

A Review on Designing of U-System Using Wireless Sensor Network and Android Device for Group Management

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Abstract

This paper introduces a group management system utilizing Wireless Sensor Network (WSN) and smart phone devices. The proposed framework was contained individual device in view of sensor node of WSN, advanced mobile phone device which is utilized by group manager and web server. The sensor node called as personal device which is held by gathering individuals sends an information data at 2 seconds to the manger device. The manger can check their gathering part's separation from him inside of a 30-m range and battery leftover amount on the manager device. Manager device sends its latitude and longitude information from Global Positioning System (GPS) and data of personal devices to web server Along these lines, other individual, for example, group member's parents can guarantee their kids' wellbeing and security through the web page. The (Received Signal Strength Indicator) RSSI esteem from sensor node was changed over into separation information by computed log-normal path loss model.

Keywords: android platform, group management system, log-normal path loss model, wireless sensor network, web server

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INTRODUCTION

As of late, the colossal needs of radio Frequency Identification (RFID) /Ubiquitous Sensor Network (USN) is being expanded in the field of service. Particularly, real time location system (RTLS) and location base service (LBS) are in the spotlight in the range of security and wellbeing. Kids been seized or been baited away by outsiders is consistently expanded in the insights of National Police Agency in Korea. For folks or watchmen, it is diligent work to fare thee well their kids when they went to handle trip.^[1] Additionally, the visit guide spent much time and gave careful consideration to security of voyagers. Around 3800 kids less than eight years old disappear every year in Korea, from among 92% of them

gave back their home. In any case, 8% of them never met again their guardians for finally.

In this manner, a framework which can secure them was required for parents and their guardians. Some comparative system, for example, kids discoverer utilizing Bluetooth innovation and gathering visit guide framework with RFIDs and Wireless Sensor Networks (WSNs) was realized in a few written works.^[1-5] What is more, a gathering administration application was likewise actualized on smart phone devices with global positioning system (GPS) information. Be that as it may, to understand these frameworks, numerous sensor nodes of WSN are required. Or more system is not suitable for kids or

impaired individuals who can't utilize smart phone or Personal Digital Assistants (PDA) devices well. Along these lines, in this paper, the gathering administration framework utilizing WSNs and smart mobile phone device is proposed for parents, guardian and tour guide for avoid missing their youngsters and effectively oversee vacationers.

The individual device sends data packet including their identification (ID), received signal strength indicator (RSSI), battery status and crisis data to manager device at regular intervals.

The manager device gets the information packet, showcases state of every individual who has individual device and advises when the individual is a long way from manager, or in the crisis circumstance.

The manager device transmits above data containing GPS information to the web server. Parents can check area of their children and guardian. Keeping in mind the end goal to guarantee adaptable exercises of kids and visitors, the network of the system was arranged with multi-hop system. Low-control calculation was actualized in the individual device to broaden their battery life time.

In the remaining of this paper is organized as follows. In second section, architecture and design of the group management system is spoken to in details. Third section pronounces experimental results in field test with numerous personal devices and some concluding remarks.

The projected group management system architecture is appeared in Figure 1. The framework on a very basic level included manager device in view of WSN, individual device on the android stage and web server utilizing Personal Hypertext Preprocessor (PHP) and the Apache.

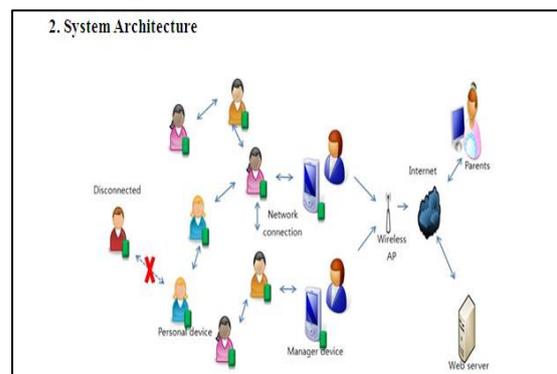


Fig. 1. System Architecture.

The gathering pioneer conveyed the supervisor de bad habit, and the individual gadget which was held by kids or sightseers communicates information signals with multi-bounce arrange at set circumstances. The site page on the web server depicted area of gathering pioneer and how youngsters a long way from the administrator. Our primary point with the framework is to offer after administrations: (i) advising director when every part leaves the gathering, (ii) educating chief that part has a crisis to avoid mischances on field trip, (iii) demonstrating status of kids to their folks in the page, (iv) utilizing less sensor hubs to understand the gathering administration framework.

