

An Integrated Embedded System Architecture for In-Vehicle Telematics and Infotainment System

Roy C. Hsu*, and L. R. Chen**

* Department of Computer Science and Information Engineering
National Chia-Yi University, Chia-Yi City, Taiwan
rchsu@mail.scyu.edu.tw

** Department of Aeronautical Engineering
National Formosa University, Yun-Lin County, Taiwan
lchen@nfu.edu.tw

Abstract—In this study, an integrated embedded system architecture for in-vehicle telematics and infotainment system (IVTIS) is proposed. A wireless communication network is utilized to provide the location-based and emergency services to the in-vehicle users, while the in-vehicle network is established to provide applications in communications and entertainment. The prototype of the system is demonstrated as well.

I. INTRODUCTION

Traditional on-board embedded electronics systems that performing various operational functions, such as anti-lock brake, cruise control, climate control, etc... are already utilized in most of today's modern vehicle [1, 2]. Recent trend shows that more and more in-vehicle embedded system are focusing on providing better functionalities, robust operation and higher degree of convenience to the in-vehicle users. Advance of wireless communication and information technology in the digital era has promoted new killer applications to the in-vehicle drivers and occupants. Among these advanced killer applications, services provided in the area of the telematics and information/entertainment have attracted most attention in the automotive industry.

A. Telematics Service

Telematics were considered as the system that provides location-based services for mobile vehicles over wireless communication networks. Typical example of automotive telematics services are emergency call (or *soscall*) systems, which instantly connects vehicle users to a service center for emergency assistance or roadside services while automatically reporting the vehicle's position [3]. Normally the emergency call system requires a wireless transceiver for voice and data communication and an on-board GPS (Global Positioning System) receiver for positioning. Telematics system was considered as the core technology in an Intelligent Transportation System (ITS) and applications of telematics services to ITS have been proposed recently. An integrated positioning system were developed to realize an efficient and cost-effective GPS based electronic road pricing system by He, Law, and Ling [4]. In [5], the importance of "situational awareness" in conveying the state of the automobile to other parties across a communication link was addressed and a novel

interactivity environment for integrated intelligent transportation and telematic systems was proposed.

B. Information/Entertainment Services

As more and more people are traveling with Internet-enabled information appliances (IA) such as notebook PCs, PDAs, mobile phones, digital cameras, MP3 players, etc.... there is a desire to connect to the Internet permanently from anywhere, at anytime, without any disruption of service, particularly for those people who spend a significant amount of time in mass transportation systems in weekdays or in their own vehicle during weekend [6]. In order to access the Internet, an in-vehicle local area network or personal area network environment must be established, and the in-vehicle embedded system shall become the mobile gateway for these Internet-enabled IA. Ernst, Uehara, and Mitsuya [6], detailed the networking requirements for connecting vehicles to the Internet by displacing an entire IPv6 network and network mobility support in the InternetCAR project. In [7], the software and hardware requirements in designing human-computer interface for an in-vehicle information system were proposed such that the safety of the in-vehicle drivers is discussed. A distributed service-based architecture [8], based on the Jini middleware technology, were proposed to provide fault tolerant application services to remote in-vehicle computers and mobile devices, such as Wifi-enabled PDA and GPRS phone. It seems that research trend has shifted to providing an *infotainment server* system for the in-vehicle users such that the network-enabled IA can access the information from the in-vehicle network and also obtain the entertainment services from the entertainment server.

An integrated architecture for in-vehicle telematics and infotainment system (IVTIS) can provide the in-vehicle users value-added services compared with traditional telematics only systems. Thus, an in-vehicle telematics and infotainment system utilizing embedded system with power embedded operation system is proposed in this paper. The packet radio network was adopted to provide the telematics service to the in-vehicle users. And an in-vehicle network environment is established such that a client/server type of in-vehicle infotainment system can be developed. The detailed design and development of the IVTIS will be described as below.

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Recent Developments in Electronics and Communication Systems KVS Ramachandra Murthy,S. Kumar,M. Kumar Singh,2023-01-31 Often no single field or expert has all the information necessary to solve complex problems and this is no less true in the fields of electronics and communications systems Transdisciplinary engineering solutions can address issues arising when a solution is not evident during the initial development stages in the multidisciplinary area This book presents the proceedings of RDECS 2022 the 1st international conference on Recent Developments in Electronics and Communication Systems held on 22 and 23 July 2022 at Aditya Engineering College Surampalem India The primary goal of RDECS 2022 was to challenge existing ideas and encourage interaction between academia and industry to promote the sort of collaborative activities involving scientists engineers professionals researchers and students that play a major role in almost all fields of scientific growth The conference also aimed to provide an arena for showcasing advancements and research endeavors being undertaken in all parts of the world A large number of technical papers with rich content describing ground breaking research from participants from various institutes were submitted for presentation at the conference This book presents 108 of these papers which cover a wide range of topics ranging from cloud computing to disease forecasting and from weather reporting to the detection of fake news Offering a fascinating overview of recent research and developments in electronics and communications systems the book will be of interest to all those working in the field **The Industrial Information**

