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RFID and WSN Integration for Redundant Data Filtering

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ABSTRACT- Wireless Sensor Network (WSN) and Radio Frequency Identification (RFID) integration is a developing innovation which utilizes focal points of both frameworks making it more solid and productive. The Hybrid network shaped by WSN and RFID integration gives brilliant foundation to secure, prepare and disperse data in element situations which are decentralized. The coordinated network comprises of different difficulties among which redundant data is basic as it is combined with postponement, time and vitality utilization which results in misuse of different network assets. In this paper redundant (copy) data issue is thought about and it is further wiped out to extemporize the execution of the cross breed network. Redundant data filtering is examined in point of interest alongside its impacts on the framework.

KEYWORDS **-** System integration, radio frequency identification (RFID), wireless sensor network (WSN), data filtering, and redundant data.

I. INTRODUCTION

Wireless Sensor Network (WSN) and Radio Frequency Identification (RFID) integration is a rising innovation which utilizes focal points of both frameworks making it more solid and productive. The Hybrid network shaped by WSN and RFID integration frameworks give brilliant base to obtain, prepare and disseminate data in element situations which are decentralized. The incorporated network comprises of different difficulties among which redundant data is mind boggling as it is combined with deferral, time and vitality utilization which results in misuse of different network assets. Wireless Sensor Network (WSN) and Radio Frequency Identification (RFID) are rising as a pervasive processing innovation due their expansive pertinence and different favorable circumstances which are noteworthy[2].

The sensor hubs has computational ability which permits handling of gathered data. This data is cooperatively gathered and handled and is transmitted further to the base station [4]. RFID innovation empowers recognition and identification of an article. A RFID network contains perusers and labels. A label comprises of a chip and a reception apparatus which is consolidated on an objective article. Data is gotten by peruser by checking these labels and transmitting data to the server. RFID innovation has been broadly acknowledged in modern applications while then again, sensor networks discovered vital applications in cruel natural conditions. Because of the utilization of sensor networks in these situations, the area and character of an item stay basic. In these cases, both WSN and RFID integration is the ideal arrangement as they supplement each other.

The Hybrid network framed by integration of RFID and WSN networks has different distinguished difficulties viz. continuous execution, vitality protection, data cleaning and filtering, against impact, validation and confinement [1].

From the most importantly difficulties, redundant data filtering is vital to stay away from wasteful usage of network assets [6]. In a RFID network, a peruser interviews its labels different times to build the watched read rate. Because of this few duplicates are connected to a solitary item. Additionally the sensor hubs and RFID labels are thickly conveyed in a

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region . It is done to cover every last territory under perception. This outcomes in excess of data as a few zones are secured by more than one hubs. Redundant data is only rehashed or copy data perusing. The evacuation or filtration of this redundant data is essential as it doesn't give any applicable helpful data. It superfluously uses significant assets. Redundant data expulsion is a procedure of adjusting, supplanting, or erasing the immaterial, wrong or mistaken or some portion of data [7]. In this paper, redundant data issue is contemplated and is dispensed with further to ad lib the execution of the mind boggling half and half network. Redundant data filtering is talked about in subtle element alongside its impacts on the framework. The following segment briefs about the writing review accomplished for this paper.

II. LITERATURE SURVEY

1. Li Wang, Li Da Xu,“ Data Cleaning for RFID and WSN Integration”, *IEEE Transactions On Industrial Informatics,* Vol. 10, No. 1, February 2014

In this, Improved Cross Redundant Cleaning Algorithm (ICRDC) proposed by Li Wang. Structure called “Cross Tag Lists (CTL) which contain tuple queue, ensures inserting and deleting operation which is maintained in the memory. Then a verification is carried out to determine whether the tags which are waiting for arbitration are nearby the reference tags in CTL. If there are no arbitration tags then Euclidean distance of the tags which are waiting for arbitration can be calculated. With minimum relative position method, the cross redundant data can be removed. If there are some tags which are waiting for arbitration, then based on sliding window mechanism, the tuple cache queue in tuple groups can be checked and detected for redundancy.

