Title: Wireless Communication in Industrial Automation – Applications, Challenges and Future Directions

Presenters

Dr Johan Åkerberg, ABB Corporate Research, Sweden.

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Presenters Biography

Johan Åkerberg received his MSc and PhD degree in Computer Science and Engineering from Mälardalen University, Sweden in 2007 and 2011, respectively. He is currently working as senior principal scientist and global research area coordinator for embedded systems and electronics at ABB Corporate Research. He is mainly working with communication for embedded real-time systems in industrial automation and is frequently invited to give talks at Universities and automation fairs. He has close to 20 years experience within ABB in various positions such as project manager, industrial communication specialist and product manager. Dr Åkerberg holds more than 10 patents (granted and pending applications) in the area of wired/wireless industrial automation and is author or co-author or more than 30 scientific publications in refereed international fora. He is an IEEE Senior Member.

Mikael Gidlund received his Lic.Eng degree in Radio Communication Systems from Royal Institute of Technology (KTH), Stockholm, Sweden in 2004; his MSc and PhD degree in Electrical Engineering from Mid Sweden University, Sundsvall, Sweden, in 2000 and 2005, respectively. He is currently working as senior principal scientist and global research area coordinator for Wireless Technologies at ABB Corporate Research. He is mainly working with wireless technologies for industrial automation networks and participating in different standardization bodies. Since February 2012 he is also a full professor at Mid Sweden University. Between 2007 and 2008 he was working as project manager and senior specialist at Nera Networks AS, Norway. Between 2006 and 2007 he was working as research engineer and project manager at Acreo AB, Sweden. During Feb. – July 2005 he was a visiting researcher at the Dept. of Informatics, University of Bergen, Norway. Dr Gidlund holds more than 15 patents (granted and pending applications) in the area of wireless communication and is the author or co-author of more than 80 scientific publications in refereed international fora.

Tomas Lennvall received his M.Sc. and Ph.D. degree in Computer Science from Mälardalen University (Mälardalen University), Sweden in 2000 and 2005, respectively. He is currently working as principal scientist in the communication and embedded systems group at ABB Corporate Research. He is mainly focusing on strategy, project management, wireless communication, and embedded real-time systems for industrial automation. Tomas has also participated in several standardization activities related to wireless communication for the automation industry: Wireless HART, ISA100.11a, and PNO WSAN (Wireless Actuator and Sensor Networks). He holds more than 20 patents in the area of industrial wireless communication and is the author or co-author of more than 20 scientific publications in refereed international flora.

Abstract

Recent advances in wireless technology have enabled the development of low-cost wireless solutions capable of robust and reliable communication. International-standardization work within the fields of WLANs, WSNs and RFID has become a foundation for the development of products within application areas such as wireless network access, wireless sensing, wireless monitoring and control, and wireless asset and personnel tracking. For the industrial automation industry, wireless technology has the potential to reduce operating costs and provide a wide new range of applications. However, a key limiting factor for the introduction of new wireless technology is the need for education and technical knowledge in both vendor and operator organizations.

The goal of this workshop is to introduce the audience to different wireless technologies and applications for the industrial automation domain and discuss different challenges and requirements.

Scope

This tutorial will be a survey of wireless communication for industrial automation domain and discuss experiences from deployments, challenges and future directions. This will include wireless technologies for substation automation, building, automation, factory automation and process automation. The tutorial is intended as a 3 hour tutorial.

Intended Audience

Practicing engineers, researchers, graduate students, and academics who work in the field of electrical engineering, control engineering, computer science, and have a medium level of knowledge in these fields.

Motivation

Wireless communications have the last years received a large interest within industrial automation since it can reduce cost, improve flexibility and production. This tutorial will give the audience an introduction to current status of usage of wireless in industrial automation, the gap between current research activities in the academia and the actual need in industry.

Objectives

 After the tutorial the audience will have a good overview of what wireless technologies are commonly used today for various applications in industrial automation. Furthermore, the audience will have the insight of what challenges there are today by deploying a wireless network and how to overcome certain hurdles. Finally, the audience will have an overview of what research problems exist for wireless technologies deployed in industrial automation.

Outline

Session 1. Fundamentals of Industrial Automation (0.5 hour)

- General introduction to industrial automation, the motivation, and tutorial outline

- Basics of industrial communication

- Requirements for industrial communication (wired and wireless)

Session 2. Fundamentals of Wireless LAN and Wireless Sensor Networks (1 hour)

- Basics of Wireless LAN

- Basics of WSN (IEEE 802.15.4)

- Introduction to Industrial Wireless Sensor Networks (ZigBee, Wireless HART, ISA 100.11a, and WIA-PA)

Session 3. Implementation examples in Industrial Automation (1 hour)

- Wireless for factory automation and process automation

- Integration of wireless devices

- WSN for wireless control applications

Session 4. Dialogue Session (0.5 hour)

- Potential applications or case studies with attendees

- Future directions and new topics