Personal Device

The individual gadgets are executed by k-bit as appeared in Figure 2. The k-bit is a sensor hub of WSN in view of telos update b stage and backings tinyos 1.0 and 2.0. It operates in the 2.4 GHz frequency band and is realized by msp430f1611 micro-processor of Texas instrument(ti) which operates with 8 MHz clock frequency, IEEE 802.15.4 wireless radio chip cc2420 which provide 2.4 GHz band for wireless communication, and ceramic antenna to provide good data transmission in indoor environments. The epic core was implemented with the msp430 and cc2420 for the personal device. The PCB artwork for the device was described in Figure 3.

The multi-hop system between every sensor node was acknowledged by Minimum Cost Forwarding Algorithm. The calculation is a technique for a node in view of the most advanced connection through trading Beacon Message with encompassing nodes including Link Quality Indicator (LQI) data to discover parent's node.

Every node has diverse hub ID and base node is considered as node 0 as appeared in Figure 4. The nodes in Figure 4 begin instating with transmitting advertisement (ADV) signal to encompassing nodes. We make supposition that among two nodes which are situated in long separation to transmit with one-hop send ADV signal through multi-hop system.



Fig. 2. Personal Device.

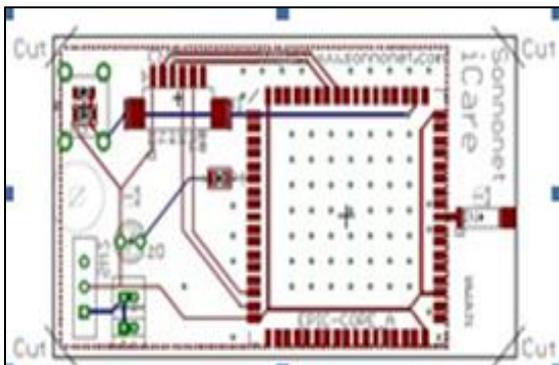


Fig. 3. PCB Artwork for Personal Device.

The ADV message directed to contiguous nodes from each node comprises RSSI and LQI information. The base node essentially has the lowest cost "0." Each

sensor node takes the lowest sum of the link cost and setup communication channel by

$$\text{Costparent} + \text{CostLink} = \text{Local ID Current Cost}$$

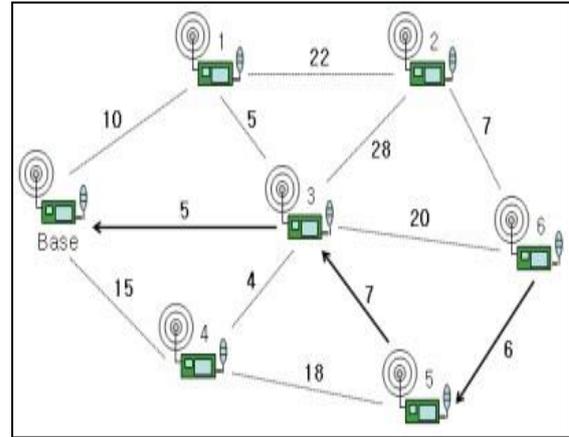


Fig. 4. Transmitting Data Using Minimum Cost Algorithm.

Likewise, for long lifetime of the individual device, low-power utilization calculation was connected to the outlined individual device.

The power utilization of certain operation of CC2420 which has a component of radio frequency (RF) correspondence is spoken to in Table 1. As appeared in Table 1, when the framework worked in Receiver X-tal (RX) or Transmitter X-tal (TX) mode, the biggest power was devoured by the CC2420. Accordingly, to lessen power utilization of the device, low-control calculation was acknowledged by flipping the RF module.

Table 1. Power Consumption of cc2420.

Operation	Power consumption (mW)
Active power (MCU active)	3
Sleep power (MCU sleep)	0.015
RX power (MCU-RF module active)	38
TX power (MCU-RF module active)	35

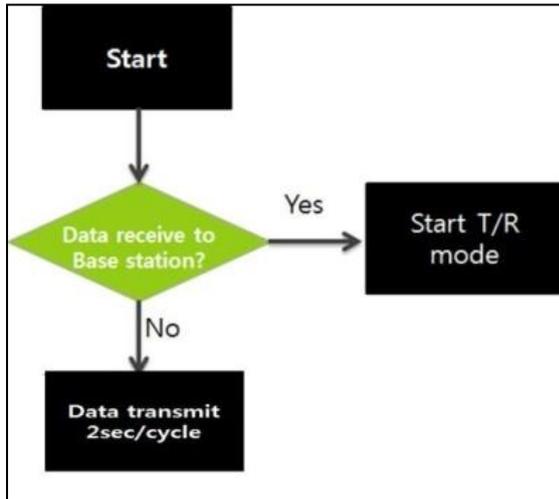


Fig. 5. A Flow Chart of Personal Device.

