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Smart Sensing System

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Abstract: Sincethebeginningoftimehumanactivityhasbeendependentuponthemovementofpeopleandmerchandise.Theyrepresentasocietalinvestmentastheamount,thedurationandimmobilityofthecapitalneededforroads,railtracksharbour'scanalsairportstunnelsetcissimplygreaterthanaverage.Keepingthesethingsinconsiderationproposedsystemislesswithmultiplemethodologieswhichcanbeusedintrafficcontrolsystem.Itisimporttanttoknowtheroadtrafficdensityrealtimeespeciallyinmegacitiesforsignalcontrolandeffectivetrafficmanagement.Inrecentyears,videomonitoringandsurveillancesystemshavebeenwidelyusedintrafficmanagement.UIDisinterfacedwiththesensors(XBEE),microcontrollerandapp.Sensorsprovideinputstoamicrocontrollerwhicharethencomparedwithpredetermineduserrequiredtopayments**.**

Keywords: Wireless Sensing Network(WSN), Zig Bee(XBee),UID.

I. INTRODUCTION

We have developed a product by using Wireless sensor networking technology (WSN) that provides a solution of E-Toll System and some other problem on transportation as well as tackling drawbacks of current technology (Fast Tag system) as well as some other (universal) problem statements transport system problems also, which are E-Toll System, application to locate skilled laborers for highway construction works, digital solution to document, analyses and manage the effect of tourism on local biodiversity and wildlife in protected areas and tourist spots, developing a real-time and automatic early warning system for forest fire, prototype/application for controlling wireless connectivity inside the premise and more those we are facing in day to day life in transports.

II. TECHNOLOGY

A wireless sensor network (WSN) is a wireless network consisting of spatially distributed autonomous devices using sensors to monitor physical or environmental conditions. A WSN system incorporates a gateway that provides wireless connectivity back to the wired world and distributed nodes (see Figure 1). The wireless protocol you select depends on your application requirements. Some of the available standards include 2.4 GHz radios based on either IEEE 802.15.4 or IEEE 802.11 (Wi-Fi) standards or proprietary radios, which are usually 900 MHz Wireless Sensor Network WSN nodes are typically organized in one of three types of network topologies.

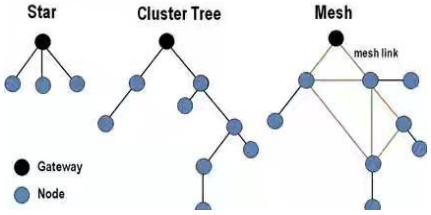

Fig 1: Different types of networks

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. [1] In a star topology, each node connects directly to a gateway. In a cluster tree network, each node connects to a node higher in the tree and then to the gateway, and data is routed from the lowest node on the tree to the gateway. Finally, to offer increased reliability, mesh networks feature nodes that can connect to multiple nodes in the system and pass data through the most reliable path available. This mesh link is often referred to as a router.

III. ARCHITECTURE

Wireless Sensor Network Architecture consists of several low powered devices named sensor nodes called motes.They cover numerous spatially distributed, little, battery-powered [2],embedded devices that are connected in a manner so as to collect and transfer data to the operators after it is processed. Computer devices that work jointly to form the networks are known as nodes. A multi-functional, energy efficient wireless device is a sensor node. [3] Motes are having a widespread industrial application. A set of sensor nodes gather data from the surroundings to achieve specific application objectives. Using transceivers, the communication between motes can be possible with each other. It consists of 5 layers and 3 cross layers. Mostly in sensor network technology, we need 5 layers, application, transport, n/w, data link & physical layer and then the 3 cross planes that are needed are namely power management [4], mobility management & task management. These layers of the WSN architecture are used to achieve the n/w and to increase the efficiency of the given network system.

