Seminar Report on In-Vehicle Networking for Electric Vehicle Technology

IAS Kerala chapter&IIST IEEE IIAS student branch chapter

11th April, 2018 3:00PM

A Seminar talk on "In-vehicle networking for EV technology" was organized by IEEE Industry Application Society Student branch chapter-Indian Institute of Space Science and Technology (I.I.S.T) at 3.00 p.m on 11th April 2018 at Science block (D2), I.I.S.T campus. The seminar talk was given by Mr Sigi C. Joseph, Principal Engineer, Power Electronics group, Centre for Development of advanced Computing (C-DAC), Trivandrum. IEEE I.I.S.T Student branch chairman Pranav Kumar Singh welcomed the participants to the program. The program was chaired by Dr. Sudharshan Kaarthik, IEEE Industry Applications Society (IAS) student branch chapter Advisor and Assistant Professor of Avionics Department I.I.S.T.

Dr. Sudharshan Kaarthik introduced the speaker to the audience. The speaker started the seminar talk by giving a brief introduction about the organization C-DAC and its current research activities in the field of power electronics. Then the main content of the talk – In-Vehicle Networking for EV and EV Charging based on SAE J1772 standard was covered. The program also included an interactive session after the talk, during which the participants cleared their doubts regarding the topic covered in the talk. The interactive session was followed by vote of thanks. IEEE IAS Student branch chair Prasoon Chandran Mavila delivered the vote of thanks. He also mentioned about the importance of IAS briefly and welcomed the interested participants to become a part of IAS SB IIST. Dr. Sudharshan Kaarthik presented a memento to the speaker on behalf of IEEE Student branch IIST and the program was disclosed at 5.00 p.m. Total 45 participants including students and professors attended the program. Participation Certificates were distributed after the program.

C-DAC (Centre for Development of advanced Computing) is a Multi-Activity R&D organization. It is involved in the design, development and deployment of electronics and advanced Information Technology products and solutions and works in the fields of power electronics, control and communication, strategic electronics etc. The Power electronics group of CDAC works on multilevel inverters, Distributed generation, UPS Drivers, EV/HEV, PQ solutions and SMPS. The projects also comes under the National Mission on Power Electronics Technology (NaMPET) sponsored by Ministry of electronics and information technology (MeitY) of Govt. of India.

EV Projects undertaken by C-DAC

CDAC has been working in the field of HEVs since 1999. The series hybrid EV project; consisting of design and development of a hybrid EV from 1999 to 2004. During 2004-2007 CDAC had worked in the development of three wheeler series hybrid electric vehicles. The other major projects include hybrid on board battery charger for Renault Nissan technology business center, Vehicle control unit and Train communication network for Indian railways.

In-Vehicle Networking

The main content of the talk was started with a discussion on the block diagrams of series HEV and distributed control in HEV. The various electrical systems inside the EVs (for Eg. Propulsion motor controller, Battery charge controller etc.) Require real time communication of various parameters for its effective working. So it necessitates the requirement for efficient data transfer systems inside the vehicle. The data transfer includes parametric data exchange such as voltage/current levels of the converter systems, speed – torque details , acceleration pedal readings etc. and logical data exchange such as status of controllers, start stop commands of systems, emergency commands etc. C-DAC has used controller area networking (CAN) for its EV implementations which efficiently supports distributed real time control applications. The CAN system in the OSI network model and CANopen application protocol was discussed. The overview of CAN Data transfer and controller architecture for PE was also mentioned.

EV charging-J1772

The availability of Chargers- Electric Vehicle Supply Equipment (EVSE) is one of the key factors contributing to the market penetration of EV. SAE surface vehicle recommended practice J1772 standard constitutes a definition of how a charging station connects with, communicates with and charges the EV. It can be thought as a smart outlet that communicates with the vehicle to “handshake” and ensure safe charging. It also deals with general physical requirements, electrical specifications and performance requirements. The charging levels were discussed. The J1772 pilot signal enables the communication of EV and EVSE. The communication happens through the modulation of voltage levels of the signal as well as the duty ratio. The talk also covered the details of GFCI-ground fault circuit interrupter and stuck relay detection.