2. Shawn R. Jeffery, Minos Garofalakis, Michael J. Franklin, “Adaptive Cleaning for RFID Data Stream” , *in Proc VLDB*, pp. 163174.,Seoul, Korea, 2006.

Shawn R. Jeffery proposed SMURF algorithm and gave various shortcomings of static smoothing filters to correct missed readings. The proposed SMURF algorithm employs adaptive smoothing scheme for RFID data filtration. It acts as the adaptive smoothing filter for data cleaning and is the first declarative algorithm. SMURF aims at two data cleaning mechanisms i.e, Pre-tag cleaning and Multi-tag cleaning. As SMURF is an adaptive smoothing scheme, setting the window size is not required as it adjusts its size automatically by considering the characteristics of data streams.

3. Jeffrey, Alonso, Franklin, Hong, and Widom,“A pipelined frame-work for on line cleaning of sensor data stream”, *in Proc.* pp. 140142, IEEE Comput. Soc. Atlanta, 2006.

Shawn R. Jeffery proposed an Extensible receptor Stream Processing (ESP) algorithm which is a declarative query based framework. Its purpose is to clean data streams produced in sensor networks. ESP (Extensible receptor Stream Processing) is a pipeline framework for data processing. It is used for cleaning data of receptor data streams online.

4. Ali Kashif Bashir, Se Jung Lim, Chauhdary Sajjad Hussain and Myong-Soon Park, “Energy Efficient In-network RFID Data Filtering Scheme in Wireless Sensor Networks”, Sensors 2011, 7004-7021; doi:10.3390/s110707004, 2011

In this paper, EIFS i.e. Energy Efficient In-Network RFID Data Filtering Scheme is proposed by Dong-Hyun Lee. Redundant data is divided into two types: Intra-cluster and Inter-cluster cases. The type of RFID data packet received by the cluster head is decided from its f field. If the value of f is 1, then the sender is an intra-cluster node and cluster head should filter out the data. After data cleaning, the field f is set to 0. Therefore the cluster head will not filter the packets with

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field f equal to 0 thus reducing the cost for computation. After intra-cluster filtering, CHs send their data towards sink. Firstly, the EIFS algorithm detects the inter-cluster redundant data. Then it sends a feedback messages to the intermediate nodes which results in reduction of unnecessary transmissions. If a redundancy is detected by a CH then through feedback it informs to its intermediate CHs. Then according to the feedback, updation of tag lists are carried out.

III. PROPOSED SYSTEM:

The integration of WSN and RFID is appeared in Figure 1. The integration of the ZigBee sensors and RFID innovation can distinguish the focused on item all around. It can likewise see the item's status in a constant way. The integration of WSN and RFID can build the extent of utilizations of the two advancements.

By alluding to figure 1, engineering of WSN and RFID network will be as appeared in figure 2.

The design comprises of four sorts of hubs as in [11], they are :

- Sensor label (ST)
- Cluster head sensor hub (CH)
- Conventional sensor hub (CSN)
- Hybrid Sensor hub (HSN)

Customary sensor hubs are the most essential and straightforward segment of the coordinated network. CSN's are ordinary sensor hubs which sense physical states of the earth. They exchange data to the group head (CH). The unmistakable part of CSN is to carry on like transfers while giving more data on the earth [11]. Group Head hubs are indistinguishable to CSN yet play out extra capacities like data handling and data accumulation. Every sensor bunch contains one CH. Hub framed by the integration of RFID tag and Sensor will be sensor label (ST). In this way it has single personality because of RFID tag and detecting capacity because of sensor fused in it. There three sorts of Sensor Tags, viz. Dynamic, Passive and Semi-dynamic. A Passive sensor labels are utilized as a part of models which don't use battery power for correspondence and detecting reason. Another key part is Hybrid Sensor Node (HSN) which is a blend of a RFID peruser and sensor hub in one single hub.