The personal device sends data packet to manager device in every 2 seconds when it does not receive data from the base station. If the base station connecting with manager device. Sends some data, the personal device operates in RX or TX mode for low-power consumption. Figure 5 describes a flow chart of personal device.

Manager Device

Subsequently wireless communication was obligatory for the manager device and the smart phone users are growing at a massive rate, smart phone grounded on android platform was engaged for the group manager in the system. Android platform is totally open source and free mobile platform.

Hence, the application developers and smart phone manufacturers do not have to pay for license. The software erection of android can be fragmented into four levels: the Application, the Application Framework, library and the android operation environment (Run Time), and operating arrangement as shown in Figure 6.^[6]

The android application program is a set of commission. The task led by the application is recognized as activity.

Comprising an activity and switching to other activities is possible in each screen. Through intent object, changing activity and transmitting specific value to next screen is available.^[7]

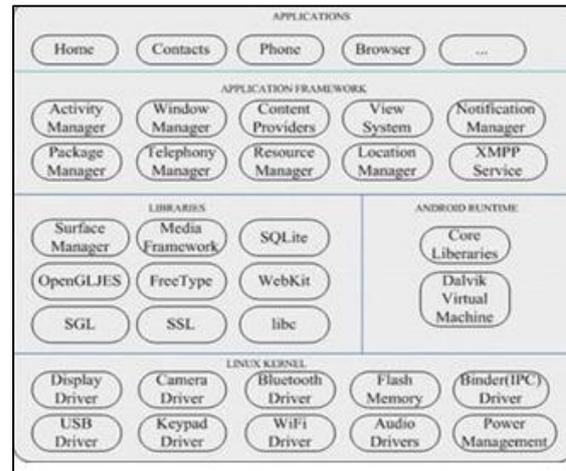


Fig. 6. Android System Structure.

The base node obtains status of for each sensor node with specific packet as displayed in Table 2. The ID of sensor node, the amount of packet from alternative sensor node, emergency condition and battery status in Table 2 is specified by Node ID, Sequence_Counter, Operation and Battery separately.

Table 2. Data Format.

Payload	Size (Byte)
Node ID	2
Sequence counter	2
Operation	2
Battery	2
RSSI	2

Basically, we can use serial port to communicate with the base node and an android device using Java Native Interface (JNI).

In any case, in this technique, the transmission speed between the base hub and android gadget is too moderate. In this manner, keeping in mind the end goal to associate with the supervisor gadget, encapsulated module with base hub and

Bluetooth was utilized as appeared as a part of Figure 7. The information bundle from sensor hub to base hub is transmitted through Bluetooth correspondence to the gadget of gathering pioneer.

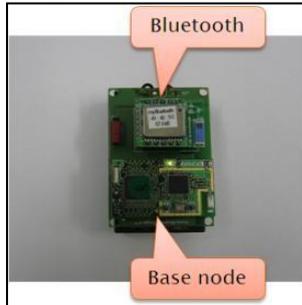


Fig. 7. Designed Module of Base Node and My Bluetooth-ex.

Web Server

A large portion of data of understudies is overseen by web server to demonstrate their folks. The web server in view of PHP and apache gets the data from android gadget and store to database (Figure 8). The data put away at database is

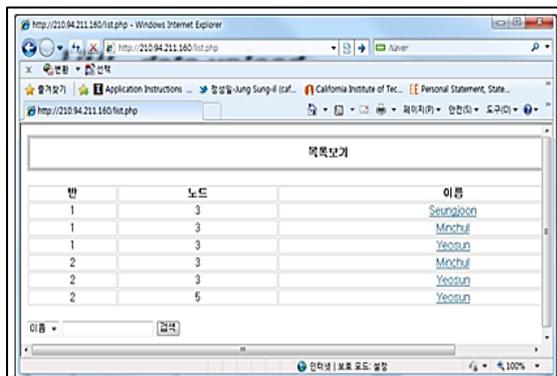


Figure8. Web page of the list of Class, Node ID, Student name

Fig. 8. Webpage of the List of Class, Node ID, Student Name.

At the point when certain name of rundown page is clicked by guardians or educators, the understudy’s data is shown as appeared in Figure 9. Their folks and instructors can check their kids circumstance and area through the page. The area of youngsters and their gatekeeper was introduced by tapping the blue catch on the page in Figure 9. Figure 10 demonstrates the area of the pioneer

with the Google outline Program Interface The web server gives Node ID and understudy name to the supervisor gadget which was inputted by gathering pioneer on website page to show the understudy list on the portable gear. The data of Node ID and understudy name was shaped of the Extensible Mark-up Language (XML) sort.