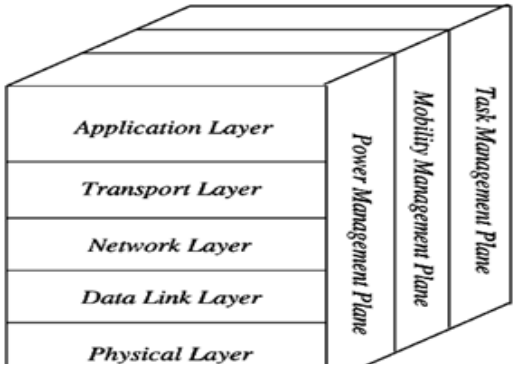

Fig 2: Architecture

IV. WORKING OF E – TOLL SYSTEM

Regarding the E-Toll system, the car will have a receiver which will process notification do some task. This receiver will catch the signals transmitted from the toll plaza nearby, once it is in the transmitters field of radius (500 M). Once that is done the driver of the car will receive a notification at his end regarding the incoming toll plaza [5], to do a payment for it in order to pass through. The payment of the toll fees may be done on the go while en-route towards the toll or even before that, via the website or app, designed. Each car will be recognized by a unique id (analogous to something like an Aadhar card for vehicles). By the time the car is about to pass through the toll, the system has already recognized the car and is verifying the payment of the toll fees. If payment is verified then the car may pass through seamlessly without interruption, otherwise, the toll wouldn't let the car pass through, and the car will have to halt at the plaza to clear the payment. [6] At this point the user will have to use a post-paid method of payment that will be billed to the user (say on a basis of monthly billing). With such a platform, the user can pay all charges and penalties to traffic policies (ex, for no parking, speed limit, signal jump, etc.). It is basically a smart device for vehicles to pay (digitally) various fees and for notifications to the driver. Payment methods include the use of BHIM app, for safe and reliable payment. One of the peculiarities of this system is, it works flawlessly on any network conditions, be it on 2G or better or even offline, the system is up and running all time. [7]

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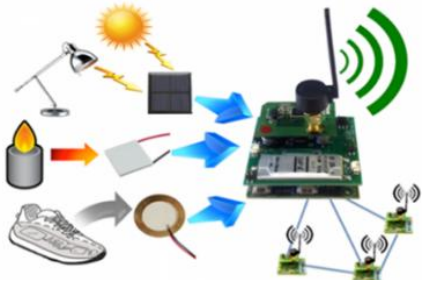

Fig 3: WSN

V. TACKLING DRAWBACKS OF CURRENT TECHNOLOGY (FAST TAG TECHNOLOGY)

Fast tag used only for toll but supporting DIGITAL INDIA using E-TOLL system we can pay different location. Installation charge more but E-toll system installation charge RS-5000 (user RS-30 to RS-600). [8] A registered fast-Tag user will not apply to all toll roads. Whereas our E-toll idea will work on every toll roads where sensors are installed. Pre-Paid Accounts and post-paid both option available. In fast-tag system required speed limits but in E-Toll system, not more. The position of a tag is fixed because of this many time problem come in e toll system is not possible. E-TOLL use Offline and ONLINE (2G) networks. [9]

VI. PROTOTYPE

By using Wireless sensor networking technology (WSN) we have made an S-Trans device that communicates with transmitter (Tx) and receiver (Rx) to exchange information with a user and main server [10]. Transmitter (UID like a car AADHAR CARD it stores all data with link payment bank (BHIM app). There are two types of transmitter one for E-toll system and second for other application (ex. DIVYAANG, no parking, speed limit, signal jump, the effect of tourism on local biodiversity, wildlife in protected areas and tourist spots, highway construction works, etc.)Roll of the transmitter over here is to send notification and data to the user by using the receiver at end of the receiver controller decode the data and give the output [11]. This notification are different types of notification for example receiver received code D00 (binary code) controller and give output is: "DIVYAANG present in your nearby (20M) please drive slow" etc.). For establishing a two-way communication between the toll and the vehicle and some other system (traffic, speed limits, speed breaker etc.) alerts and notification sounds. [12]

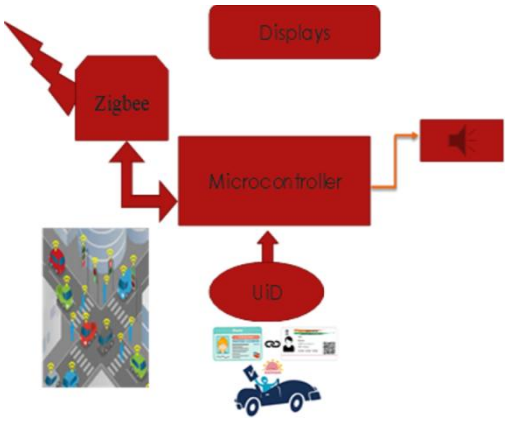

Fig 4: Block Diagram for Transmitter (Tx)