The resultant gadget can perform:

- Sensing ecological conditions.
- Wireless correspondence with each other.
- Reading of identification numbers from labeled articles or persons data between to the sink or next HSN hub.

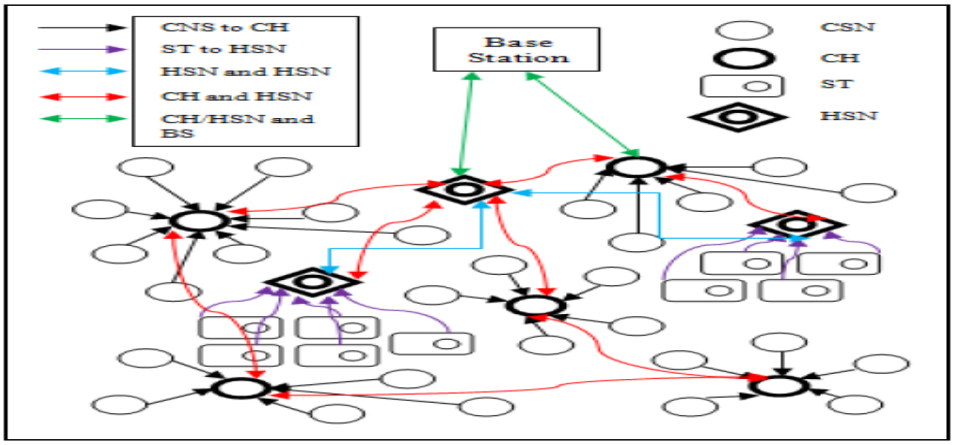

Fig.1. Architecture for Integration of WSN and RFID.

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IV. METHODOLOGY:

In this section, the issue related to redundant data is taken into consideration to improve the efficiency of communication of data. An improved data cleaning algorithm is presented, simulated, and validated.

A. Assumptions and definitions:

There are:

1. *m* Hybrid sensor node (HSN)/cluster head (CH)
2. *m*×*n* fixed reference tags / Conventional Censor Nodes
3. *l* tags/CSNs for arbitration.

The attributes of the reference tags/CSNs are known and each HSN/CH can detect and locate reference tags/CSNs in its working area [1].

Definition 1: $D_{i\,j}$ is the Euclidean distance between the signal intensity of tag *i*/CSNs *i* waiting for arbitration on HSN *j*/CH *j* and the signal intensity of *m* reference tags/CSNs of HSN *j*/CH *j*. If the value of $D_{i\,j}$ is small to HSN *j*/CH *j*, it more likely will belong to HSN/CH of the tag *i* / CSNs *i*:

$$D_{i,j} = \sqrt{\sum_{k=1}^{n}(W_{i,j} - G_{j,k})^2}, \quad i \in (1 \cdots l), j \in (1 \cdots m).$$

Where,

$G_{j,k}$ – Signal intensity of reference tag *k*/CSN *k* belonging to HSN *j* / CH *j* such that $j \in (1.....m)$, $k \in (1,....n)$.

$W_{i,j}$ – Signal intensity of reference tag *i* / CSNs *i* waiting for arbitration on HSN *j*/CH *j* such that $i \in (1,.....l)$, $j \in (1,....m)$ [1].

Definition 2: A triple $d(R_{id},T_{id}, \tau)$ is a set of original data. R_{id} is denoted as unique identification of the HSN/CH. T_{id} is denoted as unique identification of the tag/CSN. τ is timestamp which the tag/CSN is detected. Through a triple *d*, the mapping relationship of the RFID system between physical device and logic identity can be built [1].

Definition 3: Affiliation is possible as tag i/CSNs i respond to HSN j/CH j within the induction scope of HSN j/CH j at the moment t. Further, we denote it as follows:

$$F(i,j,t) = \frac{1}{3}\sum_{k=0}^{2} p(i,j,t-k) \quad i \in (1 \cdots l), j \in (1 \cdots m)$$

Where, p(i, j, t) is the frequency that HSN j/CH j links to tag i /CSNs i at the moment t [1].