Interactive session with the audience

The talk was followed by an interactive session for the participants. The main challenges in bringing EVs to Indian transportation market were discussed. Participants asked about the existence of several standards and protocols instead of a single standard protocol in the EV communication systems. The challenges that will be faced by the electrical grid due to the proliferation of EVs and EV charging stations are a main concern that needs to be taken care of. Participants also asked about the ability of in-vehicle communication systems in indicating and avoiding the possible faults inside the EVs.


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2. IEEE IAS/IES/PELS Distinguished Lecture and Inauguration of IIST IEEE IAS Student Branch Chapter at Indian Institute of Space Science and Technology by Dr. Akshay Rathore

An IEEE-IAS Distinguished Lecture and the official inauguration of the IIST IEEE - Industry Application Society (IEEE-IAS) Student branch chapter at the Indian Institute of Space Science and Technology (IIST) was held on 14th May 2018 at Aerospace Block (D4), IIST campus. The Distinguished lecture was delivered by Dr. Akshay Kumar Rathore on Impulse Commutated Frequency Modulated Soft-switching Current-fed Converters.

IEEE IAS-IES-PELS Kerala joint chapter secretary Dr K. Biju and IEEE IAS-IES-PEL Kerala joint chapter conference chair Dr. Jaison Mathew were present during the event. IEEE-IAS Chairman Mr. Prasoon Chandran Mavila welcomed the guests and the participants to the program. IIST IEEE Student branch counsellor and Head of the Avionics Dept., IIST; Dr. Manoj B.S talked a few words about the student branch activities. Dr. Biju conveyed about the IAS-IES-PEL joint chapter programmes. Then Dr. Jayson Mathew talked about various conferences taking place under the societies and their importance. The program was chaired by Dr. Sudarshan Kaarthik, IEEE Industry Applications Society (IAS) student branch chapter Advisor and Assistant Professor of Avionics Department I.I.S.T. He introduced the speaker to the audience. Dr. Akshay Kumar Rathore started the Distinguished Lecture by giving a brief introduction about DC-DC converters. The program also included an interactive session after the talk, during which the participants cleared their doubts regarding the topic covered in the talk. Dr. Rajeevan P.P, Associate Professor of Avionics Department I.I.S.T gave felicitation speech. Mr. Sagar Kumar Dash, Executive Member, IIST IEEE IAS Student Branch Chapter delivered vote of thanks. The participants had a visit to Power Electronics Lab after the DL. The on-going as well as finished research projects were explained at the lab. Total 32 participants including students and professors attended the program.

Low-Voltage High Current Applications:

Low-Voltage High Current Application was one of the major topic of the Distinguished Lecture. The various anomalies due to the voltage fed resonant converter were discussed and hence the importanc d converter with active clamp was introduced. The work with the Snubberless Naturally clamped Current-fed Converters was introduced along with its merits and demerits and the work that was done in the same topic. The DL also covered the various topologies for the Snubberless Current-Fed Converter.e of the Current-fed converters was discussed. The various issues with the current fed converters was tackled with the traditional solution of Snubber circuits and hence the topology of Current-fe

Impulse Commutated Current-Fed Converters:

The main content of the talk was started with a discussion on Low Voltage High Current Applications. The various applications were discussed along with the working of Impulse

Commutated Current fed converters. This uni-directional class of current-fed converters attains soft-switching, zero current commutation, and voltage clamping of switches through a high-frequency resonant tank. It is a simple, cost-effective and easy way of solving the traditional turn-off voltage spike across the devices. Dr.Rathore has been working on the analysis, design and development of high-density soft-switching power electronic systems; in particular, current fed topologies and novel pulse-width modulation techniques for low voltage high current applications including renewables, distributed generation, micro-grid, and electric transportation. The merits and demerits of the Impulse Commutated Current fed converter topology was covered along with the operation and the Simulation results. The Design of the converter was discussed and the experimental results were shown.