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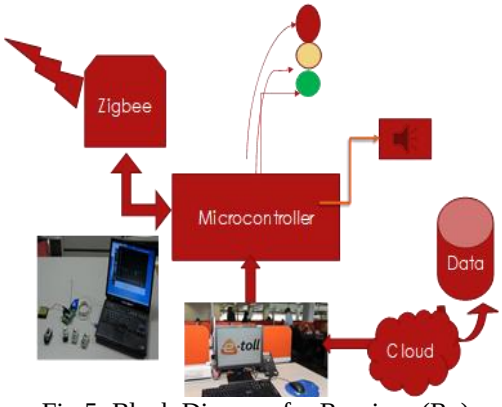

Fig 5: Block Diagram for Receiver (Rx)

VII. METHODOLOGY

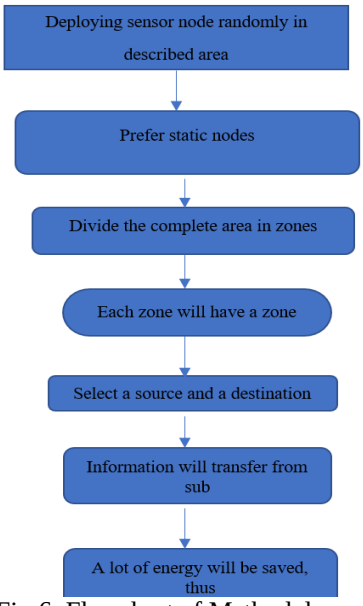

Fig 6: Flowchart of Methodology

In present work, firstly sensor nodes should be deployed in such a way that they cover the complete area. We prefer static nodes. Then divide the complete area into the zones. Each zone will have a zone header. Zone headers should be at a convenient distance from each sub nodes[13]. Then we will select a source and a destination. Information will transfer from sub nodes to headers and then from headers to headers, finally to the destination. A lot of energy will be saved, thus increasing network's lifetime. [14]

VIII. CHARACTERISTICS OF THE SMART SENSING SYSTEM

The consumption of Power limits for nodes with batteries. With node failures, it has the capacity to handle the situation. Some mobility of nodes and Heterogeneity of nodes. Scalability to the large scale of distribution. Capability to ensure strict environmental conditions. Simple to use &Cross-layer design. [15]

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Advantages of S – Trans System: Network arrangements can be carried out without immovable infrastructure. Apt for the non-reachable places like mountains, over the sea, rural areas and deep forests. Flexibleif there is a casual situation when an additional workstation is required. Execution pricing is inexpensive[16]. Plenty of wiring is reduced to a certain extent. Accommodations for the new devices at any time are easily provided. It can be opened by using a centralized monitoring. E-troll system avoids time delay which is a major dilemma for the public. Traffic congestion near toll collection centres gets reduced which avoids the wastage of fuel and time. Accidents are avoided by the e-troll system. It will settle the anti-toll collection protest. Enable collection of toll payments electrically allowing for near-nonstop toll collection. The main advantage of e toll system is that it monitors the traffic which will save the people time, fuel and also avoid accidents to a certain extent. [17]

IX. APPLICATIONS OF S – TRANS SYSTEM

Developing early warning system for forest fire:The forest fire affects the climate hazardously, increases the air pollution and disturb the entire ecosystem. It is very difficult to control forest fire situation after fire explores few kilometres. So, it is important to prevent the fire as soon as the burning starts, or symptoms of forest fire are indicated [18]. As explained for the S-Trans system, the wireless sensors can be effectively used for the forest fire control. Wireless Sensor networks efficiently work for the non-reachable places like mountains and deep forests with less installation cost. Ground-based, and remotely sensed data is used to prepare early warning system. Forest weather is calculated, or the data is taken from the respected weather forecast systems [19]. The If the fair catches, the current location is navigated through GPS (Global Positioning System). After sensing the fire, all information gathered from the mentioned resources is immediately given to the SimulatorCORE(CommonOpenResearch Emulator). A CORE is a tool developed to support mobile data/computer-based network research project. Fire spread predictions are also mentioned, and the alert is given to all nearby systems. [20]

