Industrial wireless sensor networks
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The industrial wireless sensor network (IWSN) is the
next frontier in the Industrial Internet of Things (IIoT),
which is able to help industrial organizations to gain
competitive advantages in industrial manufacturing
markets by increasing productivity, reducing the costs,
developing new products and services, and deploying
new business models. The IWSN can bridge the gap
between the existing industrial systems and cyber net-
works to offer both new challenges and opportunities
for manufacturers.

In the next few years, as the edge part of IIoT, the
IWSN plays a crucial role in transforming industrial
organizations opening up a new era of economic
growth and competitiveness in digital industrial 4.0.
The IWSN presents great benefits to industrial organi-
zations such as profitability, efficiency, productivity,
reliability, and safety mainly through three aspects: (1)
boost revenues by increasing production, (2) develop
new hybrid business models, and (3) exploit intelligent
technologies to fuel innovation.

However, there are still many challenges for the
IWSNs: (1) it involves many separate technology fami-
lies and bringing them together will take time, and (2)
there are still many technical barriers to merge different
business functions under different technical standards/
vendors.

One of the goals of this Special Issue was to gather
researchers from different industrial areas, such as
industrial wireless sensors, machine-to-machine com-
munications, and industrial applications and build on
the emerging digital industrial 4.0. In the paper
“Connectivity node set generation algorithm of mine
WSN based on the maximum distance” authored by
Ke Wang and Donghong Xu, the deployment strategy
of IWSNs in a coal mine scenario is investigated based
on the energy consumption, survival time, and quality
of services. A connectivity node set generation algo-
rithm of mine IWSN-based n maximum distance is
proposed and the proposed strategy is tested in a coal
mine monitoring system.

Location-based service (LBS) is one of the most
important topics in industrial applications; the second
paper “Indoor localization based on subarea division
with fuzzy C-means,” authored by Junhuai Li, Jubo
Tian, Rong Fei, Zhixiao Wang, and Huaijun Wang,
presents a fingerprint localization model by dividing the
target area into multiple sub-areas with fuzzy C-Means
algorithm. In this solution, the noise and non-linear
attenuation between the wireless signals are considered
to improve the accuracy.

Energy consumption and routing algorithms remain
two active topics for resource-constrained nodes in
IWSNs. In the paper “Relay participated–new-type
building energy management system: an energy-efficient
routing scheme for wireless sensor network–based
building energy management systems” by Kewang
Zhang, Qizhao Wu, and Xin Li, a novel energy-efficient
routing scheme is proposed based a new strategy: relay
participated–new-type building energy management
system (RP-NTBEMS). The new scheme can reduce the
energy consumption and extend the lifetime of IWSN
nodes and the simulation result shows that the pro-
posed RP-NTBEMS can obtain better performances

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than the most commonly used AODV and LEACH with lower energy consumption.

In the paper “Weight-based link scheduling for convergecast in WirelessHART network,” Dr Kewang Zhang et al. investigated a high robust communication protocols WirelessHART. The proposed link schedule scheme can improve the reliability of the links between nodes in IWSNs.

Security and reliability remains an important topic in IWSNs. The paper “Cumulated checksum and dynamic addresses for secure wireless sensor networks,” authored by Qiong Zhang, focuses on secure solutions for IWSN. A secure ARQ scheme (Sec-ARQ) is proposed for IWSN data link layer that protects frame checksum and addresses without using computation expensive key-preshared authentication. This is a new security solution for IWSN that can significantly reduce computation on resource-limited nodes.

In application layer of IWSN, developing new business models for new applications is an emerging topic that attracts many research efforts. In the paper “Online auction-based resource scheduling in grid computing networks,” Lili Ding, Long Chang, and Lei Wang investigated the auction-based algorithm for grid computing and proposed a reverse online auction method to allocate grid resources in IWSNs. The proposed schemes can be helpful in developing new industrial applications.