u-EMS : A Design and Implementation of Emergency Medical Service Based on Ubiquitous Sensor Network using the Bio-Sensor

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Abstract: In the paper we have suggested a design and implementation of a health care information system(called u-EMS) using a bio-sensor network technology that is a combination of the bio-sensor and the sensor network technology. In proposed system, we have used the following vital body sensor such as EKG sensor, the blood pressure sensor, the heart rate sensor, the pulse oximeter sensor and the glucose sensor. We have collected various vital sign data through the sensor network module and processed the data to implement a health care measurement system. Such measured data can be displayed by wireless terminal and the display.

Keywords: Bio-Sensor, Ubiquitous sensor network, Body sensor network, Bio-Sensor network, Health care information system.

I. INTRODUCTION

Existent carrying along medical equipment diagnostic system must be having massive mounting, There is problem that can't collect living body data of species all with living body data monitoring in stand-by status . U-Health care information system that propose in treatise that it sees that amalgamate bio-sensor technology and wireless sensor network technology by one technology to solve these problem. System that propose information perception that is species bar secession four all to sensor network technology base and monitoring was possible ordinary times, information that apply healthcare system and is patient's life vital sign EMS and medical institution storage and u-EMS database so that can utilize offer possible.

Information that is healthcare system vital sign that present in this treatise measured using EKG, blood pressure, heart rate, pulse oxmeter, glucose sensor, information that is vital sign transmits to long-distance gateway and stored to u-EMS database using node.

Can confirm or transmit to specification transfer terminal(portable phone, PDA) by is SMS message through portable phone in case there is something wrong in digital picture frame display unit(u-View) sorting each living body signal that is stored to u-EMS database, it is system that can confirm data that is stored in u-EMS database through web site. System that propose in this treatise can use in digital TV(PDP, LCD) that digital picture frame display device existence and wire, wireless network is possible, other display unit.

II. REFERENCE RESEARCH

1. Portable Medical Equipment

Portable medical equipment refers to device that check ordinary bodily something wrong every day as simple body monitoring device and confirm data directly. Medical equipment is used in case receive medical treatment service in place such as hospital and medical treatment institution, public health center. The public is very expensive equipment to buy, every day patient's ordinary times state discomfort which must observe state finding medical examination and treatment organ to do monitoring have.

2.Bio-Sensor

Human sense various kinds stimulation that have much sensory organs and comes from outside such as senses as well as pain or temperature perception. Such sensed stimulation recognizes delicate taste or intention change etc. comparing with whetstone fare that is educated by experience already in brain. Life element that can sense stimulation physical chemistry enemy who plan creature function and receive from outside applying astrionics is known as in the gross bio-sensor.

Bio-sensor technology point of care system development that can make quick diagnosis simply at high sensitivity grafting together nano technology because miniaturization, stubbornness communication, that low electrification is possible capacitate.

3.Ubiquitius sensor network

USN, that speak "that attach electron tag and detect awareness information of things to surrounding environmental information(temperature, humidity, pollution information, crack information etc.) to basis through this and connect this to network by real time and manage information to necessary everything (place)", give computing and communication function to all things ultimately and is anytime, anywhere, thing to offer service that anything communication wants in possible surrounding[1]. Therefore, main application field is expect to be developed by u-health care system. That is healthcare system that present in treatise that see because is judged and goes forward some more to use mainly early physical distribution and production management dimension but enter environment management and production control stage as is development.

III. u-EMS : Emergency rescue system

Because this system fixed bio-sensor in sensor network node with figure 1, define that is bio-node and bio-node is storing access information(user bio-node ID) for user division. Many bio-node information is consisted of device that transmit information by EMS database and u-View(Ubiquitous Viewer; Sensor network multimedia display unit) collecting in sensor network gateway. System is consisted of sensor node group by bio-sensor(bio-sensor ; blood pressure, gtroke, glycosuria, electromyogram, pulse oximeter, body temperature) for group and user body bital sign information collection at environment sensor for user surrounding information collection greatly, is consisted of ubiquitous sensor gateway(u-Sensor gateway) for data collection and processing and ubiquitous emergency medical treatment service database(u-EMS database) for auxiliary store from this group.

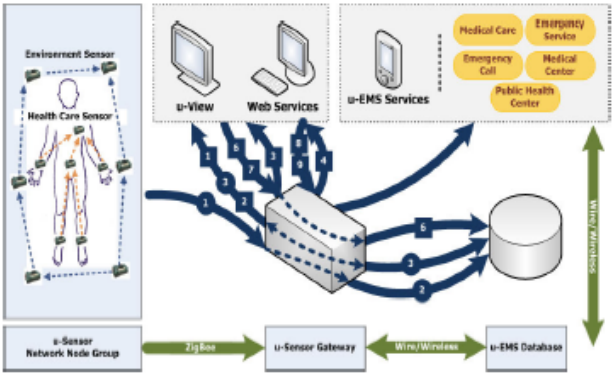

Fig.1. u-Emergency Medical Service

1. u-Sensor network data collection node

Importance factor that compose u-emergency rescue system service need nodes that collect various information of sensor network base. This node is consisted of greatly two group and first group is bio-node group which collect carious vital sign from user's body and second is environmental information node group for environmental information collection around user. 4 node of bio-node is attached to user 1 person like table 1.

