



A Vision of Industrial Electronics

As for every issue of *IEEE Industrial Electronics Magazine (IEM)*, the IEEE Industrial Electronics Society (IES) President is delivering an editorial at the attention of the IES community. This month, for my fifth editorial, I will speak of a certain vision of industrial electronics. Even if briefly mentioned in my second editorial [1], it is my duty to further develop our definition of industrial electronics and also the different topics included in our technical fields of interest. It is also important to point out that the definition of industrial electronics is very different today compared to the definition set when IES was launched more than 60 years ago in 1951. At that time, the Professional Group on Industrial Electronics was a committee within the IEEE Industry Applications Society.

History

The term “industrial electronics” was defined just after World War II, and this is the reason why IES was launched at that time by a group of engineers who were mainly based in Illinois (Chicago area) and Ohio. At that time, the numerous applications of electronics were designed with vacuum tubes, and, according to Feldman [2], they were more oriented to practicality than sophistication. The first two papers published in *IRE Transactions on Industrial Electronics* were related to induction heating and the role of electronics in naval ordnance [3], [4]. The first paper on motor drives was published in 1961 [5], while the first paper

on static energy conversion appeared in the same journal in 1962 [6].

While the IES was officially established in 1951, the first *IEEE Transactions on Industrial Electronics* was published in 1963; the main content was based on low-voltage welding, numerical control in industry, printed circuit motors, magneto-optic positioning, Doppler effect radar, magnetic pulses, and even fuel cells. The first regular series of journals was dedicated to *IEEE Transactions on Industrial Electronics and Control Instrumentation* from January 1964 (one issue per year) to December 1981 (four issues per year). The first published paper for this journal was related to automotive radar for the prevention of collisions [7], and the last one dealt with microcomputer control of a cascaded rectifier circuit [8].

The actual publication status is based on *IEEE Transactions on Industrial Electronics*, which was created in 1982 (four issues per year) and is still active today (12 issues per year), with the first published paper related to a chopper-controlled dc motor [9]. Later, *IEEE Transactions on Industrial Informatics* was created in 2005 (four issues per year), and *IEM* was launched in 2007 (four issues per year).

Fields of interest

As pointed out in a previous editorial [1], the IES fields of interest are based on “industrial and manufacturing theory and applications of electronics, controls, communications, instrumentation, and computational intelligence.” The IES technical activities address the latest developments in

- control systems applications and technologies

- data acquisition and signal and image processing
- energy conversion, control, and management
- factory communications and automation
- flexible manufacturing
- industrial informatics and computer applications
- robotics and mechatronics.

Moreover, IES technical activities are predominantly carried out in its 20 technical committees (TCs), namely:

- Power Block (six TCs)
 - 1) Electrical Machines
 - 2) Power Electronics
 - 3) Renewable Energy Systems
 - 4) Smart Grids
 - 5) Automotive Technology
 - 6) Energy Storage
- Control Block (five TCs)
 - 7) Building Automation, Control, and Management
 - 8) Control, Robotics, and Mechatronics
 - 9) Factory Automation
 - 10) Motion Control
 - 11) Network-Based Control Systems and Applications

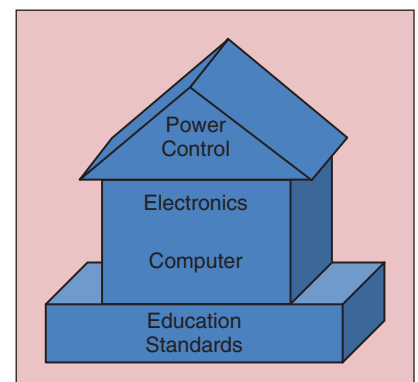


FIGURE 1 – The industrial electronics paradigm.

