International Journal of Advance Research in Science and Engineering
Volume No.06, Issue No. 10, October 2017
www.ijarse.com
IJARSE
ISSN: 2319-8354

A STUDY ON FUNCTIONING OF OPERATIONS FOR CONTEXT AWARE WI-FI SENSOR NETWORKS.

Y.Sowjanyal[1], M.Nishantha[2], Gowravaram Rashmi[3]

[1]*Asst.Prof in Cse Bharat Institution of Engineering & Tech , Hyderabad (India)*

[2]*Asst.Prof in Cse, GNITC, Hyderabad. (India)*

[3]*Asst.Prof in Cse, Bharat Institution of Engineering & Tech , Hyderabad. (India)*

ABSTRACT

In this paper we will first introduce context-aware sensors and then we will elaborate four applications of context awareness in Sensor Networks, viz.: Implementation of Ubiquitous Learning System Using Sensor Technologies [4], An Open-System Transportation Security Sensor Network: Field-Trial Experiences [5], SWATS: Wireless Sensor Networks for Steamflood and Waterflood Pipeline Monitoring [1], Framework for Intelligent Service Adaptation to Users Context in Next Generation Networks [2].A collection of huge number of low power sensor nodes principally used for monitoring physical phenomena in remote locations is typically termed as Wireless sensor networks. In such remote environments spatial and temporal dependencies between readings may exist. Spatial temporal dependencies are 1 in statistical contextual information, enabling the sensors to predict its own current reading based on past observations and its neighbour's readings.

Keywords: Radio frequency Identification Device, TDE, Context Aware Wireless Sensor Networks, E-Learning, NFC, TSSN.

I. INTRODUCTION

Context is the set of environmental settings and states that either determines an application's behaviour or in which an application event occurs and is fascinating to the user. The idea behind Context Awareness is to use simple sensors that are seamlessly integrated in the user's outfit and distributed in his environment to provide a computer system with a degree of "understanding "of what the user is doing, where he is, and what is happening around him. Using such information, the system can automatically configure itself to best suit the user's needs or even proactively retrieve, deliver, and/or record relevant information.

The design of context-aware systems is a complex and as yet not fully solved problem. It involves a number of issues to be resolved, ranging from situation modelling and application design to the actual recognition [1]. Applications of Context Awareness in Wireless Sensor Networks are : Call Forwarding, Teleporting, Mobisaic Web Browser, Active Map, Shopping Assistant, Cyber guide, Conference Assistant, People and Object Pager, Fieldwork, Adaptive GSM phone and PDA, Location-aware Information Delivery, Office Assistant, Exertion of Ubiquitous Learning System Using Sensor Technologies, An Open-System Transportation Security Sensor Network: Field-Trial Experiences, SWATS: Wireless Sensor Networks for Steamflood and Waterflood Pipeline Monitoring, Framework for Intelligent Service Adaptation to Users Context in Next Generation Networks, Personal Area Network (PAN), Body Sensor Network (BSN), Environmental monitoring, Immersive Guide, Healthcare Monitoring, Home Applications, Surveillance, Precision Agriculture, Space Exploration, Intelligent Transportation, etc.

In this study, we will elaborate four applications of context awareness in Sensor Networks,viz.:

1. Implementation of Ubiquitous Learning System Using Sensor Technologies [4].

2. An Open-System Transportation Security Sensor Network: Field-Trial Experiences [5].

3. SWATS: Wireless Sensor Networks for Steamflood and Waterflood Pipeline Monitoring [1].

4. Framework for Intelligent Service Adaptation to Users Context in Next Generation Networks [2].

II. APPLICATION 1: IMPLEMENTATION OF UBIQUITOUS LEARNING SYSTEM Using Sensor Technologies

Electronic learning (e-learning) is used to gain access the learning content using desktop computers distributed in many different forms of educational programs comprising online courses and web enhanced learning. But the limitation with e-learning is its immobility.

In Mobile learning (mlearning) learner is equipped with handheld mobile device to admission the learning content using diverse wireless technologies. M-learning offers greater flexibility in where and when learning happens. Although m-learning provides mobility, it is not context sensitive.