Technology Handbook Richard Zurawski,2018-10-03 The Industrial Information Technology Handbook focuses on existing and emerging industrial applications of IT and on evolving trends that are driven by the needs of companies and by industry led consortia and organizations Emphasizing fast growing areas that have major impacts on industrial automation and enterprise integration the Handbook covers topics such as industrial communication technology sensors and embedded systems The book is organized into two parts Part 1 presents material covering new and quickly evolving aspects of IT Part 2 introduces cutting edge areas of industrial IT The Handbook presents material in the form of tutorials surveys and technology overviews combining fundamentals and advanced issues with articles grouped into sections for a cohesive and comprehensive presentation The text contains 112 contributed reports by industry experts from government companies at the forefront of development and some of the most renowned academic and research institutions worldwide Several of the reports on recent developments actual deployments and trends cover subject matter presented to the public for the first time

The Electrical Engineering Handbook - Six Volume Set Richard C. Dorf,2018-12-14 In two editions spanning more than a decade The Electrical Engineering Handbook stands as the definitive reference to the multidisciplinary field of electrical engineering Our knowledge continues to grow and so does the Handbook For the third edition it has grown into a set of six books carefully focused on specialized areas or fields of study Each one represents a concise yet definitive collection of key concepts models and equations in its respective domain thoughtfully gathered for convenient access Combined they

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SOC (System-on-a-Chip) Testing for Plug and Play Test Automation Krishnendu Chakrabarty, 2013-04-17

System on a Chip (SOC) integrated circuits composed of embedded cores are now commonplace. Nevertheless, there remain several roadblocks to rapid and efficient system integration. Test development is seen as a major bottleneck in SOC design and manufacturing capabilities. Testing SOC's is especially challenging in the absence of standardized test structures, test automation tools and test protocols. In addition, long interconnects, high density and high speed designs lead to new types of faults involving crosstalk and signal

integrity SOC System on a Chip Testing for Plug and Play Test Automation is an edited work containing thirteen contributions that address various aspects of SOC testing SOC System on a Chip Testing for Plug and Play Test Automation is a valuable reference for researchers and students interested in various aspects of SOC testing

VLSI Architecture for Signal, Speech, and Image Processing Durgesh Nandan,Basant Kumar Mohanty, Sanjeev Kumar,Rajeev Kumar Arya,2022-11-03 This new volume introduces various VLSI very large scale integration architecture for DSP filters speech filters and image filters detailing their key applications and discussing different aspects and technologies used in VLSI design models and architectures and more The volume explores the major challenges with the aim to develop real time hardware architecture designs that are compact and accurate It provides useful research in the field of computer arithmetic and can be applied for various arithmetic circuits for their digital implementation schemes and for performance considerations

Ultra Low Power ECG Processing System for IoT Devices Temesghen Tekeste Habte,Hani Saleh,Baker Mohammad,Mohammed Ismail,2018-09-06 This book describes an ECG processing architecture that guides biomedical SoC developers from theory to implementation and testing The authors provide complete coverage of the digital circuit implementation of an ultra low power biomedical SoC comprised of a detailed description of an ECG processor implemented and fabricated on chip Coverage also includes the challenges and tradeoffs of designing ECG processors Describes digital circuit architecture for implementing ECG processing algorithms on chip Includes coverage of signal processing techniques for ECG processing Features ultra low power circuit design techniques Enables design of ECG processing architectures and their respective on chip implementation

Mobility-based Time References for Wireless Sensor Networks Fabio Sebastiano,Lucien J. Breems,Kofi A Makinwa,2012-08-09 This book describes the use of low power low cost and extremely small radios to provide essential time reference for wireless sensor networks The authors explain how to integrate such radios in a standard CMOS process to reduce both cost and size while focusing on the challenge of designing a fully integrated time reference for such radios To enable the integration of the time reference system techniques are proposed and analyzed several kinds of integrated time references are reviewed and mobility based references are identified as viable candidates to provide the required accuracy at low power consumption Practical implementations of a mobility based oscillator and a temperature sensor are also presented which demonstrate the required accuracy over a wide temperature range while drawing 51 uW from a 1.2 V supply in a 65 nm CMOS process