Interactive session with the audience

The DL was followed by an interactive session with the audience. Various challenges with the soft-switching, voltage fed converters were discussed. This was followed by a visit to the Power Electronics Lab. A brief introduction to all the working projects was done followed by an interactive discussion at the lab.

On the stage(from left): Dr. R. Sudharshan Kaarthik (Advisor ,IIST IEEE IAS SB Chapter, Asst. Prof. Avionics Dept.) , Dr. Manoj B.S (Counsellor ,IIST IEEE SB, H.O.D Avionics), Dr. Akshay Kumar Rathore(Distinguished Lecturer), Dr. Jaison Mathew(Conference Chair, IEEE IAS-IES-PEL joint chapter Kerala), Dr K.Biju (Secretary, IEEE IAS-IES-PEL joint chapter Kerala), Dr. Rajeevan PP, Associate Professor (Industry-academia interaction Chair).

EXPERT TALK On "ENTREPRENEURSHIP AND INNOVATION: STUDENTS NEED OF THE HOUR" – REPORT

IEEE IAS Student Branch Chapter IIST Organized an expert talk on the topic "Entrepreneurship and Innovation: Students need of the hour" on 12th September 2018 from 3 pm to 5 pm at Conference hall, IIST Campus. The Expert talk has been set up aiming the students who are interested in start-ups and research careers. The talk was delivered by Dr. G.S Javed. Dr G.S Javed is a Design Manager with 10+ years of experience in Analog IC Design, Layout and Characterization. He currently manages the High Speed Interface group in Terminus Circuits from 2016. Dr Javed received his M.S. and Ph.D. from Indian Institute of Science in 2016 for his work on low power integrated instrumentation circuits for sensing applications. He has worked with Integrated Circuit Design Centre (ICDC), Semiconductor Division, Bharat Electronics Limited (BEL), Ministry of Defence, India enterprise as a Deputy Engineer. He also runs a consultancy „King Consultants – Education" where he works on two areas: (a) Experiential Education and (b) Entrepreneurship Skills. . He also serves as a reviewer for many IEEE Transactions and Journals. He is an invited speaker for specialized areas like Research Methodologies, Technical Writing and Sensor Fusion for Internet of Things. Mr. Prasoon Chandran, Chairman of IIST IEEE

IAS SB Chapter welcomed the guest and audience for the program. Dr. Sudharshan Kaarthik, IIST

IEEE IAS SB Chapter Advisor, introduced the speaker to the audience. The Talk began with an introduction on the attitude of people towards Entrepreneurship and innovation in general. The basic concepts and definitions of the term Entrepreneurship was discussed. The key factors such as creativity and innovation, ability to organise resources and the risk factors were discussed. The design thinking and problem solving loops were discussed with some practical examples. The importance of education environment training and networking in building such a career and how students could be good entrepreneurs were well covered in the talk. The session went highly interactive throughout the presentation. Each of the slides was discussed with inputs from the audience. Examples of problem solving skills and building it up into entrepreneur‟s levels were discussed considering the example problems stated by the students. The session was followed by a separate interactive feedback session where the participants shared their views and suggestions about the talk. The importance of networking with experts from various fields by being member of technical organizations such as IEEE was also mentioned in detail. Total 37 students attended the talk. Ms Dharani Moka delivered the vote of thanks and the program was concluded.

Workshop on “PCB Design using KiCAD” – REPORT

IEEE Student Branch organized a workshop on KiCad software for making PCB layout on 27th Sept 2018.The workshop aims at bringing students to get familiarized with PCB layout making tool KiCad that can be used in their future projects. Participants were taken to the hands-on session on KiCad software. Participants were familiarized with tools to download library files from internet and to add them to the KiCad library directory, to be used further in layout. They were introduced with Schematic making, component assignment, routing and generating the Gerber file. The workshop was attended by 16 participants and they were given detailed instructions and links of applications files to be installed that were to be used in workshop through mail.