A new sort of learning mechanism called ubiquitous learning (u-learning) [2] is context aware and also provides learning content anytime, anywhere using innumerable mobile devices and sensor technologies. The real confront in u-learning is the delivery of learning content to mobile devices depending upon surrounding context.

Electronic learning (e-learning) is used to gain access the learning content using desktop computers distributed in numerous different forms of educational programs including online courses and web enhanced learning. But the limitation with e-learning is its immobility.

In Mobile learning (m-learning) learner is equipped with handheld mobile device to admit the learning content using numerous wireless technologies. M-learning offers greater suppleness in where and when learning happens. Though m-learning provides mobility, it is not context sensitive.

A new sort of learning mechanism called ubiquitous learning [2] (u-learning) is context aware and also provides learning content anytime, anywhere using numerous mobile devices and sensor technologies. The real challenge in u-learning is the deliverance of learning content to mobile devices depending upon adjoining context.E.g. that learning environments can be accessed in various contexts and situations.

2.1 Technologies Incorporated

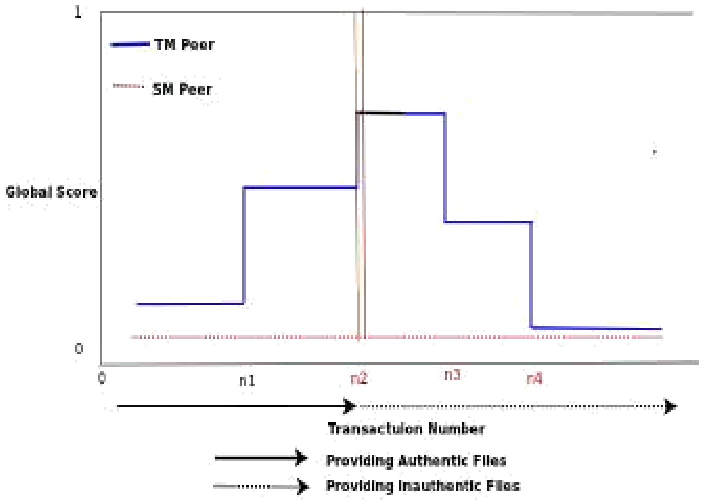
2.1.1. Radio Frequency Identification

RFID is one of the short range wireless communication technologies used to observe remote objectID using radio waves. It consists of a RF interrogator or reader wedded to interrogate RF transponder or tag within its radio range. Radio transponders are used to store and retrieve the object details entrenched inside the memory.

RFID systems can be classified in to two types 1. Passive RFID and 2. Active RFID. There are various air-interface protocols used to retrieve the object ID from a distant location.

2.1.2. Near Field Communication

Near Field Communication (NFC) is a subset of RFID technology which allows the fast and effortless exchange of small amount of data between PCs, mobile devices, and smart objects. NFC depends on smart card technology standard ISO 14442 allowing wireless data transfers up to a range of 2 to 20 centimetres. It has Touch to Exchange Information capability.



Global score for malicious peer

2.1.3. Mobile Platform

A handheld operating system or mobile platform is the operating system that controls information appliance or mobile device analogous in principle to an operating system such as Mac OS, Windows or Linux that controls a desktop computer or laptop.

2.2. Proposed Models & Implementation Details:

2.2.1. RFID Based Content Presentation

The RFID in mobile phones is being implemented in the form of NFC.

2.2.2. Location Based Services using RFID

As mobile phones are ubiquitous and are widely used across student community, the sensors present on these devices can be effectively used to gather contextual information for providing LBS to students.

Context acquisition can be done in three ways:

1. Filling in a Form

2. Context Extraction and

Client based context detection is the method adopted in providing LBS

1. Client based

2. Proxybased and

3. Server based.

III. APPLICATION 2: AN OPEN-SYSTEM TRANSPORTATION SECURITY SENSOR NETWORK: FIELD-TRIAL EXPERIENCES

The Transportation Security Sensor Network (TSSN), based on open software systems and service-oriented architecture principles where dissimilar components can be provided by different vendors, has been developed to mitigate the risks of Cargo shipment hijack, theft, or tampering, being used to transport contraband. TSSN architecture can also be used to monitor rail-born ecargo. The TSSN detects events, integrates the event type from the train in the field with logistics information, and then reports events that are important to decision makers by using networks with commercial links.

