Train control system using can protocol

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Abstract - ***This system aims to train running automatically without any human operators. Also take care of*** **Safety and security** ***, Provides information to avoid train to train collisions, over speeding problem, signaling errors .by this system passengers will get the train location, speed and direction in real time by using there mobile phone. CAN protocol interconnect all the train compartments in the network to ensure safety and security of passengers during disasters occurring within trains such as bomb blasts and fire outbreaks. The CAN node is used to ensure the safety and security of the passenger. In this system (i) a passenger can query about the location of a train via SMS. (ii) Centrally controlled route server. (iv) automatic speed adjustment (v) audio speakers to inform the passengers about the approaching station (vi)provide alert messages during a crisis situation.(vii) Emergency push button to stop the train in critical situation .***

Key Words: *mobile phone, CAN protocol*

1. INTRODUCTION

Generally when we are on railway platform waiting for a train, eager to know about the current location and expected time of arrival of train. Now, for this we completely depend on announcements made by the enquiry staff. At present the information of the running trains are monitored with the help of manual which is not perfect. RAIL RADAR is the new technology launched by Indian Railways recently, which updates train position on a map every time it crosses a station on its way. This system does not provide real-time tracking since each station is located at least 1 km apart in cities and 10-20 km apart in remote places. It does not use GPS which is a major drawback because the train location is virtually unknown until it reaches the next station that may be 5 to 20 minutes away. In this project the exact location and speed movement of the train can be monitored in real time basis. This project has been developed for a train which provides precise location through interactive mode on mobile phones, laptops, leading to the elimination for telephone enquiry. The new classification would be more useful all through winter or foggy endure stipulation as passenger hardly get in sequence about Passenger trains because this project use GPS data to monitor trains and offer genuine time in order about the position of the train to users. HUMAN ERROR is one of the major reasons for train accidents. Every year we end up with at least 2 or 3 major train accidents purely based on human errors. Train to train collisions, over speeding trains and signaling errors are typical cases where hundreds of lives have been lost. Most of the time the reason would be on errors from drivers and signal operators .This project will design a system that run the train autonomously without human operators . Another important problem is SAFETY AND SECURITY of passengers . The driver has got no way to know the happenings trains. Although security is available in railway stations, it is still not enough to prevent fire outbreak that originated in one compartment that quickly spread to other part of the trains resulting in loss of huge number behind the engine. This project will provides alert messages during crisis situation. Here is an approach to achieve efficiently design user friendly for driverless train control system application especially target at preventing accidents such as train to train collisions, over speeding problem etc.

2. SYSTEM DISCRIPTION

A. CAN bus communication
B. CAN technology
C. IP core

2.1 Block diagram

It has a front SONAR ultrasonic range finder to check any truck/car/humans/animals crossing a railway line and the train control system oversees this and can adapt to slow down the speed accordingly for this purpose. The onboard disaster prevention network connects all the comp-artments of the train with the main control node over CAN bus (Controller Area Network). Each CAN node has got a variety of sensors and devices to ensure the safety and comfort of the passengers The FPGA based processors

