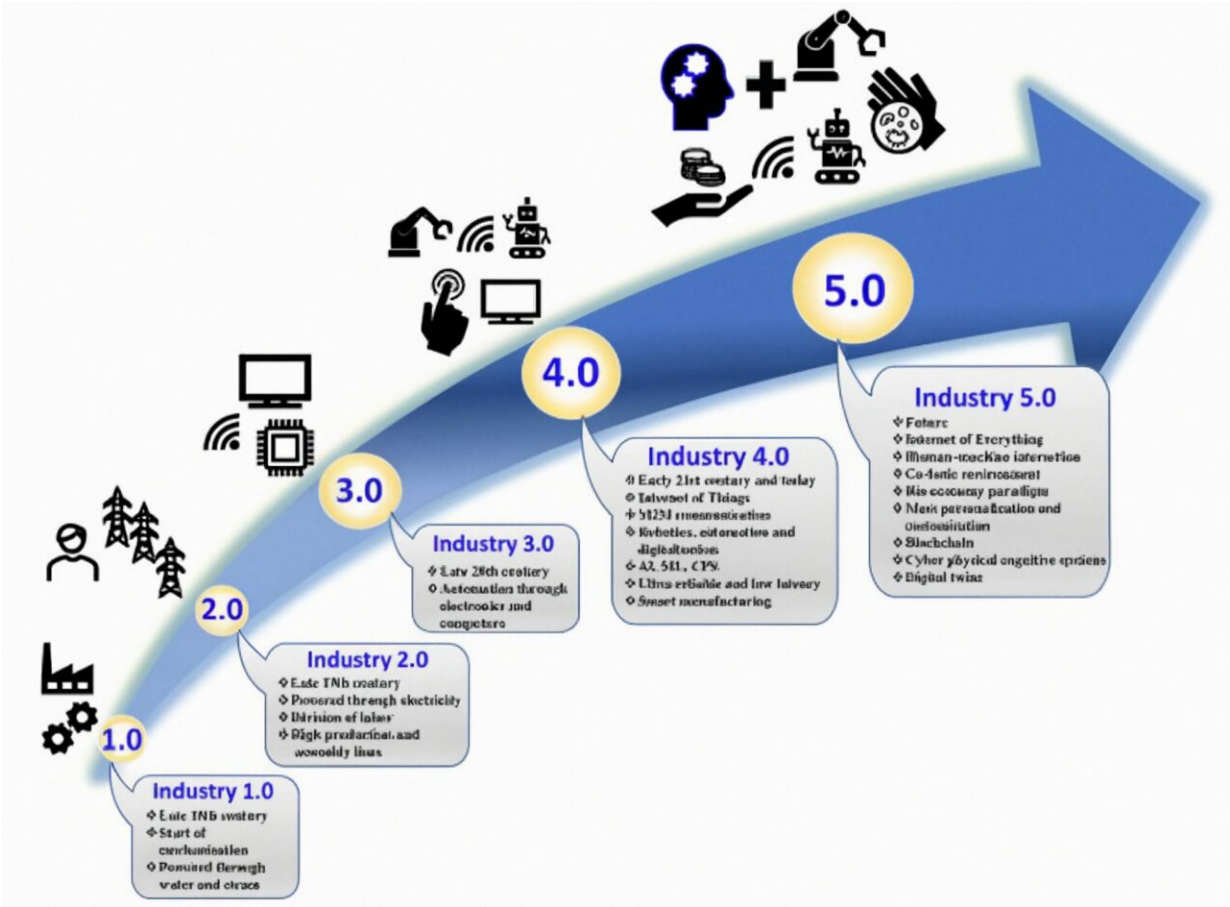


Leveraging the role of dynamic reconfigurable antennas

July 27 2023

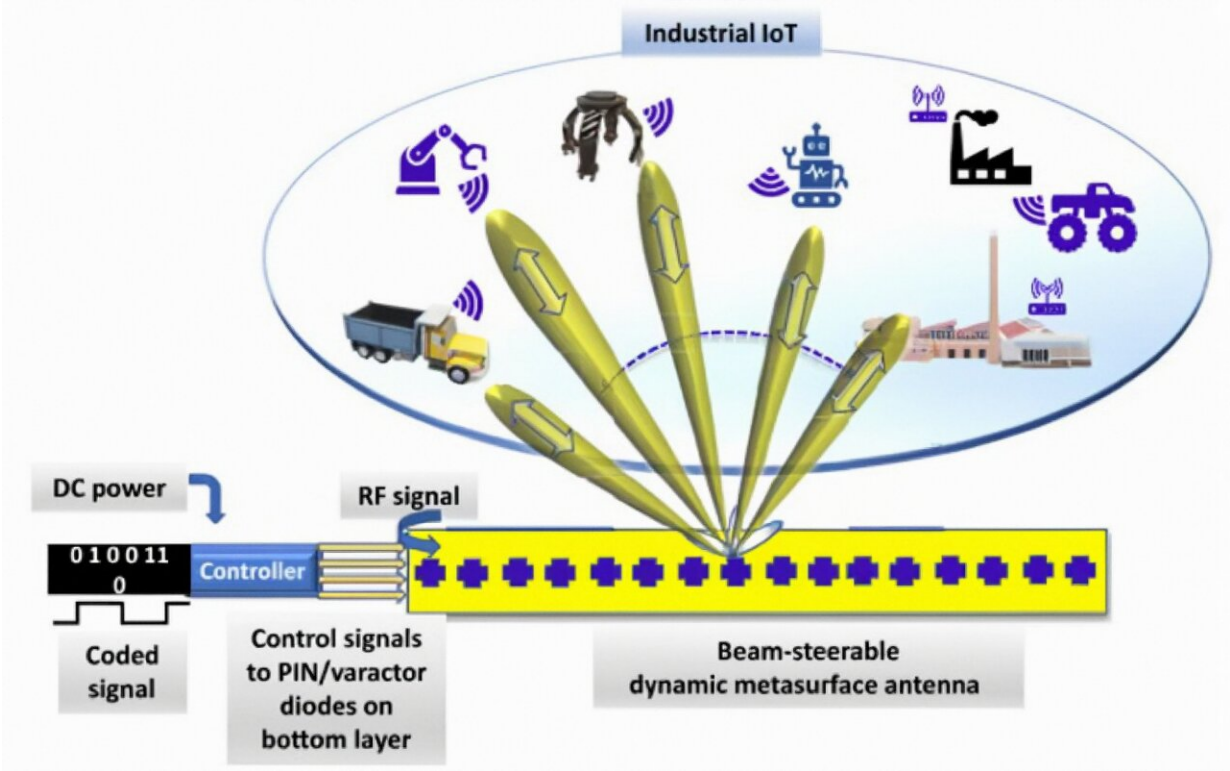


A demonstration of the industrial transformations and futuristic trends. Credit: *Research*

We are living in the realm of Industry 4.0 today, which is a digital

paradigm referring to the integration of cutting-edge computing and digital technologies into global industries. Some of the key technologies in smart industries and smart factories are the industrial Internet of Things (IoT), smart industrial sensors, machine learning and artificial intelligence, cloud computing, advanced robotics, augmented and virtual reality, digital twins, and smart adaptive communication.

In all these technologies, reliable wireless connectivity is of paramount importance. Since an antenna is the backbone of a wireless communication network, therefore it is the need of the hour to understand the [design process](#) and related frequency bands to pave the way towards industrial wireless communication.

