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## Systems Integration, Networking, and Engineering

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## Systems Integration, Networking, and Engineering

Proceedings of the Fieldbus Conference FeT '99
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# Preface

Although being a matter of course in science and industry, in the public opinion fieldbus technology is not always seen in its real importance. Terms like "home automation", "industry automation", etc. are not always perceived in a positive way: they sound ultramodern, mysterious, unreliable. Often conventional but well-known solutions instead of fieldbus technology are used. On the other hand, fieldbus technology saves money, systems are offering more services and test integration increases reliability.

Fieldbus technology is not an argument for marketing. However, its potential is enormous and unlimited although some believe realization will be a matter of the far future.

For several years, fieldbus systems have been seen as local installations of small interest in comparison with LANs, Internet, or mobile phones. This situation has changed: in automobiles, a fieldbus has to manage the communication of about one hundred nodes. Fieldbus systems are monitored via classical LANs, fieldbus systems in airplanes are used not only for control, but also for online testing, and in some building automation systems more than 10.000 nodes are connected by fieldbus systems. Great demands are arising with consequences in system complexity, reliability, availability and security, all being aspects relevant for scientific work. Activities in this field are numerous and mostly combined with other areas of scientific or engineering work. This is challenging and important because of the connection to different engineering disciplines.

There are slogans as "IT revolution in industry"[1], "the transparent factory"[2], or "concert of intelligent chips"[3]. In any way, our age is stamped by information technology. All spheres of our living are being influenced and changed by innovations of information technology. Mobile phones, teleworking, electronic commerce are revolutions in daily life. Similar to the industrial revolution which brought dramatic modifications, collecting, storing, transporting and computing of information leads to radical changes in human society.

In nature which is an important model for technical systems, primitive micro-organisms bear the information in their system structure. Animals being "more intelligent" are based on internal information systems, neuronal networks in the most complex form. Reception and communication with the external world is performed by use of highly sophisticated and adaptable sensor systems, but also internally a great number of sensors is used for process control of life functions.

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[1] Die IT-Revolution in der Industrie, MegaLink 11/99

[2] Die transparente Fabrik; Messe Wien viet; Presse-Info, 18.6.1999

[3] Drössler, Ch.: Konzert der schlauen Chips, DIE ZEIT Nr. 24; 10.6.1999

Also fieldbus technology allows more intelligent systems. Smart sensors and complex sensor systems increase the functionality and the effectiveness of the system. In a weekly newspaper[4] a prognosis of the household of tomorrow is given where cooking, controlling of goods in stock and so on are performed by integrated transponders and neuronal algorithms. This leads to the following scenario:

- more and more smart sensors will be integrated in things of every day life and will be part of the fieldbus system,
- demand of controllers and software will increase dramatically to compute, filter and apply all of these data,
- various aspects of this new technology demand extensive analysis because numerous arising questions have to be answered by scientists,
- average life will change completely, a process which cannot be stopped.

Fieldbus technology carries an enormous part of this development without appearing in public like the Internet or the use of mobile phones. Moreover, this part will increase in the years to come. A clear example for this is the continuous change of mechanical systems by the use of fieldbus technology: when for the first time in Airbus A320, mechanical control of an airplane was replaced by "fly by wire", the public did not take notice of this, moreover passengers should not be informed about this fact. Nowadays, automobiles are in a similar situation. "Steer by wire" replaces the mechanical steering-gear by electronic control of every wheel, a technique more efficient and flexible, but also cheaper.

In industry and in the private sphere a similar development can be assumed. More and more, decisions for product development are influenced by the total costs which includes service and maintenance. Moreover, the competition of producers leads to increased features of the products. These are all arguments for an integration of fieldbus technology.

Large organizations like factories, hospitals, laboratories need transparency gained by automatic data acquisition. These data are not only directly related to the costs, but also to the personnel and to logistic parameters such as location, functionality, and status of maintenance of the equipment. Dynamic management of the facilities combined with data from processes and the personnel enables a more efficient and reliable operation of this complex system.

In the technical realization of such systems, problems are arising from the inter-connection of different types of networks, especially fieldbus systems with LANs and the Internet. Furthermore, security is an important aspect. These all are subjects reflected in this book.