3.1. System Architecture

The TSSN system is comprised of three major geographically distributed components:

1. A trade data exchange (TDE) [6];

2. A virtual network operations centre (VNOC), and

3.A mobile rail network (MRN) [5].

Wired links are used between the TDE and the VNOC, whereas MRN to-VNOC communications are done using networks with commercial wireless link components.

3.1.1. TDE

The TDE contains shipping data, and it interconnects commercial, regulatory, and security stakeholders. The TDE is hosted on a server through a wired connection to the Internet.

3.1.2. VNOC

The VNOC is the management facility of the TSSN, and it is also the shipper's interface to the TDE.

3.1.3. MRN

The MRN subsystem is located on the train, and it consists of hardware and software.

MRN Hardware: The MRN subsystem hardware consists of a set of wireless shipping container security seals and a TSSN collector node.

MRN Software: The prototype MRN software was implemented using the SOA approach. The software comprises of a Sensor Node service, an Alarm Processor service, and a Communications service.

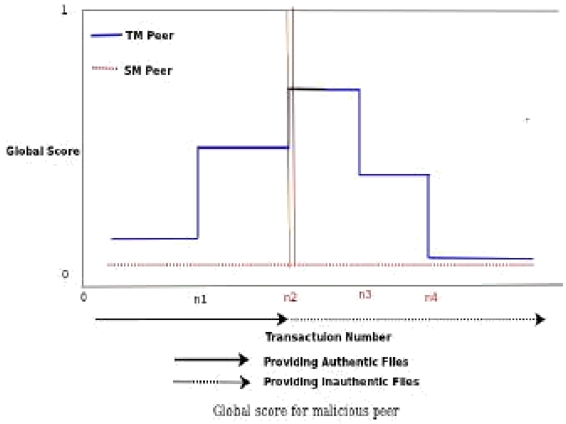


Figure 1: Global Scores for TM Peers in PTrust [1]

The TSSN architecture provides a mechanism for timely notification of decision makers. However, additional development and testing are needed before the TSSN architecture can be deployed in production systems.

IV. APPLICATION 3: SWATS -WIRELESS SENSOR NETWORKS FOR STEAM FLOOD AND WATER FLOOD PIPELINE MONITORING

Steam flood and Water flood Tracking System (SWATS), aims to allow continuous monitoring of the steam flood and water flood systems to detect, identify and localize major anomalies such as blockage and leakage, outside force damage, generator, and Splitigator malfunction, with low cost, short delay, and fine-granularity coverage while providing high accuracy and reliability. The anomaly detection and identification is challenging because of the inherent inaccuracy and unreliability of sensors and the transient characteristics of the flows.

4.1. Applications

1. Pipeline Monitoring

2. Target Tracking

4.2. Techniques

There are three main techniques related to SWATS in the literature: SCADA, collaborative fusion, and decision tree.

1. SCADA Systems -SCADA [7] is a computer system for gathering and analysing real-time data, which usually consists of remote telemetry and sensors, controllers, networks, a data server, and a user interface.

2. Collaborative Fusion -Collaborative fusion is the process of combining (fusion) and evaluating information obtained from multiple heterogeneous sensors into a single composite picture of the environment.

3. Decision Tree -the decision tree takes as input a set of properties describing an object or a situation, and outputs a yes/no decision (Boolean outcome) or classification tree (discrete outcome) or regression tree (continuous outcome) [8].

4.3.Steamflood Monitoring Algorithm in SWATS

Algorithm consists of two stages (single-node processing and multinode collaboration) with six components. Single-Node Processing at each node, our algorithm performs in-node sensor readings validation (using multimodal sensing) and noise reduction. Then it analyses the temporal trend locally to detect the onset of events.

Step 1: In-Node Sensor Readings Validation.

Step 2: Noise Reduction.

Step 3: Event Detection Multinode Collaboration Decision tree algorithm utilizes collaboration of neighbouring nodes to reach consensus in their detection and identification results for the same phenomena:

Step 4: In-Network Event Detection Validation.

Step 5: Problem Identification.

Step 6: Problem Localization.

4.4. Decision Tree Algorithm

SWATS classify the anomalies into five types of problems and six false alarms. The decision tree checks from critical to trivial causes: problems to false alarms. The algorithm first compares the problem set using the rules in the decision tree. Then it tries to distinguish the candidate problems from the related false alarms.