B. Conditions: Cross redundant data is produced by some nodes which are located in the same working area. Following conditions are satisfied by cross redundant data:

1. For two arbitrary triples di (R_id_i, T_id_i, τ_i) and d_j (R_id_j, T_id_j, τ_j) from the same cross space, the condition of ($R_id_i \neq R_id_j$) $\cap$ ($T_id_i = T_id_j$) is satisfied.

2. At the same time, the relation of ($\tau_i = \tau_j$) $\cap$ ($|\tau_i - \tau_j| \leq \sigma$) is also satisfied, where σ is the time threshold [1].

C. Description of the Proposed Algorithm:

To eliminate redundant data, following algorithm is employed. A structure called Cross Tag-Sensor List (CT-SL) is maintained incrementally in the memory. CT-SL consists of a tuple queue which ensures inserting and deleting operation. The time sliding window mechanism used can complete the arbitration using the units of time window on many orderly tuple simultaneously [1]. The algorithm works as follows:

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- Initially, Every HSN and CH ascertains the Euclidean separation of every single hub present inside its cluster.Also the RSSI estimation of each approaching data parcel is figured. Data bundles having RSSI esteem above edge quality are sent for further process.
- According to the Euclidean separation, Cluster head further makes an underlying CT-SL. This is accomplished by perusing the enrollment of arrangement records. The CT-SL contains every one of the data parcels which are sorted out in above stride considering RSSI esteem. In this way introductory CT-SL is made taking Euclidean separation and RSSI esteem into thought.
- The essentially made CT-SL is redesigned every once in a while as per the data streams got from RFID labels and Conventional sensor hubs (CSNs) present in the network.
- Further, it is tried whether the current labels/CSNs of holding up intervention are near reference labels/CSNs in CT-SL. On the off chance that the answer is NO, go to step 10) and if YES go to step 5).
- Then based upon the sliding window system, the tuple store line can be identified in tuple bunches.
- Further the calculation checks whether the tuple is redundant or not utilizing the determination standards as a part of definition 2. On the off chance that it not fulfilling the condition then come back to step 3; generally, go to step 7.
- The alliance F(i, j, t) is processed which shows that label i/CSNs i reacts to HSN j/CH j right now t.
- Further, the sign force Wij is processed to see whether the label i/CSNs i of holding up assertion is in respect to the HSN j/CH j that effectively distinguished label i/CSNs i in sliding window.
- Calculate the sign force vector Gj = (Gj,1, Gj,2,… Gj,n) which means whether the reference labels/CSNs has a place with HSN/CH or not.
- The technique for least relative position and F(i, j, t) are connected to parley the HSN/CH of cross redundant data. The cross redundant data can be killed through a selective procedure.
- The lapsed cross data tuple in CT-SL is sifted so as to keep up a sensible measure of memory and then come back to step3.Modified ICRDC algorithm is similar to ICRDC with minor changes as follows:

1. Firstly, the CH and HSN calculates the Euclidean distance of each and every node present within its cluster.
2. The RSSI value of every incoming data packet is then calculated. After that, only the data packets having RSSI value above a threshold value are forwarded for further processing.
3. The initial CT-SL is formed in with respect to the Euclidean distance of node and it contains data packets having appropriate RSSI value.

V. SIMULATION RESULTS AND ITS ANALYSIS:

The Modified ICRDC scheme is implemented in Integrated Network. The simulation of the algorithm is carried out in Network Simulator-2 (NS-2) (Network Animator v1.15) which is a network simulator under GNU GPLv2 license for research and development. Figure 2 shows the Network Animator View of NS-2 where RFID and WSN were integrated and simulated. It consists of 34 nodes among which, some are sensor nodes and some are integrated nodes.

