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Automising the CAN Communication SystemUsing Raspberry-Pi

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***Abstract:** This Project is set an objective of developing and improvement of communication system of Electrical parameters control in EV system withaccuracy the use of latest controller Raspberry-pi and CAN module, today'straction control unit TCU has CAN communication platform, which communicates with all accessories e.g., Cluster, Vehicle control unit, Battery management system BMS, CAN plays vital role in vehicle network management for program flashing. The focus of this project to check effectiveness CAN protocol in TCU withrespect to e-motor functions to have commandcontrol and atomize its functions andacknowledge the status and error from the TCU, an addition to that managing the all data received from the system in a cloud management is to be performed here with example of electric motor and illuminating devices. Cloud data storage will be help full for industries and owner of object in securities. Adding CAN bus with Raspberry-pi for many applications is the aim of this project by addingnecessary futures.*
***Keywords:** (CAN, TCU, e-Motor)*

I. INTRODUCTION

The modern fast-moving world is adoptingtowards smart technology which is also leads advances ideas like artificial intelligence, CAN is also one of communication device which can perform an ultimate role in this project for controlling as per commands by communicating with raspberry-pi.

The CAN standard was devised to fill many needs. Before CAN was introduced, each electronic device is connected to other devices using many wires to enable communication. The Controller Area Network (CAN) is a vehicle bus standard which allows various electronic components such as microcontrollers, sensors, actuators to communicate with each other without a host computer, with speed up to 1Mb/s.

It is a message-based protocol designed specifically for automotive, but it is also used in areas such as aerospace, and industrial automation. For hardware design, the CAN controller used in this research is CAN transceiver MCP 2515 which uses the SPI interface to widen CANBus interface.

One of the most popular Single Board Computer (SBC) is the Raspberry Pi (RPi), with a vast online community of users around the world. Build on open-source principles and motivated by the non- profit incentive to increase global access to computing and solve a variety of real-world challenges using digital technology, these low- cost SBCs bring together external hardware, sensors and controller interfaces, with user- friendly programming capabilities, high connectivity, and desktop functionality.

Raspberry pi is one of the main components which monitors overall system, using TFT screen it gets the input commands from the userand it is able to process those commands to CAN module help of the SPI communication and also receives feedback data from thedifferent devices in this system those received data will be displayed on the TFT screen.

II. LITERATURE SURVEY

A. Implementation Of CAN Bus Communicationto UART In LAPAN-A4 Satellite

Rommy Hartono;A Hadi Syafrudin;WahyudiHasbi;Rakhmad Yatim 2018 IEEE International Conference on Aerospace Electronics and Remote SensingTechnology (ICARES)

Year: 2018 | Conference Paper | Publisher:IEEE

This paper is aimed at the design and implementation of CAN using microchip MCP and microcontroller for being able to communicate with SLIM4 over CAN Bus.

For hardware design, the CAN controller used in this research is MCP 2515 and the CAN transceiver is MCP 2551 which uses the SPI interface to widen CAN Bus interface.

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B. VANET based overtake mishap preventiveadvance road safety system
Aniket D. Sathe;Singh; Tanmay;Vivek DeoDeshmukh 2016 International Conference on Inventive Computation Technologies (ICICT)Year: 2016
In this study an Overtake Mishap preventive road safety system is designed. The System makes driver aware about the platoon of which its vehicle is a part. The system helps driver to know the overtaking behavior of back vehicle. The system with the help of front vehicle's response also guides driver when it decides to overtake it. The Road-Side-Devices help to maintain the communication amongst vehicles in its coverage area. Every vehicle receives and broadcasts the required information through In-Vehicle-Module when it is traveling throughcoverage of Road-Side-Device. The information shared by every vehicle is received by In-Vehicle- Module of other vehicles via Road-Side-Device and on the basis of that each In-Vehicle-Module operates Decision algorithmto decide front and back vehicle in reference to itself.