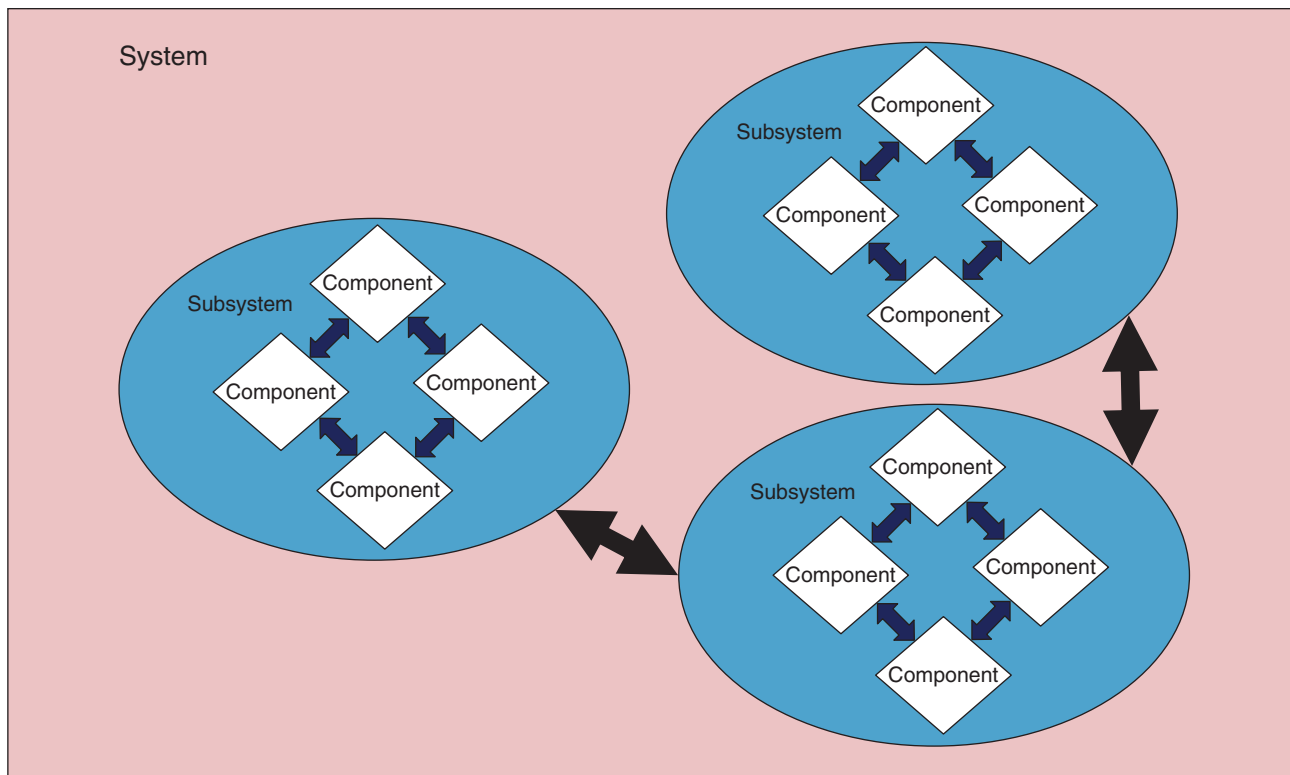


FIGURE 2 – The future of industrial electronics: systems of systems.

- Electronics Block (three TCs)
 - 12) Electronic Systems on Chip
 - 13) Microelectromechanical Systems and Nanotechnologies
 - 14) Sensors and Actuators
- Computer Block (four TCs)
 - 15) Human Factors
 - 16) Industrial Agents
 - 17) Industrial Informatics
 - 18) Resilience and Security
- General Block (two TCs)
 - 19) Standards
 - 20) Education in Engineering and Industrial Technologies.

This classification is somehow the result of the history and is due to the actual industrial electronics technology that is still in permanent evolution. Today, electricity production, transport, transformation, and distribution are under focus because of the need for diversification and the use of green energy. Therefore, the power topic is now benefitting from the evolution of industrial electronics. Twenty years ago, the miniaturization of electronics components to implement more components and more functions on the smallest possible surface was the trend.

Even if industrial electronics shows a clear evolution in our technical

activities, it is possible to define what can be called the industrial electronics paradigm (Figure 1). Inside the industrial electronics “house,” there is still one roof, four walls, and one basement in which one can find our six basic index terms: power, control, electronics, computer, education, and standards. Going back to our early days, they have continuously been the key issues of our Society.

Conclusion

The IES fields of interest have been established for a while, and they have been subject to the technology evolution in the last ten years. Looking back at the history, one can find permanent use of electronics in many, if not all, industrial applications. After being based on components, the industrial electronics technology is now mainly focused on the system level. As with many other modern technologies, it can also be defined as systems of systems (Figure 2). This will surely be the future of industrial electronics in the next decade, and our fields of interest will surely follow this trend.

On behalf of the IES, I take the opportunity, in this first issue of *IEM* in

2013, to wish you all the best in the new year in both personal and professional matters. May 2013 bring you what you expect, and may new volunteers and new members joining us make IES stronger and more successful than it was in 2012. My e-mail, my Skype, and my phone line are always open for any suggestions to improve IES.

References

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