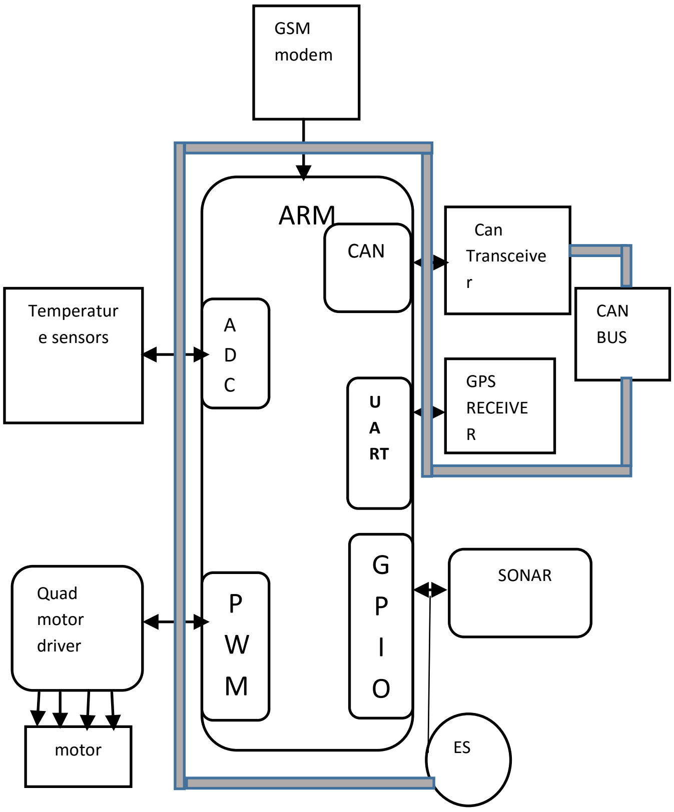

Fig-1: CAN bus communication

feature a better power efficiency, flexibility. The train unit have an onboard GPS and GSM module The train control system send its present GPS location information at times to the central railway server. By using SONAR, we know how to detect the obstacles and lessen the severity of accidents. The onboard disaster prevention network connects all the compartments of the train with the main control node over CAN bus. Temperature sensor detects fire outbreaks by sensing large temperature variations. Audio announcement system is designed to announce the approaching station names found out via GPS location. This is also used to update critical emergency information with the passengers such as fire outbreak. Emergency push button to stop the train in critical situation The mp3 audio files are stored in an external 2-GB Micro SD memory card and an MP3 Decoder chip is used to play it in speaker. The microcontroller is able to access the files in memory card via a FAT-32 file system library.[1]

2.2 CAN technology

CAN technology is adopt by most automotive industries nowadays. As per Chuliang the paper presents a virtual instrument based control system for research and enlargement of the automotive and railway industries. This resourceful low rate proficient and realistic arrangement contains the applications of data acquisition, controller area network (CAN), harmful engine exhaust emissions reduction, and spot welding[2]. The system must be proficient to be employed in various automation industries due to its flexibility. The detailed applications of the system presented here, addresses the monitoring of car engine exhaust emissions, CAN application in reducing car engine exhaust emissions and monitoring of automotive and railway spot welding. The disadvantages are the data as of the gas sensors is require to be collected and compared for each processing. The virtual control system is used for only three applications such as DAQ, CAN and harmful engine exhaust emissions reduction. According to Chuliang, in this paper introduces a built network for data CAN transmission following the data acquisition from the necessary temperature sensors mounted on a car engine and a train bogie in two respective tests[3]. LABVIEW is the only useful software during this network design based in the lead of the industrial widely use. The network should be capable to be functional in various transportation industries suitable to its elasticity, extensibility and achievability. The disadvantages are separate PC's are used to operate as DAQ and CAN system for data sharing instead of using both the system in same PC. By using only LAN network we can transfer the data from DAQ PC to CAN PC. More CAN nodes cannot be extended to build a complex and functional CAN network This article introduce a method by means of ARM as the main controller and double gateway in a control computer in a car[4]. This system

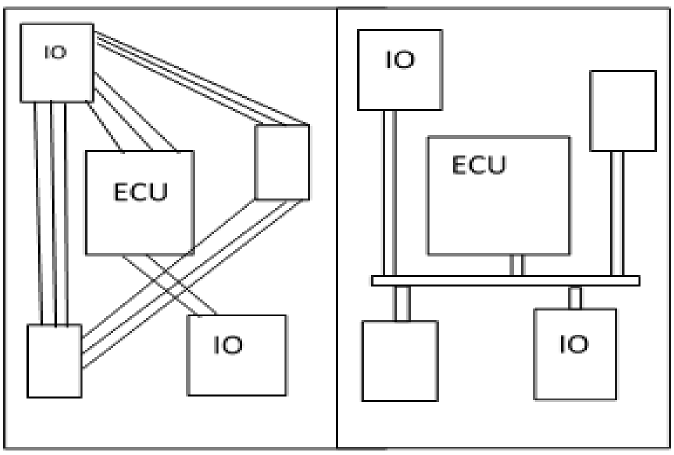

Fig -2: System without CAN and with CAN make use of the high presentation of ARM, high speed reduction of CAN bus communication control networks and instrument control as a result as to get full sharing of data between nodes and improve their collaborative work. This system features efficient data transfer among different nodes in the practical applications. The system leads to easy data sharing but it is done between different control systems[5]. The process maintenance is hard to carry out. The electric system uses a single point to point communication approach which results in large cabling problem.

2.3 IP core

IP core development process includes two parts: the IP core design and the IP core verification. The IP core design process generally can be divided into four stages specifications confirmation and module division, sub-module definition and design, top-level module design and the product. And the IP core verification procedure includes the establishment of reference model, a test platform and preparing the cases for verification, regression tests and formal verification