C. Electric Vehicle Charging Communication Test- bed following CHAdeMO Devika Anil;P. Sivraj 2020 11th International Conference on Computing, Communication and Networking Technologies (ICCCNT). 15 October 2020 Year: 2020
This paper presents software and hardware framework for an electric vehicle charging communication following CHAdeMO based data exchange between EV and Electric Vehicle Supply Equipment (EVSE). As CHAdeMO IEEE - 49239 11th ICCCNT 2020 July 1-3, 2020 - IIT - Kharagpur Authorized licensed uselimited to: University of Gothenburg. Downloaded on November 20,2020 at 07:36:27 UTC from IEEE Xplore. Restrictions apply. Kharagpur, India uses Controller Area Network (CAN) for message exchange, Vehicular Network Toolbox and MCP2515 CAN module are used to implement CHAdeMO message flow over CAN in MATLAB and Arduino respectively. User can simulate CHAdeMO based message flow in this setup as in real scenario. This test system also gives user provision to see the behavior of EV and EVSE under various operational conditions during charging in charger or vehicle.

D. Rajesh Kannan Megalingam1, Arjun Sahajan1, Anandu Rajendraprasad1, Sakthi prasad Kuttankulangara Manoharan1, Chennareddy Pavanth Kumar Reddy2 Department of Electronics and Communication Engineering, Amrita Vishwa Vidyapeetham,Amritapuri, India Department of Electrical Engineering, University of Dayton, Dayton, Ohio, USA. 26 May 2021
In this research work we propose a mechanism where six actuator nodes which represent thesix degrees of freedom (DOF) of a robotic arm are connected via the Controller Area Network (CAN) bus to forms its communication network and receives commands from a common controller (Raspberry Pi). A simulation environment is created in the Gazebosimulator of host simulator and real time analysis of the robotic arm is done via Rviz. Through the simulation, the robotic arm receives instructions from a joystick integrated to the same host PC. The position of each joint with respect to the command from the joystick is sent over WIFI to the common controller and an indication that the message has been received is shown on hardware using the CAN network setup. The arrangement creates an effective framework for learning the workingof complex robotic systems with several DOFs.

E. Gao xian, Li lin-sheng College of electronic information engineering Taiyuan University of science and technology Taiyuan, Shanxi, ChinaE- mail: gaoxianlin@yeah.net 30 August 2020.
Through analyzing of the delay composition ofmessage transmission in CAN bus, it discussesthe two main parts of information delay in CANnetwork the frame delay and media accessdelay. The frame delay is determined by framelength and baud rate, so we can reach different frame delay under the different frame structure and different baud rate. Through the latitudinal and longitudinal comparison, it analyses the frame delay on the different situations. And the media access delay is mainly caused by the CAN protocol themselves. We can improve the site's priority by dynamic priority algorithm. In this paper, module increase is analyzed. Thismethod can increase the sites priority, so that thereal time of CAN network will be improved

F. Pi Models for a Broad Spectrum of Interests Eric Gamess MCIS Department Jacksonville State University Jacksonville, Alabama, USA . Sergio Hernandez Information SecurityCitibank, New York USA
In this paper, we evaluated the performance of anumber of SBCs: RPi Zero W, RPi Zero 2 W, RPi Zero 2 W overclocked, RPi 3B, RPi 3B+, and RPi 4B. The RPi 4B RPi 4B have an integrated port. They offer Fast Ethernet (100 Mbps), Gigabit Ethernet over USB 2.0 (maximum throughput 300 Mbps), and Gigabit Ethernet,respectively. For the other SBCs of this study, Ethernet can still be added through a USB port. However, this solution should be considered only in existing projects as an extension, since new projects will be more cost-effective when using RP is with native Ethernet support.

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III. CAN SPECIFICATIONS

A. CAN

1) CAN uses pair of twisted wire cables. It offerseasy and simplified handling.
2) Multiple ECUs can be connected on the sameCAN-BUS.
3) Developed to support and enable high speedand efficient communication in automobiles.
4) It has reduced weight and wire costs.
5) Error reduction.
6) A quick exchange of data. Uses arbitrationprocess; hence top priority data get access ofthe bus.
7) Scope for upgradation.