ATS represent a new approach to oilfield monitoring that has the benefits of low cost, flexible deployment, continuous monitoring, and accurate problem detection, identification, and localization quickly, reliably, and accurately.

V. APPLICATION 4: FRAMEWORK FOR INTELLIGENT SERVICE ADAPTATION TO USERS CONTEXT IN NEXT GENERATION NETWORKS

Traditionally applications have had to take care of context management themselves. This framework presents a solution for a converged context management, combining clustering techniques and semantics, directly deployable in the real world, and how it can be employed in a future Internetto integrate data from all context sources and serve it to client applications in a seamless and transparent manner. It works integrated within an open telco operator infrastructure, based on the IP multimedia subsystem (IMS) [10].

The IMS core provides advanced NGN functionalities that do not need to be replicated by the context management framework, which simply acts as an additional node/application server in the environment. Additionally, this framework has presented how the context intelligence of the system carries out context inference to predict missing values and find high-level context data. The approach presented is based on a combination of clustering AI and semantic reasoning.

5.1. Global Architecture

5.1.1. Context Management Framework

It is composed of an operator's domain, the set of user's devices, and third party provided services or applications, usually available on the web. The core of the system, the context enabler, is located inside a telco operator, but publicly available through the Internet [9].

The context enabler handles context information in a pure semantic format and comprises three main sub modules: context manager, context database, and context intelligence. The context manager is in charge of centralizing all operations related to retrieving and serving context. The context database simply stores context data. The context intelligence is in charge of applying several levels of reasoning over the context data. The rest of the operator's domain is composed by the different access networks, internal application servers, operation support systems (OSS), and IMS core. The rest of the context management framework comprises a wide array of different context sources, sensor networks, and applications acting as context consumers. They are connected through a variety of access networks, and communicate with the context enabler using a specific contextual protocol.

The Context Management Framework presented, is able to provide all the functionalities required for integrate context management, so services in the network never have to worry again about retrieving, validating, or inferring any kind of context data.

VI. CONCLUSION

A context-aware application is one which adapts its behaviour to a changing environment. A context-aware application needs to know the location of users and equipment, and the capabilities of the equipment and networking infrastructure. Context-aware systems offer entirely new opportunities for application developers and for end users by gathering context data and adapting systems behaviour accordingly. Especially in combination with mobile devices these mechanisms are of high value and are used to increase usability tremendously.

Within a richly equipped networked environment such as a modem office the user need not carry any equipment around; the user-interfaces of the applications themselves can follow the user as they move, using the equipment and networking resources available. Various applications for context-aware computing which enables applications to follow mobile users as they move around a building have been described.

In "Implementation of Ubiquitous Learning System Using Sensor Technologies", learners were provided with right content based on their location information.

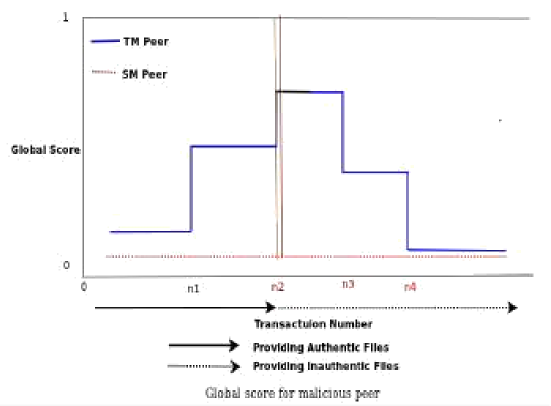


Figure 2: Global Scores for TM Peers in PTrust [1]

The TSSN architecture provides a mechanism for timely notification of decision makers. However, additional growth and testing are needed before the TSSN architecture can be deployed in production systems. SWATS represents a new approach to oilfield monitoring that has the benefits of low cost, flexible deployment, continuous monitoring, and accurate problem detection, identification, and localization quickly, reliably, and accurately.

The Context Management Framework presented, is able to provide all the functionalities required for integrate context management, so services in the network never have to worry again about retrieving, validating, or inferring any kind of context data.