2.3.1 The main steps of IP core design:

a) Specifications confirmation and modules partition:
IP core's main specifications are: an overview, functional requirements, performance requirements, physical requirements, detailed structure block diagram, the detailed definition to the external system interface, a detailed description of configurable features, the support verification strategy and support manufacture and test methods. Functional demonstration and feasibility analysis can be performed by behavior modeling, and specifications can be confirmed by making a compromise between performance and cost. Module partition is to give each sub-module a detailed function description and clear timing requirements of interface between sub-modules when giving IP core structure block diagram.
b) Sub-module definition and design:
It focuses on checking the consistency of timing interface and functional interface when analyzing, discussing and examining all sub module specifications. And we should sort out the detailed design proposal of sub-module, then in accordance with the implementation plan we should begin to write RTL code, compile the time constraint files, the comprehensive batch files, sub-module test bench and test suite for verification, etc. Finally, we also need to pass lots of examinations such as code standardization, function coverage, performance analysis and power dissipation, etc
c) Top - level module design:
This step is to integrate all designed sub - module to form the top-level module and conduct comprehensive treatment and functional verification on it. Comprehensive treatment includes writing comprehensive batch files, synthesizing in different reference library, inserting scan chains of chip and ATPG to achieve testability of the chip, and conducting the performance analysis and power analysis of overall module, etc. The functional verification includes using the test vectors developed by the behavior model to do simulation test on the top - level module, the regression test under the conditions of a variety of configuration which is aimed at configurable options of IP core, and examining the coverage rate of test vectors with simulation tools, etc
d) IP core products:
To realize the implementation of IP core product, we need to provide IP core design and test bench for verification, package and submit it by commercial converter and then re-validate it, and do simulation on several mainstream simulators, conduct comprehensive, gate level simulation, formal verification at several main processes to ensure the consistency of the network and the RTL – level, and generate or update user documentation. If it is hard IP core, we also need placement and routing, map extraction ,timing analysis and formal verification at the base of top-level module (soft IP core), and then integrate it into the trial prototype chip of the IP core for trial cast film, and verify it in the demo board.

2.3.2 The main steps of IP core verification:

The major steps of IP core verification process are as follows.
a) Building of reference model:
Reference model is used for system function verification and control verification of RTL models, which can be constructed with System C / Specman E / Vera / Verilog /VHDL language, etc
b) Building of test platform:
When designing the sub–module, to build verification environment and develop test cases, and debug test environment and test cases for the IP core behavioral model to prepare for verification environment and test cases which are used for simulation test on the RTL level IP core.
c) Regression testing:
Regression testing ensures that no new errors will be introduced to the verified basic functions in the process of modifying an error or adding a new feature. Therefore, in the verification process, it should be noted that when an error is found, or a new feature is added, their corresponding test cases should be placed in time into the regression test set.
d) Formal verification:
Formal verification does not need test vectors. It verifies the consistency of their functions by judging whether the two designs are equivalent. Therefore, formal verification must first have a reference design, which is used to verify the consistency between the functions achieved before and after design changes, and is also used to verify the consistency of the functions of net list before and after

integration, inserting the scan chain, and extracting the layout [6]

3 . BLOCK DIAGRAM FOR PROPOSED SYSTEM

Here we will use FPGA for all processing part. A reconfigurable FPGA is efficient method to implement a design, because FPGA provides a compromise between general-purpose processors and ASIC. The FPGA based design is also more flexible, programmable and can be re-programmed. FPGA based design can easily be modified by modifying design's software part

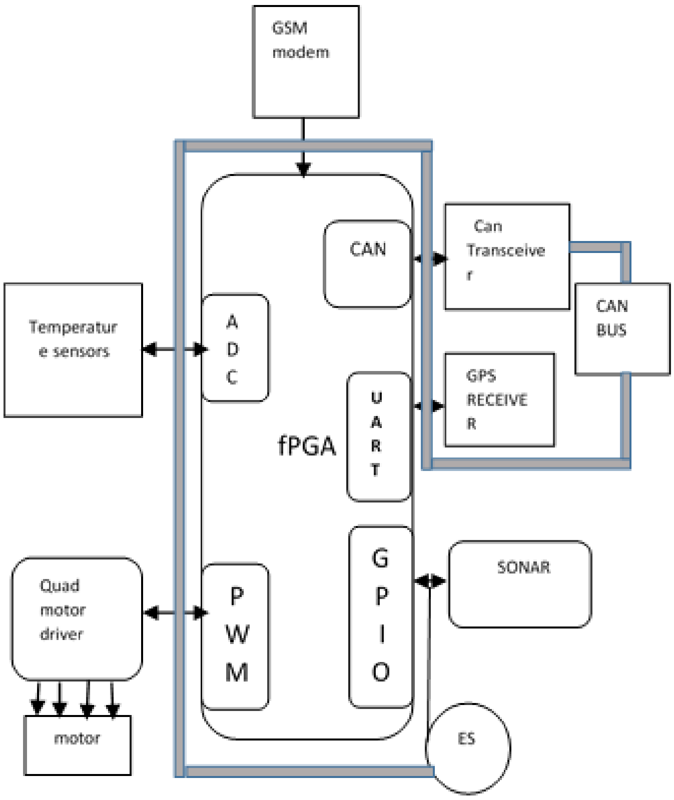

Fig-3: block diagram for proposed system

3. CONCLUSION:

CAN's features are Low-Cost, Lightweight Network, Broadcast Communication ,Priority Error, Capabilities so it reliable and reduce the connections . passenger got comfort ,safety and security . flexibility will improve due to use of IP technology .The technologies of SOC design develop rapidly, and it will certainly be widely used in the near future

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