B. CAN 2.0 B

1) Standard CAN 2.0A allows 11Bit data transmission (meaning, a total of 2048 different
2) Extended CAN 2.0B allows 29Bit data
3) transmission (that sums up to 536+ millionmessages)
4) Up to 1 Mb/s operation
5) Up to 10 MHz SPI clock speed
6) Standard DB9 connector for secure connection
7) Small PCB size for flexible designs 1.4" ×1.8" (3.6 cm × 4.6 cm)
8) 12-pin Pmod connector with SPI interface
9) Follows the Diligent Pmod Interface
10) Specification 1.1.0 type 2A
11) Libraries and example code available inresource center
12) CAN 2.0B controller with integratedtransceiver
13) Suitable for automotive applications

IV. ADVANTAGES

1) Low use of wiring due to its distributed control
2) Can be applied to many electrical environmentswithout any issues.
3) Multi master and multicast features can beapplied
4) High speed data rate
5) Low cost and light in weight and robustness
6) Supports auto retransmission for attribution lostmessages
7) Built in error detection capabilities. (ack error,form error stuff error etc.)

The MCP2515 CAN module has varying applications. You can find a few examples below:

- Electronic Gear Shifting System
- Primary automation interface
- Robots Automation
- A car engine's auto start and stopfunction
- Medical equipment

V. RASPBERRY PI-4B

1) *Processor* -Broadcom 2711, quad-core
2) *Memory* - 4GB
3) *Connectivity* - 2.4 GHz/5.0 GHz wireless LANbluetooth5.0 BLE 2x USB 2.0 / 2 x USB 3.0 ports delivering true gigabyte ethernet.
4) *Access* -Extended 40 pin GPIO header.
5) *Video & Sound*-2 x HDMI 4K video
6) *SD card Support* – Micro SD card for loadingOS & Storage
7) *Input power* – 5v/3A volt via USB type Cconnector, 5v DC via GPIO PoE Enabled.

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Comparison Table

UART	SPI	12C	CAN
Asynchronous	synchronous	synchronous	**Asynchronous**
Point4 to-Point (only two devices	Multi • Point	Multi • Point	**Multi • Point**
full Duplex	full Duplex	Half Duplex	**Half Duplex**
Higher Noise Immunity	lesser Noise Immunity	lesser Noise Immunity	**Higher Noise Immunity**
longer range (severalmeters)	Shorter range (Same PCB)	Shorter range (Same PCB)	**longer range (1 KM)**
low speed	High speed	High speed	**High speed**
lesser bandwidth	higher bandwidth	lesser bandwidth	**Higher Throughput**
no master/slave	one master many slaves	True multi mastercapability	**True multi master capability**
no bus concept	follows bus concept	Scalable bus system	**Scalable bus system**
No addressing	Has HW addressing mechanism	SW based device addressing	**Broadcast mechanism**
Simple Wiring	complex Wiring	Simple Wiring	**Simple Wiring**

VI. CONCLUSION

In this survey, we summarized, the selection of CAN module and raspberry pi, we concluded specified modules for the project design based on some particular observations about their uses in real time industrial applications and their advantages, the selected modules in CAN and raspberry pi are CANmcp2515 and raspberry pi 4B accordingly TFT screen has been chosen for to provide UI commands to fulfil the aim of this project controlling, monitoring, and managing the data in cloud. CAN serves as a practical communication protocol for many industrial and automotive applications. Not only that, but it also offers other features.

REFERENCES

[1] Implementation Of CAN Bus CommunicationTo UART In LAPAN-A4 Satellite Rommy Hartono;A HadiSyafrudin;Wahyudi Hasbi;RakhmadYatim 2018 IEEE International Conference on Aerospace Electronics and Remote Sensing Technology (ICARES) Year: 2018 | ConferencePaper |Publisher: IEE