REFERENCES

[1] Akyildiz et al., 2002, I.F. Akyildiz, W. Su, Y. Sankarasubramaniam, E. Cayirci, Wireless sensor networks: a survey ComputNetw, 38 (2002), pp. 393–422.

[2] Shashi Phoha, Thomas La Porta, Christopher Griffein , Sensor Network Operations, IEEEPress, Wiley Interscience, A John Wiley & Sons, Inc Publication.

[3] Jiangtao Yin, Xudong Yang, RFID-Based Ubiquitous Learning Environment for School Students,Fifth IEEE International Conference on Wireless, Mobile, and UbiquitousTechnologyin Education, 2003.

[4] Trade Data ExchangeNothing Short of a Logistics Revolution, KC SmartPort, Nov. 10, 2008. [Online]. Available: http://www.jocdigital.com/joc/20081110/?pg=29.

[5] Nava Jyothi Karna, Sarat Chandra BabuNelaturu, Radhika Kambham, RamuParupalli andKumar Mandula, Blending Grid, Ubiquitous Computing and Web Technologies for UbiquitousLearning, Uniqiutous Learning, An International Journal, 2003.

[6] D. T. Fokum, V. S. Frost, D. DePardo, M. Kuehnhausen, A. N. Oguna, L. S. Searl, E. Komp,M. Zeets, D. Deavours, J. B. Evans, and G. J. Minden, Experiences from a transportationsecurity sensor network field trial, in Proc. 3rd IEEE Workshop EFSOI: Towards SociallyAware Netw., Honolulu, HI, Dec. 2009, pp. 16.

[7] D. Erickson and D. Twaite, Pipeline Integrity Monitoring System for Leak Detection, Control,and Optimization of Wet Gas Pipelines, SPE Annual Tech. Conf. & Exhibition, Oct. 1996.

[8] C. Baladron et al., Integrating User-Generated Content and Pervasive Communications, IEEEPervasive Computing, vol. 7, no. 4, Oct.Dec. 2008, pp. 5861.

[9] A. Udugama et al., NetCAPE: Enabling Seamless IMS Service Delivery Across HeterogeneousMobile

[10] Chuong et al., 2009, Chuong C, Torabi T, Loke SW. Towards context-aware task recommendation. In: Proceedings of pervasive computing (JCPC); 2009. p. 289–92.

[11] Cleidson and David, 2011R. Cleidson, F. David, “The awareness network, to whom should I display my actions? And, whose actions should I monitor?”IEEE Trans SoftwEng, 3 (3) (2011), pp. 325–340.

[12] Ibnkahla, 2012, M. Ibnkahla, “Wireless sensor networks: a cognitive perspective, CRC Press, FL, USA (2012)”.

[13] S. Boyer, SCADA: Supervisory Control and Data Acquisition, Instrument Society of America, 2004.

[14] Edwards, 2005, W.K. Edwards, Putting computing in context: an infrastructure to support extensible context-enhanced collaborative applications, ACM Trans Comput–Hum Interact, 12 (4) (2005), pp. 446–474.

[15] Tari et al., Tari K, Amirat Y, Chibani A, Yachir A, Mellouk A. Context-aware dynamic service composition in ubiquitous environment. In: IEE international conference on communications (ICC); 2010. p. 1–6.

[16] Fadzillah et al., Fadzillah N, Omar N, Abidin S. Application-based context-awareness in collaborative workspaces: a review. In: Proceedings of the IEEE power engineering and optimization conference (PEDCO); 2012. p. 411–5.Bagula et al., 2012, A. Bagula, M. Zennaro, G. Inggs, S. Scott, D. Gascon, Ubiquitous sensor networking for development (usn4d): an application to pollution monitoring, IEEE Sens, 12 (2012), pp. 391–414.

[17] Soylu et al.,Soylu A, Causmaecker PD, Desmet P. Context and adaptivity in context-aware pervasive computing environments. In: IEEE symposia and workshops on ubiquitous, autonomic and trusted computing; 2009.

[18] Hussain SS. Integrating end-user support and negotiations to specify requirements for context-based adaptations in a collaboration environment. In: Proceedings of the 2nd ACM SIGCHI symposium on engineering interactive computing. Berlin, Germany; 2010.

[19] http://en.wikipedia.org/wiki/Ubiquitous learning.