Table 1. Bio-node collect information

	Bio-sensor / Contents
NODE1	blood pressure, pulse information collect
NODE2	Electrocardiogram information collect
NODE3	Blood oxygen information collect
NODE4	IR body temperature information collect

Therefore, each 4 node can use to one user group. That is, bio-node 1~4 is user A, bio-node 5~8 is user B this form used for user division user limited by bio-node 20 by 5 persons in this treatise. This user node division is used by ID to store vital sign information to u-EMS database, is utilized to information for automatic login sensing user in u-View. Because bio-node 1 (NODE1) divides by channel when transmit data from node by gateway inform that 3 sensor is attached in one node in table 1, channel 1 is blood pressure, channel 3 is pulsation, channel 5 is divided to glycosuria data. Environmental information node does not attach in user's body unlike bio-node group, and fix's in position that is specified. Environmental information node can do 4 premature senility divisions all being consisted of article 1of 2. Because each article is fixed in position that is specified to u-View, transmit user surrounding environmental information by u-sensor gateway.

2. u-Sensor gateway

With bio-node group which is sensor network data collection node group that is transmited from environmental information node group collect all data that is not sequential in u-sensor gateway store to u-EMS database, data of service that user wants so that can confirm information communicating stored contents with u-view by view act sensor network data collection node and u-EMS database, u-view's gateway role. Also, u-sensor gateway acts as multimedia gateway that is u-view's function act as web application server relay.

u-Sensor network node group in fig 1. check that is user login table 1 that is collected data after transmit by u-sensor gateway by ① of Zigbee(IEEE 802.15.4) wireless that user bio-sensor data and table 2 relationship environmental information node data are fig 1. transmited data is stored to u-EMS database by wire and wireless through ② stored data confirms transmited data using ③ by display unit or service device that user wants.

3. u-EMS database

u-sensor network node group collected data store all, basis data that write to u-view drawing data that user wants in u-sensor gateway is stored to u-EMS database. u-EMS database that is realization in this treatise was consisted of structure that is simple. Composed database schema is consisted of greatly 5 structure table. Consisted table distributed store sensor data information and these stored time, urgency contact information, web service inspection information, u-EMS service call information, collect at user NODE ID, name, time that is login etc.

4. u-View(display device)

To device that possess picture viewer facility with multimedia movie player that embody in treatise that attach LCD integrated u-health care information system display software. Through u-view confirm information that is confirmed user's vital sign such as body state check, body change confirmation by surrounding environment, today biorhythm check when and ubiquitous can confirm. U-view device and web access service, u-EMS service etc. belongs in u-View sphere, each service does u-sensor gateway and interface through u-view, embedded system so that user can confirm information o u-EMS database.

5. u-Healthcare information system interface

System that propose in this paper, user uses 4 bio-sensor by zigbee wireless communication approaching in u-sensor gateway u-sensor gateway, u-EMS database, u-View, web service, u-EMS service by wire or wireless communication bio-node and user ID in u-EMS database confirmation and data send-receive. User login and out use ①, ②, ④, ⑤, ⑧, ⑨ of figure 1, and new user creation uses ③, ⑥, ⑦. Can be serviced various information that use user who is logged in to u-healthcare information system is vital sign, surrounding environmental information u-sensor network node, can appreciate movie, still image, MP3 etc. by u-View multimedia service function.

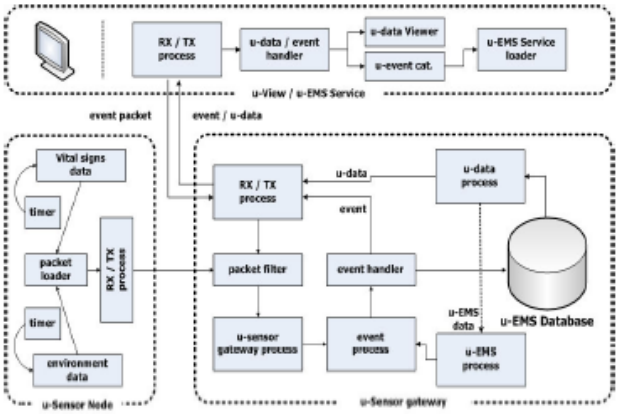

Fig.2. u-Emergency Medical Service Data Flow

Figure 2 is data flow chart that display process of figure 1 and u-data and event current of event handler. Timer event by scheduling of operating system(tinyos) at u-sensor node group's bio-sensor or environmental information data that event vital sign, communication process transmits into u-sensor gateway. At u-sensor gateway is data that is received from node packet filtering one node number, channel number, receiver group ID, hop count, data value, etc. interrupt u-sensor gateway process whether is u-View event packet or u-sensor node group's data.

