Detection and Location of Passive and Semi-passive RFID Tags in In-door Environments

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Abstract: This presentation will review the development of Radio frequency identification (RFID) technology, which has received increasing research interest in recent years due to its huge potential in asset tracking and localization. The most promising feature of this technique is its ability to identify an RFID tagged object from a distance, which, unlike traditional bar-code techniques, does not require line of sight between the reader and tag. Clear applications have been identified for active, semi-passive and passive RFID tags, with battery-free tags being recognised to be particularly appropriate for very low cost situations. A challenge with such tags however is in ensuring highly reliable detection particularly in environments where in-door features lead to RF nulls. This, in turn affects location accuracy.

In recent years, the problem of nulls has been overcome by using phased array antennas and distributed antenna system (DAS) approaches. For example, researchers have achieved wide area coverage by maximizing the link budget through space time array techniques, smart antennas and digital beam forming. In respect of DAS, excellent performance has been achieved by distributed transmitter and receiver signal control and signal processing, so that >99% reliability has been achieved for tag numbers in excess of 100 over areas of up to 20 m x 20 m. Research has additionally identified that by careful design, larger areas can be monitored using multiple cells where cell to cell interference can be used to enhance read reliability. Wireless antenna nodes can also be used to enhance read range.

This paper will therefore review the current status of this rapidly developing field, and describe recent advances in location.

BRIEF BIOGRAPHY

Prof Ian White is currently Master of Jesus College, Cambridge, Deputy Vice Chancellor of the University, van Eck Professor of Engineering, and Head of the Photonic Research Group, comprising CMMPE, CPS and Photonics and Sensors, in the Engineering Department at the University of Cambridge.

He gained his BA and PhD degrees from the University of Cambridge, England in 1980 and 1984. He was then appointed a Research Fellow and Assistant Lecturer at the University of Cambridge before becoming Professor of Physics at the University of Bath in 1990. In 1996 he moved to the University of Bristol and became Head of the Department of Electrical and Electronic Engineering in 1998, before returning to the University of Cambridge in October 2001.

Ian White has built up a substantial research activity in the field of optoelectronics and optical communications and his team numbers approximately 45 people publishing on average 60 papers a year. In terms of research output, the group is one of the largest in the field of optoelectronic systems in the UK. Highlights of his research have included: the development of the first all-optical laser diode flip flop, the first negative chirp electroabsorption modulator and the invention of a technique for transmitting radio frequency signals over long distances of multimode optical fibre.

Several of these advances have already made commercial impact, the offset launch technique for enhancing the bandwidth of optical fibre links having already been adopted within Gigabit Ethernet standard.

He currently chairs the channel model sub-task force of the IEEE 10 GbE LRM standard. The Institution of Electrical Engineers has awarded him the Blumlein-Browne-Willans Prize and the Ambrose Fleming Premium Award. Ian White is a Fellow of the Royal Academy of Engineering and of the Institution of Electrical Engineers and Institute of Electrical and Electronics Engineers. He is heavily involved in policy development and administration of research and sits on a number of other committees.
International Conference Committees. He is a Member of the Board of Governors of the IEEE Photonics Society and Editor-in-Chief of Electronics Letters. He has published in excess of 900 journal and conference papers, and 40 patents. He is a co-founder of Zinwave and PervasID.