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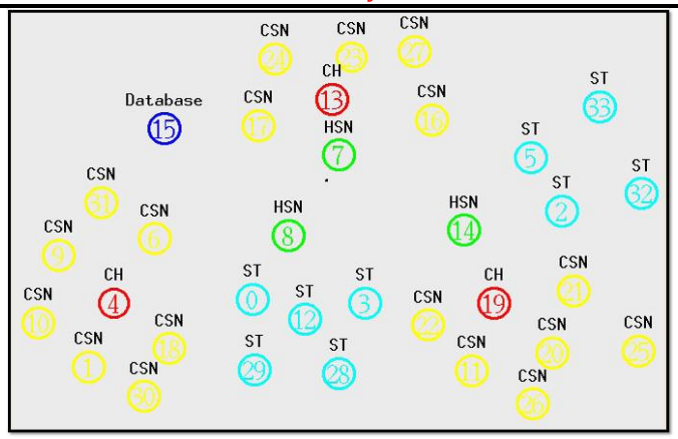
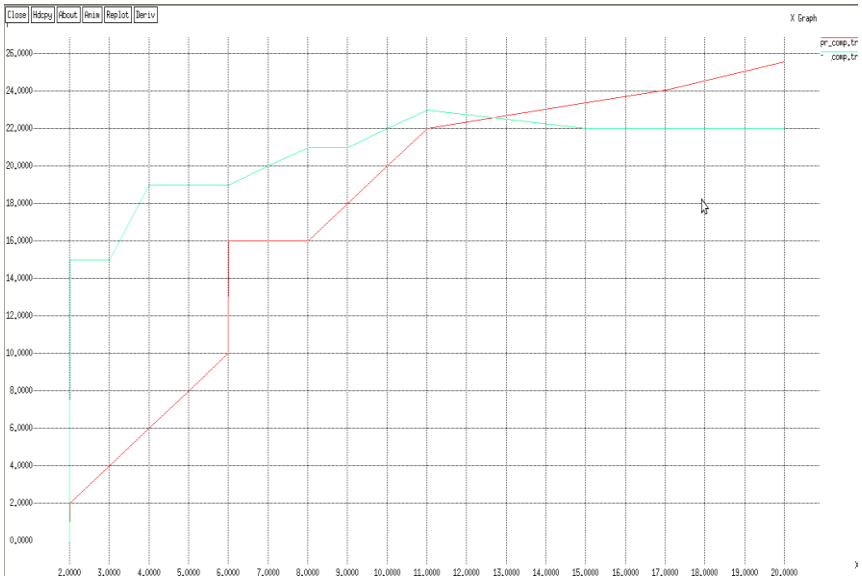


Fig. 2 Network Animator View of NS-2 for RFID and WSN integration.

Figure 3 demonstrates the Compressibility chart plotted against reproduction time. The compressibility parameter here means the measure of pressure accomplished in assembled data because of disposal of redundant data. In diagram, red line speaks to the conduct of proposed plan and green line demonstrates ICRDC conduct in Integrated Network. The created diagram demonstrates that however the ICRDC performs well in the essential stage, the general execution of Modified ICRDC is predominant. Figure 4 demonstrates the examination amongst ICRDC and proposed procedure as far as precision. The exactness parameter here indicates how precisely the data filtering calculation performs redundant data end. A little change is accomplished as far as exactness as correlation with ICRDC. Figure 5 demonstrates vitality spared when contrasted with before calculation. A slow measure of vitality is spared when contrasted with ICRDC. Figure 6 demonstrates the dormancy decreased after expulsion of redundant data by utilizing changed ICRDC. From the chart , it can be seen that an observable measure of dormancy is decreased for preparing data after evacuation of redundant data when contrasted with ICRDC.



Fig,.3 Comparison of Compresibility between ICRDC and Modified ICRDC.