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[4] Drössler, Ch.: Konzert der schlauen Chips, DIE ZEIT Nr. 24; 10.6.1999

Network interconnection is a technical and financial problem. Solutions are normally based on compromises and can be optimized by technical efforts. Security is a complex problem because of various aspects, especially the anxiety of the users. Intranet used in companies and banks is an expensive technique which shields against the Internet. On the other hand, an increasing number of systems can be read out and manipulated by remote control and remote service over networks which allow system access needing strict security provision methods. Several principles are known which have to prove their values.

Communication networks connect different spheres and in so far they help to overcome barriers[5]. They create new products, new markets and also new professions. Fieldbus technology is not at the front end of this trend because it acts in the background and in critical domains. Equipped with sensitive sensors, fieldbus technology becomes the backbone of many processes of our life.

This book is a collection of articles dealing with the matter of fieldbus technology. The articles were submitted to the fieldbus conference FeT'99 taking place in Magdeburg, Germany. Two very successful conferences before, the FeT'95 and the FeT'97, were held in Vienna, Austria. The articles were reviewed by the international program committee which decided to also include some high quality articles not presented at the conference.

The book comprises eleven chapters dealing with important aspects of fieldbus technology and reflecting areas of main activity in science and industry. These chapters also coincide with the sessions at the conference.

A number of people were strongly involved in the preparation and completion of this book: M. Wollschlaeger, Magdeburg, managed a main part of the communication with the authors to ensure the preparation of the articles in time. W. Kandler, Vienna, made the final check of the layout of the book which entailed a lot of corrections. We like to thank them very much. We also thank Springer-Verlag Wien for printing and binding the book in its well known high quality.

We would like to thank all those who helped in the organization of the conference: H. Mueller and H. Rosenzweig, VDI/VDE-GMA, who were responsible for the organization, Th. Sauter, W. Kandler and M. Wollschlaeger, who made preparations for the program committee meetings, and the program committee itself. We thank our authors and speakers who provided the valuable contributions for our stimulating discussions. We also thank our four invited speakers who followed our invitation.

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[5] Dietrich, D.; Posta, R.; Schmalek, R.: Feldbussysteme - Synthese statt Konflikt; etz 1-2- 96, Jahrbuch elektrotechnik; VDE

Our aim is to reach a broad audience. Therefore the conference fees were kept moderate. This became possible only with the support of sponsoring organizations whose financial support we appreciate very much.

Magdeburg, September 1999

Dietmar Dietrich Herbert Schweinzer Peter Neumann

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# Prozeßautomatisierung

1998. XV, 270 Seiten. 229 Abbildungen.
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Schwerpunkte dieses Buches sind: Automatisierungstechnik, vernetzte Rechnersysteme, Computer Integrated Manufacturing, Regelungstechnik (sowohl die klassische Form der Regelungstechnik als auch Fuzzy-Control) sowie Software-Entwicklung für Automatisierungssysteme.

Der Leser bekommt eine leicht verständliche Übersicht über den derzeitigen technologischen Stand der Automatisierungstechnik.

„... Man darf überrascht sein, dass trotz der inhaltlichen Viefalt und des doch eng begrenzten Gesamtumfangs eine große Fülle an Einzelfaktoren, Zusammenhängen und an Hintergrundinformation geboten wird, wie es insbesondere für Informatik-Studenten an Technischen Universitäten erforderlich ist; in leicht fasslicher Form und unter ansprechender Bebilderung." e&i

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SpringerTechnik

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Herbert Schweinzer (Hrsg.)

# Feldbustechnik in Forschung, Entwicklung und Anwendung

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Feldbussysteme sind im Zusammenwirken mit LANs (Large Area Network) und WANs (Wide Area Network) als Nervensystem anzusehen, das in Systeme aller Bereiche unseres Lebens eingebettet wird. Die Automatisierung erlebt dadurch zur Zeit eine revolutionäre Weiterentwicklung. Die Tagung FeT '97 in Wien hat sich zum Ziel gesetzt, aktuelle Fragen zu diskutieren.

Das Buch beinhaltet Aufsätze, die anläßlich dieser Tagung eingereicht und vom Programmkomitee bestbewertet wurden. Damit ist ein guter Überblick geboten, welche Schwerpunkte in der Feldbustechnik gegenwärtig bearbeitet werden. Der Aufbau des Buches erfolgt in zwei Teilen: der erste Teil beinhaltet Beiträge aus Forschung und Entwicklung, der zweite Teil Beiträge mit Produkt- und Anwendungsorientierung. Innerhalb dieser Teile gibt es eine Gliederung nach den Anwendungsschwerpunkten Industrietechnik, Gebäudeautomation und bereichsübergreifende Beiträge.

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