New methods to engineer and seamlessly reconfigure time triggered Ethernet based systems during runtime based on the PROFINET IRT example Lukasz Wisniewski,2017-03-20 The objective of this dissertation is to design a concept that would allow to increase the flexibility of currently available Time Triggered Ethernet based TTEB systems however without affecting their performance and robustness The main challenges are related to scheduling of time triggered communication that may take significant amount of time and has to be performed on a powerful platform Additionally the reliability has to be considered and kept on the required high level Finally the

reconfiguration has to be optimally done without affecting the currently running system

Nanostructures For Electronics, Photonics, Biosensors, And Emerging Systems Applications

Faquir C Jain, C Broadbridge, M

Gherasimova, Hong Tang, 2022-11-22 This unique edited compendium consists of peer reviewed articles focusing on 2D materials based nanoelectronics to nanophotonic devices for biosensors and bio nano systems Wide ranging topics span from novel systems for implementing data with security tokens single chemical sensor for multi analyte mixture detection additively manufactured RF devices for communication packaging remote sensing to energy harvesting applications Quantum dot based devices featuring optical modulators and mid infrared photodetectors in the form of Ferroelectric and quantum dot non volatile memories 3D confined quantum dot channel QDC and spatial wavefunction switched SWS FETs for high speed multi bit logic and novel system applications are also included Contributed by eminent researchers recent coverage of materials science for high speed electronics nanoelectronics based on ferroelectric and van der Waals materials material synthesis modeling of dislocations behavior in various heterostructures Ultrahigh Q on chip SiGe microresonators for quantum transduction in new trend in computing are also prominently discussed

Readings in Hardware/Software Co-Design Giovanni De Micheli, Rolf Ernst, Wayne Wolf, 2002 This title serves as an introduction and reference for the field with the papers that have shaped the hardware software co design since its inception in the early 90s

Real-Time Simulation Technologies: Principles, Methodologies, and Applications Katalin Popovici, Pieter Mosterman, 2017-12-19 Real Time Simulation Technologies Principles Methodologies and Applications is an edited compilation of work that explores fundamental concepts and basic techniques of real time simulation for complex and diverse systems across a broad spectrum Useful for both new entrants and experienced experts in the field this book integrates coverage of detailed theory acclaimed methodological approaches entrenched technologies and high value applications of real time simulation all from the unique perspectives of renowned international contributors Because it offers an accurate and otherwise unattainable assessment of how a system will behave over a particular time frame real time simulation is increasingly critical to the optimization of dynamic processes and adaptive systems in a variety of enterprises These range in scope from the maintenance of the national power grid to space exploration to the development of virtual reality programs and cyber physical systems This book outlines how for these and other undertakings engineers must assimilate real time data with computational tools for rapid decision making under uncertainty Clarifying the central concepts behind real time simulation tools and techniques this one of a kind resource Discusses the state of the art important challenges and high impact developments in simulation technologies Provides a basis for the study of real time simulation as a fundamental and foundational technology Helps readers develop and refine principles that are applicable across a wide variety of application domains As science moves toward more advanced technologies unconventional design approaches and unproven regions of the design space simulation tools are increasingly critical to successful design and operation of technical systems in a growing number of application

domains This must have resource presents detailed coverage of real time simulation for system design parallel and distributed simulations industry tools and a large set of applications

Internet of Things: Enabling Technologies, Security and Social Implications Santosh Kumar Pani,Manjusha Pandey,2021-01-13 This edited book presents point of view and the work being undertaken by active researchers in the domain of IOT and its applications with societal impact The book is useful to other researchers for the understanding of the research domain and different points of views expressed by the experts in their contributed chapters The contributions are from both industry and academia hence it provides a rich source of both theoretical and practical work going on in the research domain of IOT

PROCEEDINGS OF THE 23RD CONFERENCE ON FORMAL METHODS IN COMPUTER-AIDED DESIGN - FMCAD 2023 Alexander Nadel ,Kristin Yvonne Rozier,2023-10-13 The Conference on Formal Methods in Computer Aided Design FMCAD is an annual conference on the theory and applications of formal methods in hardware and system in academia and industry for presenting and discussing groundbreaking methods technologies theoretical results and tools for reasoning formally about computing systems FMCAD covers formal aspects of computer aided system testing

