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Putting the lab on the map: A wireless sensor network system for border security and surveillance

Mohammad Hammoudeh
School of Computing, Mathematics and Digital Technology, Manchester Metropolitan University
M.Hammoudeh@mmu.ac.uk

ABSTRACT

Traditionally, countries viewed international border control as mostly immigration- and customs-based challenge. However, with the increased risks of terrorism, illegal movement of drugs, weapons, contraband and people, these countries face unprecedented challenges in securing borders effectively. Securing international borders is a complex task that involves international collaboration, deployment of advanced technological solutions and professional skill-sets. In the current financial climate, governments strive to secure their borders, but also ensure that costs are kept low.

Wireless Sensor Networks (WSNs) is a low cost technology that can provide an effective solution to the range of problems faced in securing borders effectively. The ability of a WSN to operate without human involvement and in situations where other surveillance technologies are impractical has made it favourite for deployment in hostile hazardous environments. This technology offers intelligence-led approach to strengthen vulnerable points on the international borders. This class of WSN applications imposes a linear network topology, which has nodes daisy chained using radio communication. Linear WSN topologies are characterised by sparse node deployment, long data transmission distances and alignment of nodes along a virtual line. This talk presents solutions to address the new challenges introduced by Linear WSNs, including: What is the minimum network density to achieve k-barrier coverage in a given belt region? Given an appropriate network density, how to determine if a region is indeed k-barrier covered? How to find a path connecting the two ends of the border such that every point on the path is covered by a sensor node? How to balance workload across sensor nodes? How to elongate network life time and meet quality of service requirements?

Categories and Subject Descriptors

C.2.1 [Network Architecture and Design]: Network Topology, C.2.2 [Computer-Communication Networks]: Network Protocols – Routing protocols.
C.2.3 [Computer-Communication Networks]: Network Operations – Network management.

General Terms

Security, Sensor Networks.

Keywords

Wireless Sensor Networks, Security.

Short Biography

Dr Mohammad Hammoudeh is a Senior Lecturer in Computer Networks and Security in the School of Computing, Math and Digital Technology at the Manchester Metropolitan University. He received his Ph.D. in Computer Science from the University of Wolverhampton in 2009, his MSc (Distinction) in Advanced Distributed Systems from the University of Leicester in 2007, and his BSc (Hons) in Computer Communications from Hawaii University in 2004. He is the co-founder and member of the FUture Networks and Distributed Systems research Group (FUNDS). He is also the founder and coordinator of the FUNDS-IoT Lab. His research interests are in highly decentralised algorithms, communication, and cross-layered solutions to wireless ad-hoc networks. He is a highly proficient, experienced, and professionally certified cyber security. Hammoudeh is the general chair of the European Intelligence and Security Informatics Conference 2015. He has been an active member of the technical program committee on many international conferences and journals. He is regularly invited to talk at international conferences and workshops.