Stored to u-EMS database u-sensor node group's data used u-data process, data to transmit to u-view is transmited by transmit process, data that u-EMS service is necessary searches relevant event at u-EMS process and transmits by event process. u-EMS service catalog by u-data process is same with table 2.

Table 2. u-EMS catalog

	Event service
EMS 1	Emergency call (number. 119)
EMS 2	Medical center (reservation)
EMS 3	Public Health Center
EMS 4	Medical Health Care
EMS 5	Family Call (SMS Message)
EMS 6	Environment Auto Control

u-sensor gateway transmission process is u-data can confirm in u-View display screen. Also, event data is u-event category according to contents u-EMS services calling use. U-EMS service uses in various field such as medical examination and treatment engine's medical treatment information service, medical treatment

clearinghouse database registration, public health center medical examination and treatment service, medical institution automation reservation service, 119 service.

IV. EFFECTIVENESS VERIFICATION

To experiment effectiveness of "u-emergency rescue system" that propose in this treatise, experiment information and surrounding environmental information that is user's vital sign whether u-EMS service event item is executed at service offer of user and user's emergency situation occurrence with figure 1, figure 2. Experiment because arrange environmental information node from specification space to experiment environment and attach bio-node of table 1 experimenter A and B, and u-EMS service composes surrounding to provide imagination service.

Approval which is login with figure 1 at request that is user login to u-view and service selection consist exactly, u-View user selection screen is to figure 3 at request that user A and B is login at the same time and can confirm packet data flow. After is user selection login, u-data and change of event are same with figure 4 with figure 2choosing healthcare service and environmental information service. u-EMS service event occurrence made situation operation bio-sensor, u-data packet and u-EMS service call information of table 2 are displayed with figure 6. Could confirm in display transmitting by storage and u-view to u-sensor network gateway at u-EMS database in effectiveness verification result u-sensor network node group's data. Can confirm normalcy that is operated of u-EMS service at emergency situation appearance.

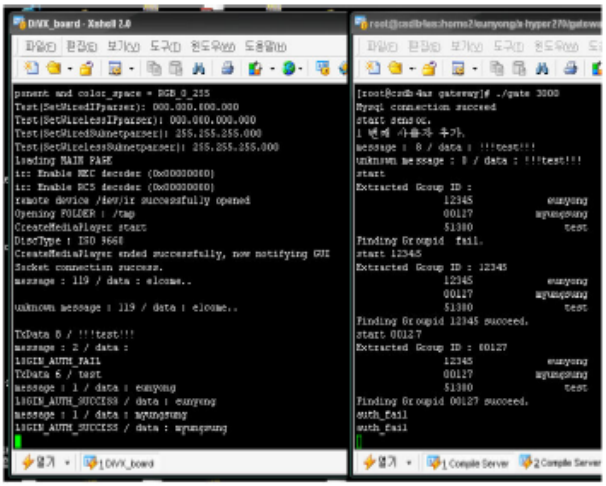

Fig.3. Multi user event

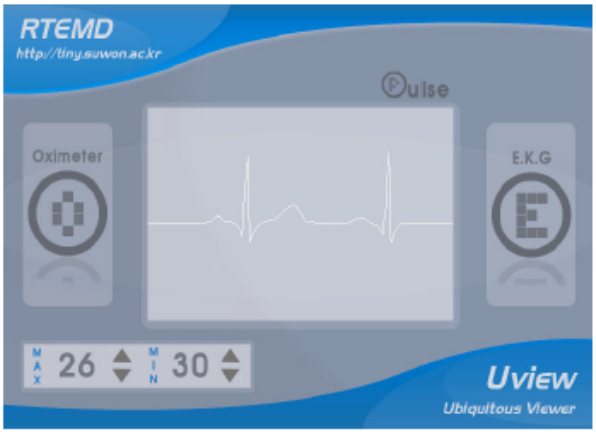

Fig 4. U-Data and graph of information

Fig 5. U-EMS service called(SMS)

V. CONCLUSION

In this paper ubiquitous sensor network technology that is wireless communication technology of received bio-sensor technology by one technology generation sensor technology and proposed u-emergency structure system that need most in present life. Collected data can confirm present body state directly comparing with data ordinary times and can send a letter information to registered family when degree is serious, These information can use several medical institutions and connect to data server in remote zone and watch change that is vital sign. Can use to valid information that can use own vital sign in medical institution storing measured data could do direction confirmation straightforwardly as result that verify effectiveness of system that propose.

Here after, as well as measurement target person can connect and measure multiplex Function that target person demand Location tracking system. Need improvements of much system to connect proposed system with string medical treatment system and first of

all low-cost of node, variety Bio-sensor development of species is pressing all.

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