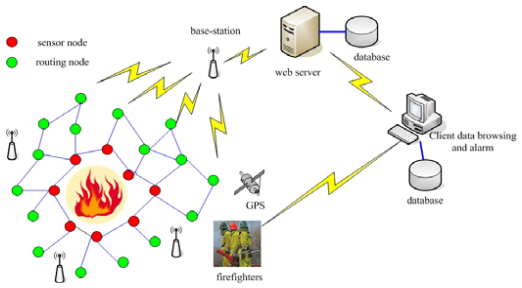

Fig 7: warning system for forest

Car Services: With the help of WSN technology, low-cost sensors can be used at each parking block in the passage. These sensors can capture the images of the car field and can send the data to the transportation system. This system can be operated through the mobile to manage various functions like finding an empty slot, managing parking toll, etc. Another use of WSN regarding car is whenever there is any problem with the car, it will give notification to the user about it and give him options for car maintenance shops. Now the user will select the shop and the car will be taken to the car service centre and it will provide necessary service. [21]

Biomedical: Monitoring is vital for biomedical application. Since WSN can work with a large amount of data it can be used to generate high quality of service. S-Trans system sensors node, with the capability to interface multiplesensors at the same time and to harvest energy from the surrounding ambient creates numerous new possibilities inpatient and equipment monitoring. [22]

Our technology can be used in biomedical applications for patient monitoring and event detection, surgical control, equipment control systems certain plus of using WSN technology for biomedical applications includes patient independence while constantly being monitored, long-term checks.

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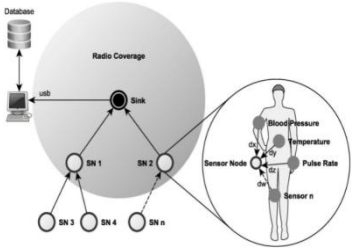

Fig 9: Biomedical application of WSN

Energy Industry:In energy industry (as renewable energy plant, refinery, pipeline distribution, electricity generation), WSN technology can be used to measure and monitor physical processes as vibration, strain [23], temperature, displacement, pressure, liquid flow or other application specific physics phenomena.

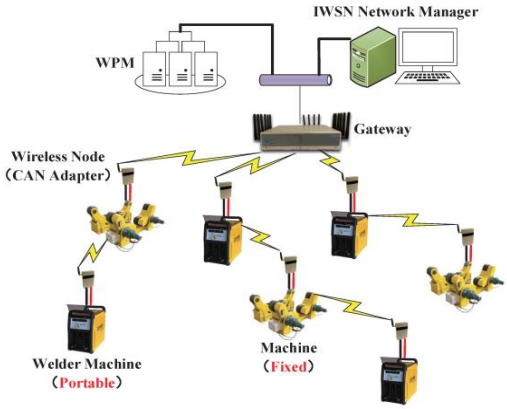

Fig 10: Energy Industry

Transportation:S-Trans WSN system platform can be used in transportation applications to capture real-time data, which may consist in mechanical stresses for bearing structures,temperaturetrends,vibrations or other physicalinformation related to the vehicle. Information data concerning the transportation vehicle can be used for purposes of structural health and usage monitoring systems, monitoring of rotating parts, freight conditions [24], information system about the roads or the railway. Among the many benefits of using WSN technology in transportation application, we should point-up the possibilitiesofreal-time monitoring, which enable predictive maintenance and enhanced vehicle safety.

X. RESULTS

So as stated above, our system consists of hardware components and software components. AS for the hardware components, the figure below depicts the transmitter circuit as well as the receiver circuit. These circuits have been implemented on PCB boards and the required components have been soldered onto it.

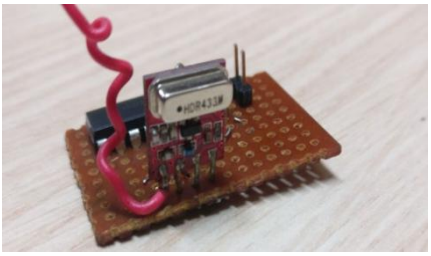

Fig 11: Transmitter

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When the transmitter comes within range of the receiver, the receiver detects it. The microcontroller connected to the PC in conjunction with a data acquisition software (acquires data from the receiver) throws data into a spreadsheet. Such a spreadsheet has been shown below.

