



KPT
KEMENTERIAN PENGAJIAN TINGGI



PENYELIDIKAN MEMACU TRANSFORMASI

PROSIDING SEMINAR

HASIL PENYELIDIKAN

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Jilid III ICT dan Kejuruteraan

disunting oleh
**ABDUL GHAFAR ISMAIL
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Intelligent Health Monitoring System (IHMS) Using Wireless ZigBee Technology

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ABSTRACT

In real situation, doctors and health care workers need to move physically from one patient to another patient to perform their duty to check patient's health condition. This approach to monitor the patient's health condition continuously is not efficient. Intelligent Health Monitoring System by Using Wireless zigbee (IHMS) is an innovative system that developed to improve the quality of communication among patients, doctors, and other health care workers continuously in real time basis. The IHMS is the integration of wireless zigbee technology and health monitoring using PC/laptop. As PC/laptop has become an inseparable part of our life, thus it can integrate health monitoring more seamlessly to our daily life. The IHMS will identifies/ detects the abnormality of the patient and delivery the accurate medical information to the care centre (doctors and health care workers) instantly. Once the abnormality is detected on patient, then the IHMS will react appropriately to collect the patient health information through the sensors and send the alert to care centre and display it in PC/laptop. Furthermore, it is useful to alert the care centre when the patients are not be able to press the emergency call button due to their critical health condition. Thus, the IHMS is developed to enables the doctors and health care workers to monitor the real time health information of their patient and react immediately when abnormality is detected. The IHMS also save the collected patient health information in the database for future reference. The IHMS is helpful for fast emergency response which is crucial for critical case.

Keywords: Intelligent Health Monitoring System; ZigBee technology.

INTRODUCTION

An intelligent health monitoring system is crucial to monitor the patient health in real time basis. The abnormality of patient will be detected through wearable sensors which are placed on patient's body. The wearable sensors can be conveniently placed on patient's body without any difficulty. Once the abnormal condition is detected on patient, the information will be transmitted to nursing station though wireless zigbee technology. The information will be displayed on PC/ Laptop via Graphic User Interface (GUI). Thus, though the wireless zigbee technology, the patient and the nursing station which is placed few meters away can be connected continuously.

The physiological signals such as body temperature, heart rate, blood pressure and etc. can be obtained through the wearable sensors [7, 8, 9]. The PC will collect the physiological signals from zigbee receiver and will analysis it and display the abnormality at GUI together with patient's information such as room number and the patient's name. The working principle of wireless zigbee is based on 802.15.4 principle [6, 10]. The distance between zigbee transmitter and receiver is about 1000 meter is line of sight.

The goal of this project is to design an intelligent health monitoring system which is capable to provide real-time health information when abnormality is detected. The knowledge of wireless zigbee technology and wearable sensor is needed to design an efficient intelligent health monitoring system.

The benefits of this system are:

- Wired are not required to establish the communication between patient and nursing station.
- The systems are helpful for doctor and nurse to monitor the patient health condition continuously.

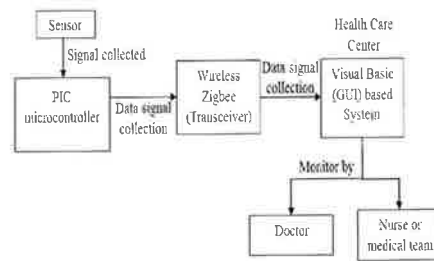


Figure 1: Project Block Diagram

CONVENTIONAL METHOD & PROBLEM STATEMENT

Over the decade, plenty of researches have been done on increasing the hospital performance such as enhancing the hospital facilities, enhancing the wireless body sensor network system, and enhancing the health monitoring system [1, 2, 3, 4]. However, the current process still requires the nurse or the doctor need to move physically from one person to another to perform their health checking. This approach may not be feasible to monitor the patient's health conditions continuously. Furthermore, the current approach also is not helpful to the heart patients who need the immediate help in case of emergency. Apart from that, any critical condition of patient cannot be found easily unless the nurse or doctor checks the person's health at that moment. Besides, the current approach on visiting the patient on time basis is not practical to detect the patient's health condition continuously. In certain situation, the patient is unable to press the emergency button due to their critical health condition. Therefore in this case the chance for the patients to survive is decrease.

Figure 2 shows the conventional method which is currently practicing in hospitals. The nurse will move physically from one patient to another to check their health condition. If any abnormal condition is detected by the nurse, then she will contact the doctor for further treatment, otherwise, if the health condition is normal, then the next visit to the patient will be after 4 hours. This method is not practical to monitor the patient's health condition continuously. A part from that, it is not connects the doctor and the patient continuously which might lead to serious consequences to the patient's health condition when abnormality is occurred.