Superconducting Memory Technologies Ahmedullah Aziz,Shamiul Alam,2025-03-18 There is a lot of excitement around quantum computers that use superconducting qubits which operate at extremely low temperatures since they are ultra sensitive to noise These quantum computers need a memory and control processor that can operate under cryogenic conditions Among the cryogenic memory technologies superconducting memories are the most efficient and compatible for these purposes They can help advance quantum computing facilitate high performance computing and explore space more effectively However cryogenic memory technologies currently face various challenges This book discusses the latest advancements in superconducting memory technologies It covers four main types of superconducting memories Josephson junction based magnetic Josephson junction based superconducting memristor based and ferroelectric superconducting quantum interference device based memories The book explores the background working principles and challenges of each of these technologies providing a comprehensive overview of the field

Security, Privacy, and Trust in WBANs and E-Healthcare Anuj Kumar Singh,Sachin Kumar,2024-11-29 Wireless Body Area Networks WBANs are vulnerable to cyberattacks and security breaches that could unlock the door for cybercriminals to penetrate hospital networks This book covers the fundamental concepts of security and privacy in WBANs including security requirements issues and challenges Security Privacy and Trust in WBANs and E Healthcare highlights the taxonomy of threats and attacks in WBANs and Internet of Medical Things IoMT and presents all technical aspects related to the security and privacy of WBANs In addition to outlining viable solutions that take into account constrained resources at WBAN end devices hybrid network architecture application characteristics and communication protocols the book covers the core concepts of WBAN security privacy and trust It describes both theoretical and practical aspects for those working in security in the WBAN and IoMT emphasizing the most significant potential WBAN security

issues and challenges The book also covers intrusion detection and security risk assessments in WBANs as well as lightweight security solutions for WBANs blockchain based solutions for WBANs and authentication and access control in WBANs through various applications and case studies This book is highly relevant to the graduate postgraduate students academicians security system designers security analysts computer scientists engineers researchers digital forensic experts and other personnel working in information security IoMT and WBAN

Security and Privacy in Cyber-Physical Systems and Smart Vehicles Xiali Hei,Luis Garcia,Taegyu Kim,Kyungtae Kim,2025-06-26 This book LNICST 622 constitutes the refereed proceedings of the Second EAI International Conference on Security and Privacy in Cyber Physical Systems and Smart Vehicles SmartSP 2024 held in New Orleans LA USA during November 7 8 2024 The 18 full papers were carefully reviewed an selected from 47 submissions The proceedings focus on Emerging Applications Hardware and Firmware Security Adversarial Attacks in Autonomous Systems Ethics Privacy Human Centric Considerations and Security Techniques for Cyber Physical Systems

Computing for Data Analysis: Theory and Practices Sanjay Chakraborty,Lopamudra Dey,2023-02-04 This book covers various cutting edge computing technologies and their applications over data It discusses in depth knowledge on big data and cloud computing quantum computing cognitive computing and computational biology with respect to different kinds of data analysis and applications In this book authors describe some interesting models in the cloud quantum cognitive and computational biology domains that provide some useful impact on intelligent data emotional image etc analysis They also explain how these computing technologies based data analysis approaches used for various real life applications The book will be beneficial for readers working in this area

Cyber-Physical Systems: Architecture, Security and Application Song Guo,Deze Zeng,2018-09-20 This book provides an overview of recent innovations and achievements in the broad areas of cyber physical systems CPS including architecture networking systems applications security and privacy The book discusses various new CPS technologies from diverse aspects to enable higher level of innovation towards intelligent life The book provides insight to the future integration coordination and interaction between the physical world the information world and human beings The book features contributions from renowned researchers and engineers who discuss key issues from various perspectives presenting opinions and recent CPS related achievements Investigates how to advance the development of cyber physical systems Provides a joint consideration of other newly emerged technologies and concepts in relation to CPS like cloud computing big data fog computing and crowd sourcing Includes topics related to CPS such as architecture system networking application algorithm security and privacy

New Trends and Developments in Automotive System Engineering Marcello Chiaberge,2011-01-08 In the last few years the automobile design process is required to become more responsible and responsibly related to environmental needs Basing the automotive design not only on the appearance the visual appearance of the vehicle needs to be thought together and deeply integrated with the power developed by the engine The purpose of this book is to try to present the new technologies development scenario and not to

give any indication about the direction that should be given to the research in this complex and multi disciplinary challenging field

Proceedings of the International Conference on Information Engineering, Management and Security

2015 Vignesh Ramakrishnan,Prasanth Venugopal,Tuhin Mukherjee,2015-08-13 ICIEMS 2015 is the conference aim is to provide a platform for researchers engineers academicians as well as industrial professionals from all over the world to present their research results and development activities in Engineering Technology Industrial Engineering Application Level Security and Management Science This conference provides opportunities for the delegates to exchange new ideas and application experiences face to face to establish business or research relations and to find global partners for future collaboration

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