture today. First, ARM cores are very easily done compared to most other general-purpose processors, which means that they can be manufactured using a once in a blue moon small abode of transistors, leaving plenty of generation on the micro for application-specific macro cells.

A typical ARM chip can contain several extraterritorial controllers, a digital cry processor, and some approach of on-chip memory, along with bodily of an ARM core. MMU, floating involves

and other co-processors are optional, which gives an end to flexibility in apartment application-specific ARM-based processors. Finally, while being small and low-power, ARM processors provide steep performance for embedded applications. For lesson, the PXA255 XScale processor running at 400MHz provides performance comparable to Pentium 2 at 300MHz, while using fifty times less energy.

Temperature Sensor:

The LM35 arrangements are exactness incorporated circuit moistness gadgets to create voltage directly relative to the Centigrade temperature. The LM35 gadget has leverage over straight temperature sensors adjusted in Kelvin, as the oddity isn't authorized to diminish a luxurious consistent voltage from the yield to acquire advantageous Centigrade scaling.

IV. FLOWCHART

Transmitter

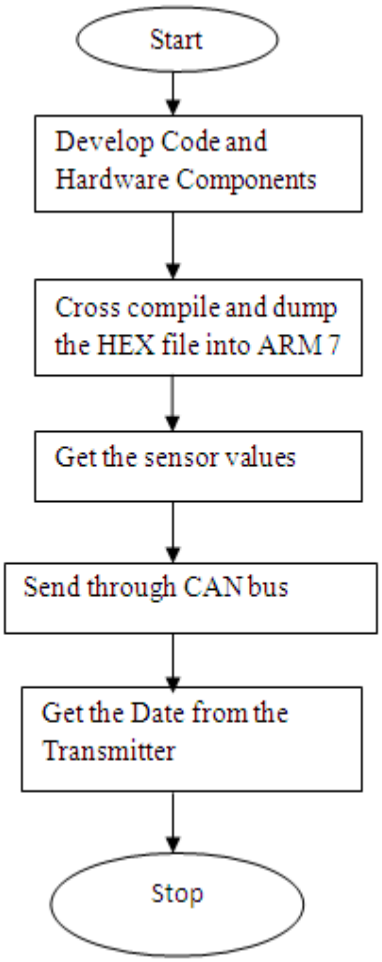

Fig.4: Transmitter Section

Receiver

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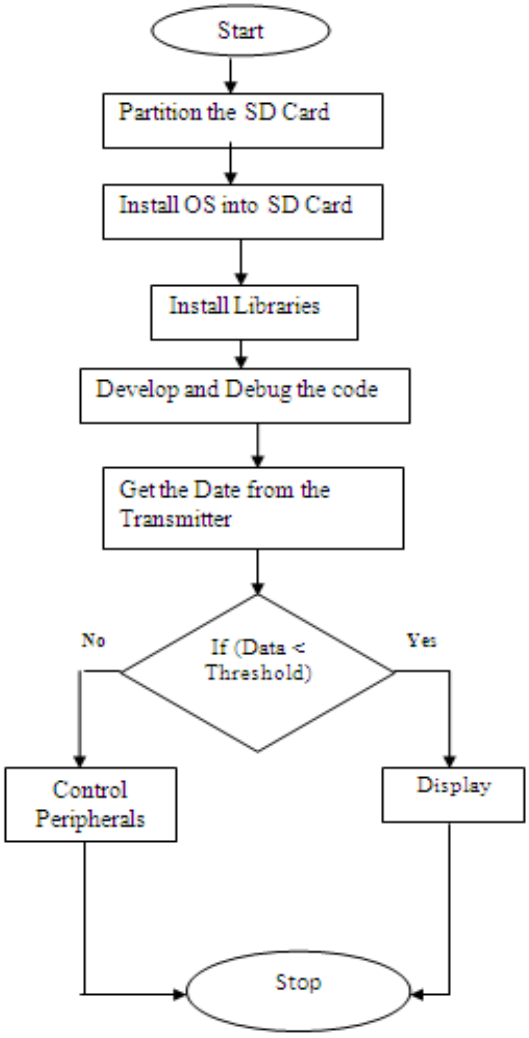

Fig.5: Receiver Section

Software Tools Used:

- Keil IDE
- Python Language for Programming
- A Wheezy Raspbian Installed System Required Qt Creator V4.0

V. RESULTS

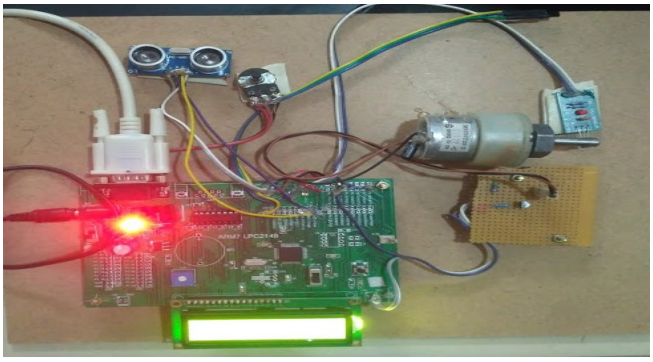

Fig.6: Proto type of the Vehicle Monitoring System by using CAN Protocol

Fig.7: Arm7 LPC2148 Microcontroller board with Lcd Display

Fig.8: Transmitter Section Status of the Prototype

Fig.9: Raspbeery Pi3 Connection

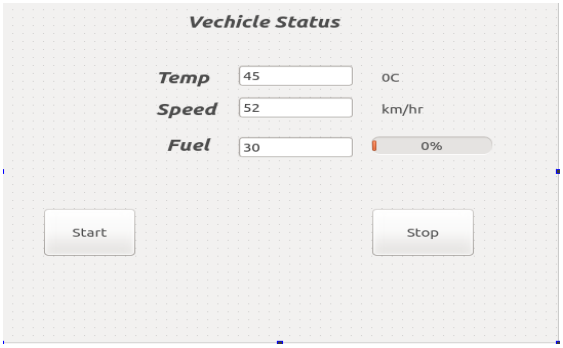

Fig.10: Receiver Section of the Prototype

VI. CONCLUSION AND FUTURE SCOPE

From the above results and discussions we manage that as the engine facilitate in RPS & unavailable duration of engine increases the fuel directly in the tank decreases which is monitored & effectively communicated over CAN bus. Our design here is mainly intended to achieve communication between master and slave modules for monitoring various parameters of the vehicle. This work can further be extended by using IR sensor, GPRS and 3G technologies.

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