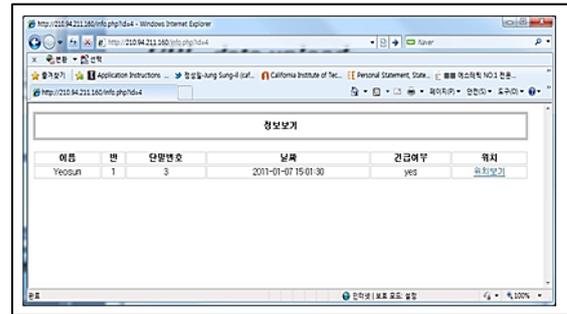


Fig. 9. Information Page of Students on Web Server.



Fig. 10. Location of the Leader With Google Map API.

Manager device (Figure 11) demonstrates the data as of planned module with base node and the Bluetooth. The group management application software was verified on both two smart phones grounded on window mobile and android platform as displayed in Figure 12. Figure 13 displays the process screen of android platform and window mobile device.

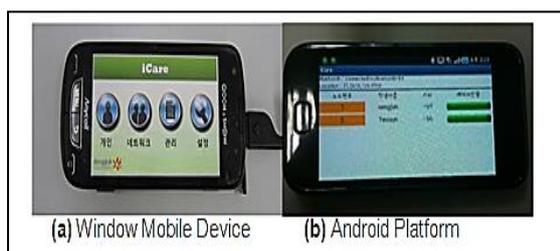


Fig. 11. Manager Device.

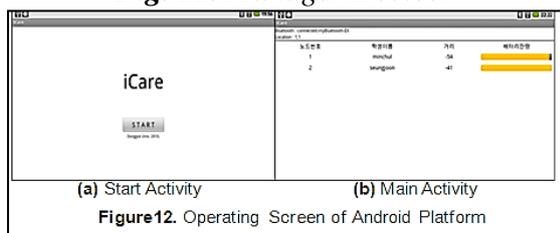


Figure 12. Operating Screen of Android Platform.

Fig. 12. Operating Screen of Android Platform.

The group manager info their group members name and Node ID which will be held by group member on the web server. This data changed over XML structure to transmit to manager device. Administrator device thinks about the Node ID from web server and base node, speaks to status of their students and illuminates when certain students has detached device with the manager.

CONCLUSION

In this paper, the gathering administration framework with WSNs and application on android stage is proposed. The anticipated framework was contained administrator gadget in view of advanced mobile phone gadget, individual gadget which is sensor hub for kids and gathering individuals and web server. The base hub and Bluetooth module was merged to specific module to relate with the trough gadget. The individual device sends data including its Node ID, RSSI esteem, and battery remaining amount and crisis circumstance to the manager device. The group pioneer can guarantee their understudy “s” distance from him with the information packet from individual device. The web server put away this data to show status of kids and manager with map and appear to

other individual, for example, group member’s parents. The computed log-ordinary way misfortune model was utilized to change over RSSI information to distance value.

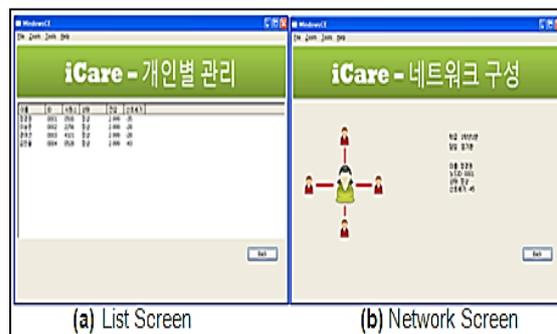


Fig. 13. Operating Screen of Window Mobile Device.

REFERENCES

1. Yusof A.M., Rusli M.E., Yusof Y. Kids Finder Through Bluetooth Technology, *International Conference on Digital Telecommunications (ICDT'06)*. 2006, 12p.
2. Chen P.Y., Chen W.T., Wu C.H. A group tour guide system with rfids and wireless sensor networks, *International conference on Information Processing in Sensor Networks*, 2007, 561–2p.
3. Liu T.-Y., Tan T.-H., Chu Y.-L. Outdoor natural science learning with an RFID-supported immersive ubiquitous learning environment”, *Educ Technol Soc*. 2009; 12(4): 161–75p.
4. Tsai C.-Y., Chou S.-y., Lin S.-W. Location-aware tour guide systems in museums, *Sci Res Essayas*. 2010; 5(8): 714–20p.
5. Yan R.-H., Yu C.-H., Tsai K.C. *Wireless Sensor network Based Smart*.
6. Community Security Service. *The 2nd Workshop on Wireless, Ad Hoc, and Sensor Networks*. 2006, 13p.
7. Yoo S., Chong K.P., Kim D. “S3: School zone safety system based on wireless sensor.