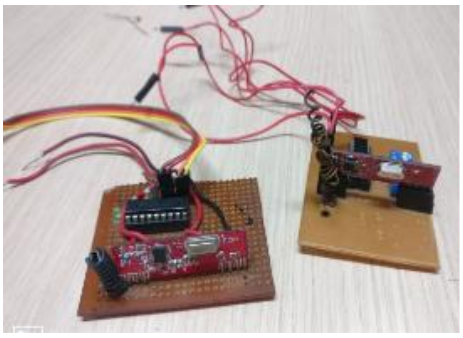

Fig 12: Receiver

The image below, shows a spreadsheet generated by the system when used as a smart e-toll system. Initial column logs time, next in shows the UID of the vehicle and then a link to proceed with the payment of the toll fees. So, in general, the first column, date and time will be logged. Next column shall denote the UID for a particular transmitter (purpose) and the following column will provide a link for further processing of information by user or for further communication.

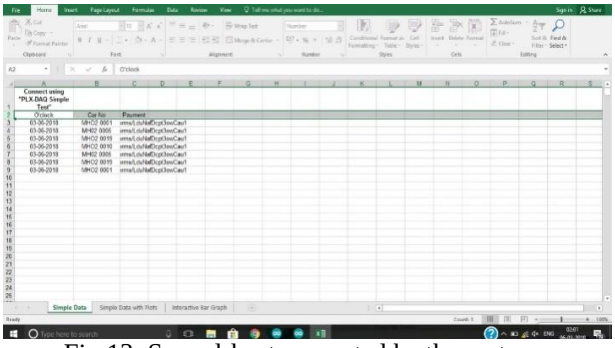

Fig 13: Spreadsheet generated by the system

The system also adjunct with an app. The when opened up has a login/signup page. Then the details of the car owner are flashed which shows information like chassis number and insurance expiry and PUC expiry and other basic vehicle details. The app gives you a notification when your vehicle insurance and PUC is about to expire. The app also provides services for the users to take new vehicle insurances and also allows them to renew it.

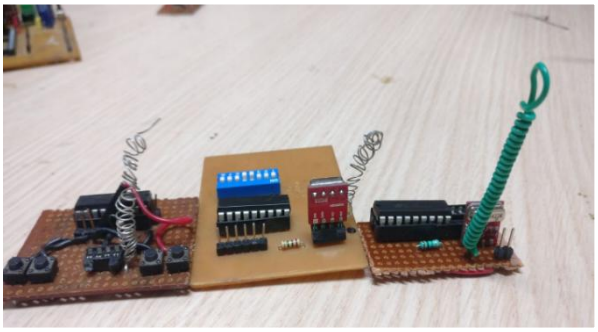

Fig 14: Entire system

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CONCLUSION

There are excess of possibilities to be gouged upon in this field of technology. If this technology becomes justifiably marketed, then every vehicle can communicate with each other through Wireless sensor networking technology (WSN) just like human being communicate. By the virtue of this, we can revolutionize to a greener, cleaner, safer and a bright future. The concept of Wireless sensor networking technology (WSN) is becoming a centre of attraction because it offers a genuine and efficient way to solve the various problems. This concept assures to solve issues such as traffic controls, e-toll system, automated car service etc. It is upcoming and on growing technology acting as a component for various other developing and already invented technologies. Hence the future applications can be predicated and extended to different platforms and various walks of human life.