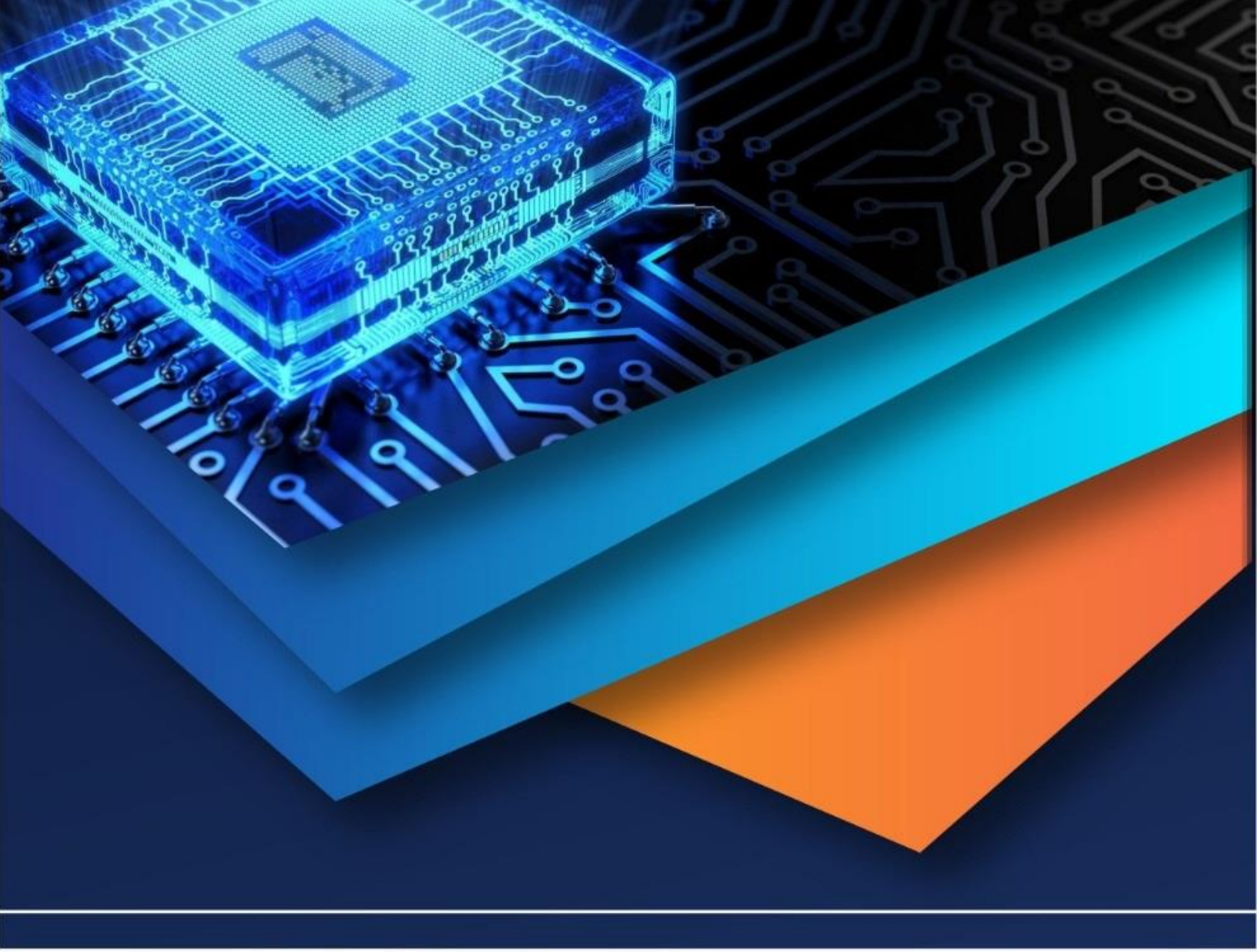
[2] VANET based overtake mishap preventiveadvance road safety system Aniket D.Sathe;DivyaSingh;Tanmay Dalal;Vivek DeoDeshmukh 2016 International Conference on Inventive

[3] Computation Technologies (ICICT)Electric Vehicle Charging Communication Test- bed following CHAdeMO Devika Anil;P. Sivraj2020 11th International Conference on Computing, Communicationand Networking Technologies (ICCCNT). 15October 2020 Year: 2020

[4] Rajesh Kannan Megalingam1, Arjun Sahajan1, Anandu Rajendraprasad1, Sakthi prasad Kuttankulangara Manoharan1, ChennareddyPavanth Kumar Reddy2 Department of Electronics and Communication Engineering, Amrita Vishwa Vidyapeetham, Amritapuri, India Department of Electrical Engineering, University of Dayton, Dayton, Ohio, USA. 26 May 2021

[5] Gao Xian, Li Lin-sheng College of electronic information engineering Taiyuan University of science and technology Taiyuan, Shanxi, China E-mail: gaoxianlin@yeah.net 30 August 2020.

[6] "Raspberry Pi 4 B Review and Benchmark - What's Improved over Pi 3 B+," Sep. 2019. https://ibug.io/blog/2019/09/raspberry-pi-4-reviewbenchmark.



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