IEEE DAY- WORKSHOP ON "CHARACTERIZATION AND CONTROL OF DC DRIVES"

A Workshop on the topic "Characterization and Control of DC Drives" was organized at Indian Institute of Space Science and Technology (I.I.S.T.) on October 2nd, 2018 as a part of IEEE Day, under IEEE IAS Student Branch Chapter IIST. Mr. Prasoon Chandran, vice chair IEEE SB IIST welcomed the participants and briefed about the importance of IEEE in the context of IEEE Day. The workshop was handled by Mr. Ranjith and Mr. Archit of final year M.tech- Power Electronics, IIST. The session started with a presentation on the closed loop control structure of DC motor, Machine ratings and obtaining parameters of the machine for design of the controller. The Digital implementation of the speed controllers in Texas Instruments Digital Signal Controller TMS320F28377S was discussed in detail. The usage interrupts and different peripherals required and their initialization and configuration for the control were covered in the session. The presentation was followed by a live demonstration session at the power electronics research lab, IIST. The working of the closed loop speed control of DC motor was explained with hardware experimental setup. 31 students attended the workshop. The workshop was very interactive and the participants cleared their doubts regarding the topic during the presentation as well as during the demonstration session


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Expert talk on “Power Electronics for a Renewables-rich Grid – Applications and Challenges”

IEEE Industry Application Society Student Branch Chapter Indian Institute of Space Science and Technology organized an expert talk on the topic “Power Electronics for a Renewables-rich Grid – Applications and Challenges” on 17 December 2018 from 9.30AM to 11 AM at C106, Aerospace block, IIST campus. The expert talk was delivered by Dr. Abhijit Kshirsagar (University of Minnesota). IIST IAS SBC executive member Ms. Dharani Moka welcomed the participants and introduced the speaker to the audience. Dr Abhijit is a post-doctoral associate in Prof. Ned Mohan’s lab at the University of Minnesota and is currently working on Modula Multilevel Converter (MMC) topologies and high frequency converters. He is also involved in teaching and has developed a course material for the Consortium of Universities for Sustainable Power (CUSP). The talk was aimed at graduate and undergraduate students to provide an outline of the roles, importance and challenges of power electronics in renewable energy-rich grid applications. The speaker gave the glimpse of the effects of climate change and global warming and the role of renewable energy in such a scenario. Currently, the electric and transportation sectors have huge carbon footprint due to the usage of non-renewable resources. The talk delivered the aspects of solar and wind energy power systems for reducing the carbon footprint and discussed the Modular Multilevel Converter (MMC) based converter topologies used for utility. The talk also covered the challenges the utility might face with the rising penetration of renewables. 20 participants attended the program. Executive member Ms. Arpita delivered vote of thanks and the program was concluded with tea and snacks.

Expert talk on "Power Electronics Applications – From Electrified Transportation to High Energy Physics"

IEEE IAS SBC IIST organized an expert talk on the topic "Power electronics applications- from electrified transportation to high energy physics" on 17 December 2018 from 11.30 AM to 1 PM at C106, Aerospace block, IIST Campus. The talk was delivered by Dr. Lalit Patnaik, senior fellow at the European Organization for Nuclear Research (CERN), Geneva. The talk summarized ideas and results from four different projects covering diverse application areas of power electronic systems. (1) Low-power (10W mechanical) low-speed (0.6 m/s) transport using rimless-wheel based mobile robotic system (50 kg) driven by brushless DC motors. (2) Constant-Temperature Constant-Voltage (CT-CV) charging scheme for reducing charge time of Li-ion batteries by 20%. (3) Analysis of battery size reduction and range extension enabled by wireless opportunity charging of electric vehicles. (4) Design of radiation tolerant power supplies for use inside the Large Hadron Collider (LHC) tunnel. The talk was followed by an interactive session with the audience. 20 participants attended the program. IIST IAS SBC chair Mr. Prasoon Chandran Mavila delivered vote of thanks and the program was concluded.