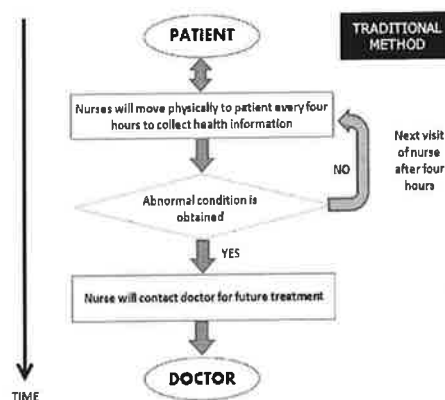


Figure 2: Conventional Method

IHMS METHOD

The IHMS is developed to connect the health care center (i.e. nurses and doctor) and patient continuously through wireless zigbee technology. The wearable sensors will be placed on patient's body to detect the abnormality. Once abnormality is detected, the IHMS system will send the alert to the health care center. The information which is transmitted from the patients will be stored and displayed through GUI at nursing station. The system also designed to send the (SMS) through GSM modem. This SMS will be received by the in charge doctor. Figure 3 shows the proposed IHMS method which is developed to monitor the patient's health in real time basis. The IHMS system is helpful to the emergency cases which is requires fast respond when abnormality is detected.

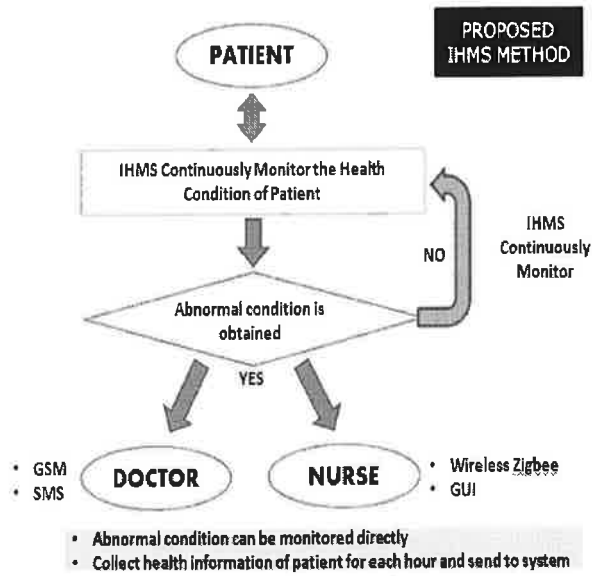


Figure 3: IHMS Method

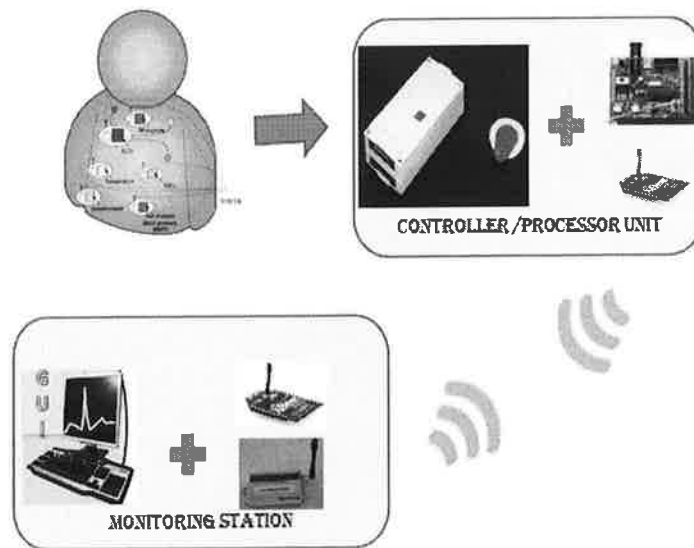


Figure 4: The IHMS with Wearable Sensor

Figure 4 shows that how physiological signal is detected from the patient's body through the wearable sensor. The Microcontroller will receive the abnormality signal and Xbee will be triggered to send signal from this controller / processor unit to the monitoring station. The monitoring system that receives the signal from controller unit will alert the nurse through GUI on the PC/Laptop. The IHMS also will send the SMS to the doctor.