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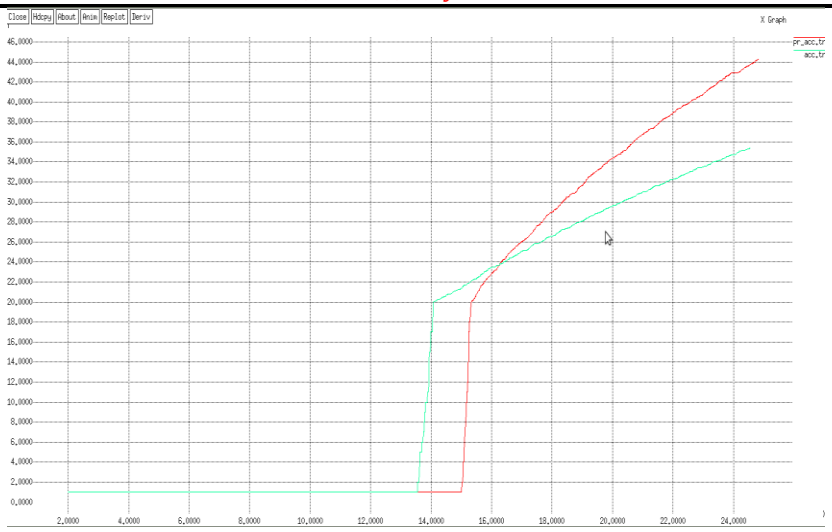

Fig. 4 Comparison of Accuracy between ICRDC and Modified ICRDC.

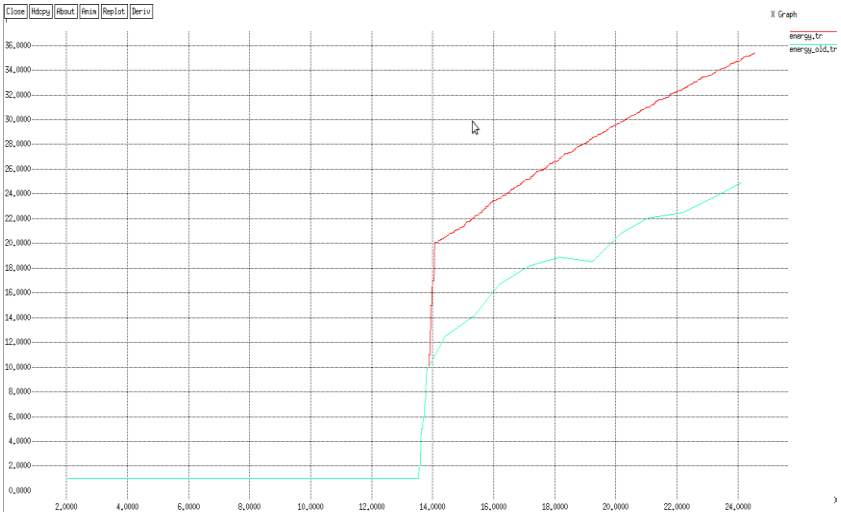

Fig. 5 Comparison of "Energy Saved" between ICRDC and Modified ICRDC.

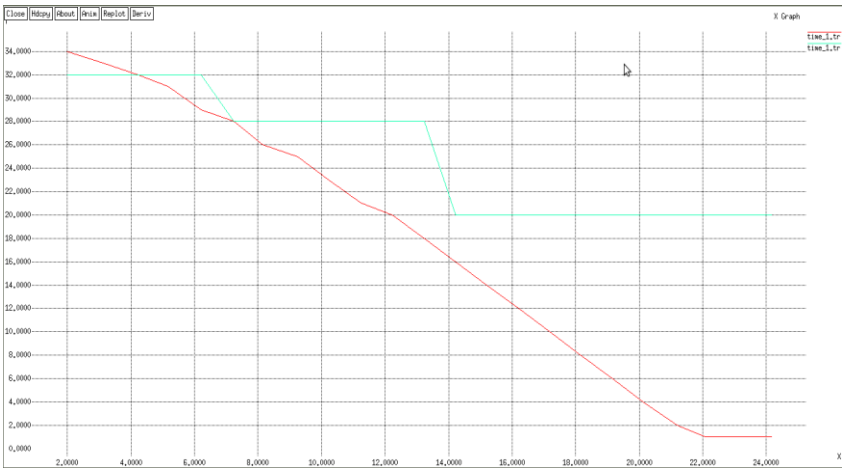

Fig. 6 : Comparison of "Latency reduced" between ICRDC and Modified ICRDC.