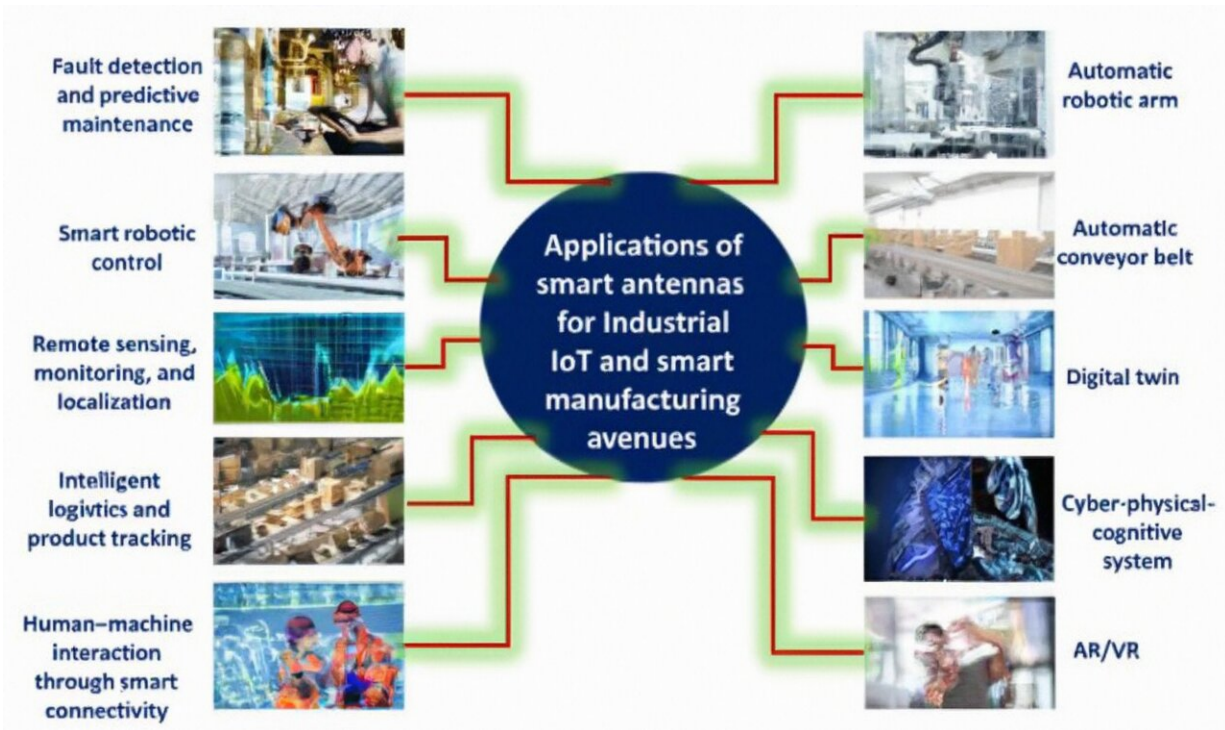


A conceptual depiction of the application of a beam-steerable DMA for Industrial IoT applications. Credit: *Research*

Industrial wireless communication is essential for increasing productivity and efficiency in manufacturing operations. Real-time data transfer makes it possible to take quick decisions and minimize downtime. Moreover, wireless connectivity makes remote monitoring and control possible in industrial settings, promoting safer operations and reducing the need for personal inspections in dangerous locations.

The researchers from the Communication, Sensing and Imaging group at the University of Glasgow have presented a comprehensive review paper on the key technological aspects of Industry 4.0 and beyond. A harmonized review of the industrial revolution journey, industrial communication infrastructure, key performance requirements, potential sub-6 GHz frequency bands is presented. Based on that, state-of-the-art smart antenna design solutions such as dynamic reconfigurable antennas are thoroughly reviewed and emphasized.

Dynamic reconfigurable antennas have the potential to create wireless communication systems that are flexible and changeable, enabling effective beamforming and beam steering in a range of directions and frequencies. Smart antennas offer greater signal quality, more capacity, and better utilization of the available spectrum, hence improving wireless networks' overall performance. This mitigates the impediments of traditional wired communication in industries which are immobile, not scalable and more costly.



An outlook of the future applications of smart antennas in Industry 4.0 and beyond avenues. Credit: *Research*

The smart antennas through efficient wireless connectivity can help in intelligent industrial logistics, [high-definition video](#) based fault detection and surveillance, automatic factory control, as well as remote visual monitoring and control.

At the end of the paper, some exciting futuristic research directions are highlighted that have amazing prospects and huge potential for next-generation industrial applications. These areas include intelligent reflecting surfaces for smart factory communication, multiple-input-multiple-output (MIMO) antenna technology, as well as Millimeter-wave and Terahertz communication.

The work is published in the journal *Research*.

More information: Abdul Jabbar et al, Leveraging the Role of Dynamic Reconfigurable Antennas in Viewpoint of Industry 4.0 and Beyond, *Research* (2023). [DOI: 10.34133/research.0110](https://doi.org/10.34133/research.0110)

Provided by Research

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