REFERENCES

[1]. Raymond Mulligan and Habib M.Ammari, "Coverage in Wireless Sensor Networks: A Survey", Macrothink Institute, ISSN 1943-3581, Vol.2, No.2, 2010.
[2]. V.Blessy Johanal Selvarasi and A. Aruna Devi, "Sensor Deployment and Scheduling using Optimization", International Journal of Science Technology & Engineering (IJSTE), Volume 2, Issue 10, April 2016.
[3]. Wei Shen and Qishi Wu, "Exploring Redundancy in Sensor Deployment to Maximize Network Lifetime and Coverage," 8th Annual IEEE Communications Society Conference on Sensor, Mesh and Ad-hoc Communication and Networks, 2011.
[4]. Bai, S. Kumar, D. Xuan, Z. Yun, and T. H. Lai, "Deploying wireless sensors to achieve both coverage and connectivity," in Proc. 7th ACM Int. Symp. Mobile Ad-hoc Netw. Comput., 2006, pp. 131– 142
[5]. Akyildiz, I.F., Su, W., Sankarasubramaniam, y., Cyirci, E., Wireless sensor networks: a survey.
[6]. Mauri, K., Hännikäinen, M., Hämäläinen, T., A survey of application distribution in wireless sensor networks. EURASIP Journal on Wireless Communications and Networking, vol. 2005: p. 774-788, 2005.
[7]. Kazi , R., A Survey on Sensor Network. JCIT, vol.1, issue 1. 2010
[8]. Buratti, C., Dardari, D., Verdone, R., and Conti, A., An Overview of Wireless Sensor Networks Technology and Evolution. Sensors, vol, 9: p., 6869-6896, 2009
[9]. Lucchi, M.; Giorgetti, A.; Chiani, M. Cooperative Diversity in Wireless Sensor Networks. In
[10]. Proceedings of WPMC'05, Aalborg, Denmark, 2005, pp. 1738–1742.
[11]. Toriumi, S.; Sei, Y.; Shinichi, H. Energy-efficient Event Detection in 3DWireless Sensor Networks.In Proceedings of IEEE IFIP Wireless Days, Dubai, United Arab Emirates, 2008.
[12]. Lee, D.-S.; Lee, Y.-D.; Chung,W.-Y.; Myllyla, R. Vital sign monitoring system with life emergencyevent detection using wireless sensor network. In Proceedings of IEEE Conference on Sensors,Daegu, Korea, 2006.
[13]. Quek, T.; Dardari, D.;Win, M.Z. Energy efficiency of dense wireless sensor networks: To cooperate or not to cooperate. IEEE J. Select. Areas Commun. 2007, 25, 459–470.
[14]. Sohrabi, K.; Gao, J.; Ailawadhi, V.; Pottie, G. Protocols for self-organization of a wireless sensor network. IEEE Personal Commun. 2000, 7, 16–27.
[15]. Culler, D.; Estrin, D.; Srivastava, M. Overview of sensor networks. IEEE Comput. Mag. 2004,37, 41–49.
[16]. Chiasserini, C.; Nordio, A.; Viterbo, E. On Data Scquisition and Field Reconstruction in Wireless Sensor Networks. In Proceedings of Tyrrhenian Workshop on Digital Communications, Sorrento, Italy, 2005.
[17]. Dardari, D.; Conti, A.; Buratti, C.; Verdone, R. Mathematical evaluation of environmental
[18]. monitoring estimation error through energy-efficient wireless sensor networks. IEEE Trans. Mobile Comput. 2007, 6, 790–803.
[19]. Severi, S.; Liva, G.; Chiani, M.; Dardari, D. A New Low-complexity User Tracking Algorithm forWlan-Based Positioning Systems. In Proceedings of 16th IST Mobile and Wireless Communications Summit, Budapest, Hungary, 2007; pp. 1–5.
[20]. Verdone, R.; Fabbri, F.; Buratti, C. Area Throughput for Csma Based Wireless Sensor Networks. In Proceedings of IEEE Int. Symp. on Personal, Indoor and MoRadio Communications, PIMRC 2008, Cannes, France, 2008.
[21]. Fabbri, F.; Buratti, C.; Verdone, R.; Riihij¨arvi, J.; M¨ah¨onen, P. Area Throughput and EnergyConsumption for Clustered Wireless Sensor Networks. In Proceedings of IEEE WCNC 2009,Budapest, Hungary, 2009.
[22]. Buratti, C.; Verdone, R. Performance analysis of ieee 802.15.4 non-beacon enabled mode. IEEE Trans. Veh. Technol. 2009, 4096, 884–893.
[23]. Zhao, F.; Liu, J.; Guibas, L.; Reich, J. Collaborative signal and information processing: aninformation-directed approach. Proc. IEEE 2003, 91, 1199–1209.