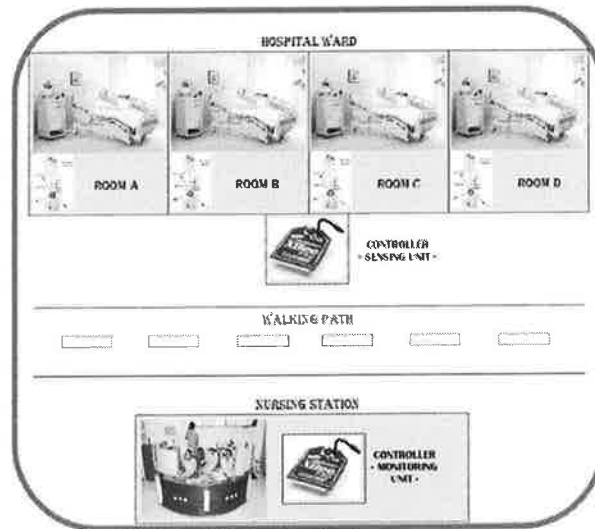


Figure 5: The Implementation of IHMS in Hospital

Figure 5 shows the implementation of IHMS in the hospital. The controller unit will be mounted at hospital ward and it will act as sensing unit. It will interface with wearable sensor to collect the physiological signal from patient. The controller unit also consists of Xbee module which is act as transmitter of the system. The system will detects the abnormality based on threshold values that set in controller. Once the abnormality is detected, then the system will trigger the Xbee module to transmit the collected data to receiver which is placed at nursing station. The controller of monitoring unit consists of Xbee module which is act as receiver. The controller unit will analyze the received data and display it on GUI as an alert notification at nursing station. Through this system, the patient and nursing station is connected between each other continuously.

Figure 6 shows the GUI layout of the IHMS. The nurse is required to select the Com Port and Baud Rate which be able to interface with the XBee device. The contact information of doctor will be selected by nurse according to doctor's schedule and based on working hour of the doctor. If the abnormality is detected by the system, then it will receive the analog data through XBee device. The received health information will be displayed on GUI for notification and display purpose. The example of alert which will be displayed on GUI is:-

"Temperature Albert at Room 1:40.7"

This alert shows that the temperature of Albert at room 1 is 40.7 degree Celsius and this patient need the immediate medication. The SMS alert also will be sent to doctor through the GSM modem which is interfaced with controller unit. The received data will be stored in database at monitoring station for future reference. The nurse also can view the patient information, the health information and previous health history through this GUI.

MONITORING UNIT

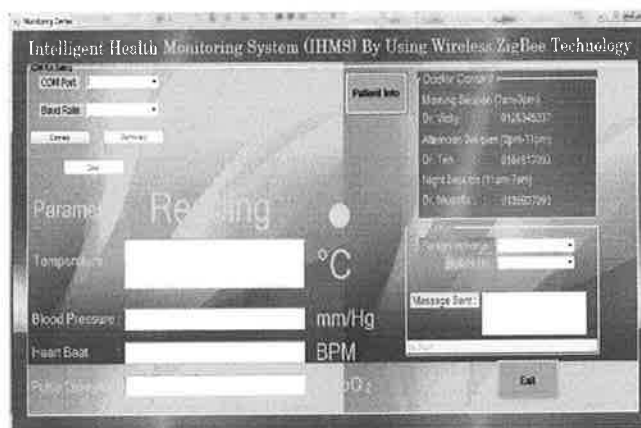


Figure 6: GUI at Monitoring Station

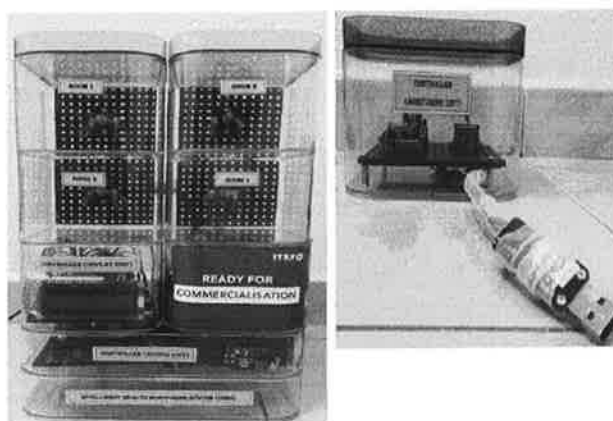


Figure 7: Working Prototype of IHMS

Figure 7 shows the working prototype of IHMS which already tested on its functionality by using temperature sensor, sensing and monitoring controllers, Xbee modules and GUI .

CONCLUSION

The IHMS is developed to enables the doctors and health care workers to monitor the real time health information of their patient and react immediately when abnormality is detected. Each data which is transmitted in real time basis is important to save the human life especially when emergency cases are concern. In addition, the IHMS also improves the quality of communication among patients, doctors, and other health care workers continuously in real time basis.

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NOTIFICATION OF PAPER ACCEPTANCE

Dear Mr. Vigneswara Rao S/O Gannapathy,

On behalf of the SHP-KPT 2012 Committee, we are pleased to inform you that your submitted full paper (SHPKPT2012-256) entitled "Intelligent Health Monitoring System (IHMS) by Using Wireless ZigBee Technology", has been **ACCEPTED** for the seminar. Congratulations!

Please inform us if there are any changes to the Presenter name.

As a reminder, the SEMINAR HASIL PENYELIDIKAN, KEMENTERIAN PENGAJIAN TINGGI will be held on 8 - 9 November 2012 at Akademi Kepimpinan Pengajian Tinggi (AKEPT) Lebu Enstek, Bandar Enstek, 71760 Negeri Sembilan. We look forward to seeing you at the conference.

Thank you very much for your contribution.

Secretariat SHP-KPT 2012

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