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VI. CONCLUSION

In this paper, the issue of redundant data in WSN and RFID coordinated network is thought about. Writing on WSNs and RFIDs has been evaluated completely. Bluetooth and ZigBee advancements can be chosen as the correspondence convention for WSNs to meet the necessities of vast number of sensor hubs, wide territories, and minimal effort. Redundant Data transmission causes exercise in futility, vitality and other network assets. Redundant data filtering can be effectively performed by the proposed calculation making the coordinated network proficient.

REFERENCES

[1] **Li Wang, Li Da Xu, "Data Cleaning for RFID and WSN Integration",** ***IEEE Transaction On Industrial Informatics*****, Vol. 10, No. 1, February 2014.**

[2] **J. Cho, Y. Shim, T. Kwon, and Y. Choi, "SARIF: A novel framework for integrating wireless sensor and RFID network",** ***IEEE Wireless Communications,*** **December 2007.**

[3] **Al-Turjman, Al-Fagih1 and Hassanein, "A Novel Cost-Effective Architecture and Deployment Strategy for Integrated RFID and WSN System",*International Conference on Computing, Networking and Communication,* Network Architecture P2P Protocol Symposium, 2012.**

[4] **Liu, Bolic, Nayak and Stojmenovic, " Taxonomy and Challenges of the Integration of RFID and Wireless Sensor Network ", IEEE ,Vol.22, No.6, pp.26-35, November-December 2008.**

[5] **Ashwini W. Nagpurkar, Siddhant K. Jaiswal, " An Overview of WSN and RFID Network Integration",** ***IEEE Sponsored Second International Conference On Electronics And Communication Systems(Icecs 2015).***

[6] **Bashir, Lim, Hussain and Park, "Energy Efficient In-network RFID Data Filtering Scheme in Wireless Sensor Network",** ***Sensors 2011*****, 11, 7004-7021; doi:10.3390/110707004.**

[7] **Kochar and Chhillar, "An Effective Data Warehousing System for RFID Using Novel Data Cleaning, Data Transformation and Loading Techniques",*The International Arab Journal of Information Technology,* Vol. 9, May 2012.**

[8] **hawn R. Jeffery, Minos Garofalakis and Michael J. Franklin, "Adaptive Cleaning for RFID Data Stream",** ***in Proc VLDB*****, Seoul, Korea, 2006, pp. 163174.**

[9] **Jeffrey, Alonso, Franklin, Hong, and Widom, "A pipelined frame-work for on line cleaning of sensor data stream",** ***in Proc.*** **IEEE Comput. Soc. Atlanta, 2006, pp. 140142.**

[10] **C. Zhang and Y. Fan, "Complex event processing in enterprise information system based on RFID",** ***Enterprise Inf. Syst.*****, vol. 1, no. 1, pp. 223, 2007.**

[11] **Lopez, Kim,Canepa,Koumad, "Integrating wireless sensor and RFID tags into energy-efficient and dynamic context network",** ***Computer J.*****, vol. 52, no. 2, 2009.**

[12] **Kaur, Sandhu, Mohan, "RFID Technology Principles, Advantages, Limitations Its Applications",*International Journal of Computer and Electrical Engineering,* Vol.3, February, 2011.**

[13] M. Ramanathan, M. Koyuturk, C. Hoffmann, A. Grama, Carbunar, "Redundant reader elimination in RFID system", ***Sensor Ad Hoc Commun. Networks*****, pp. 176–184, 2005.**

[14] Nokonoko, Lusilao-Zodi, Bagula, Dlodlo, "An Energy-Efficient Routing Protocol for Hybrid-RFID Sensor Network", *IEEE Africon 2011 - The Fall Resort and Conference Centre, Livingstone, Zambia,* 13 - 15 September 2011.