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Research Article

MONITORING OF LEUKEMIA PATIENTS AND THEIR BIOMEDICAL PARAMETERS USING EMBEDDED SYSTEM

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ABSTRACT

Health care plays an important role in monitoring the health condition of the patients. There are various technologies implemented in this sector for reliability in patient's health. The important aspect in developing this model is because of the special care to be taken for blood cancer patients and their dosing measures. In this paper, we design a Perception Drug Case for Leukemia patients and also propose a wireless stand-alone, embedded system design that helps in the detailed monitor of available three biomedical parameters into a single personal medical device. The three parameters are: heart rate, temperature and patient movement monitoring. The goal of this work is to build and design a good cost effective and very compact device that helps to monitor the patients even when they are in their day to day normal activities, and store these parameter readings in an embedded system-based portable device.

Keywords: AML, PIC 16F877A, DC Motor, IR sensor, GSM, PIR Sensor, Temperature Sensor, Heartbeat Sensor.

INTRODUCTION

Recently, the number of citizen who is affected by Leukemia disease has been due to Smoking. Since they have much risk for solitary death, their caretakers (e.g. their family) are concerned about their health. Especially the senior citizens of age from 45-50 will be exposed to this type of cancer. In general many of senior are recipients who take medicine regularly (e.g. twice a day). They sometimes in due the accidents caused by incorrect dosing such as "forgetting to dose" or "overdose" because of their cognitive deterioration. Since incorrect dosing decreases efficacy of medicines and may invite serious accidents¹.

Acute myeloid leukemia is a type of blood cancer. The patients who are having this type of cancer needs additional care in proper dosing of tablets in prescribed time given by the doctor. Especially adults from the age group of 40-55 will be exposed to this kind of cancer². The admonishing of them by their son or daughter is very difficult. For overcoming the practical concern faced we are going to design a Drug Case which gives an alert signal to the patient to take the tablet and also the inform the patient's guardian about incorrect dosing through an enhanced technology called as "Embedded System".



Figure 1: Perception Drug Case

In this paper we proposed a perception drug case for monitoring dosing condition of cancer patient. It is also recognizes how medicines are taken from its storage space by using sensors which are embedded in the medicine case. These dosing histories are accumulated in a GSM modem. Therefore, caretakers will check for the condition of the dosage and reminds the patient to take medicine³.

An infection may be particularly serious when your white blood cell count is low. Fever may be a sign of a dangerous infection. Fever is a side effect of some biologic therapies. So we need to monitor the body temperature of the cancer patient.

Many cancer patients receive chemotherapy as part of their treatment. Unfortunately, the majority of cancer patients on chemotherapy develop anemia. Anemia, if not treated, can cause heart failure, brain damage and testicular cancer. So we need to measure heart rate at regular interval of time for cancer patient⁴.

To monitoring the patient movement, we are using Passive infrared motion sensor. This sensor senses IR radiation from patient based on human movement.

SYSTEM CONFIGURATION

Since most of the serious accidents are caused by mistakes of dosing timing and dosing quantity, drug case system also needs to transfer the information about the dosing timing and dosing quantity to his/her caretakers because they usually reside at a distance. We think medicine case could recognize the quantity of medicines in its storage space by using IR sensor. And also, we use GSM modem as server for transferring the dosing condition.

Drug case System is composed of intelligent

Medicine case (iMec), IR Sensor and GSM modem. IMec is camera-embedded medicine case developed in our laboratory and confirms whether a recipient has picked up medicines from correct storage space by using internal camera. Ubiquitous Sensor (IR sensor) is inexpensive sensor embedded in the recipient's house and measures the recipient's position and the usage of electric appliances and house furniture. GSM modem accumulates the dosing condition of the recipient received from iMec and provides his/her caretakers with UART interfaces that contain the information necessary for dosing monitoring⁵.

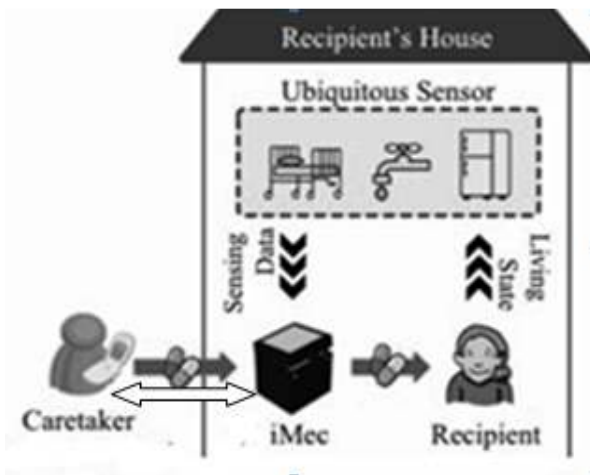


Figure 2: System Configurations

EXISTING SYSTEM

As existing work, drug case System can inform the caretakers about the dosing condition of the patient when they access to the Server via the Internet. The Server sends e-mail when the drug case machine detects signs of incorrect dosing. Therefore, care takers check the dosing condition and remind the patient to take medicine.

PROPOSED SYSTEM

At present there is no such perception drug case for leukemia patients. These patients required more attention since it is

blood related disease. The dosing of the tablets to the patients in prescribed time interval. So we don't have a drug case for admonishing the patient's health.

To overcome this kind of the cancer, a systematic treatment method to be followed by the patient by taking the tablets in prescribed time interval. This objective is achieved in this Perception Drug Case which even gives alert to the patient and also the guardian regarding the dosing information.

At regular interval of time, caretaker sends a message to GSM modem to open the medicine case. Medicine case opens with a bleep sound to alert the patient to take medicine. If the tablet is taken by patient, IR pair flow and GSM modem send a message to caretaker and the medicine case is closed automatically. If the tablet is not taken by patient, IR pair flow is cut and GSM send a message to caretaker and the medicine case is closed automatically⁶.

BLOCK DIAGRAM

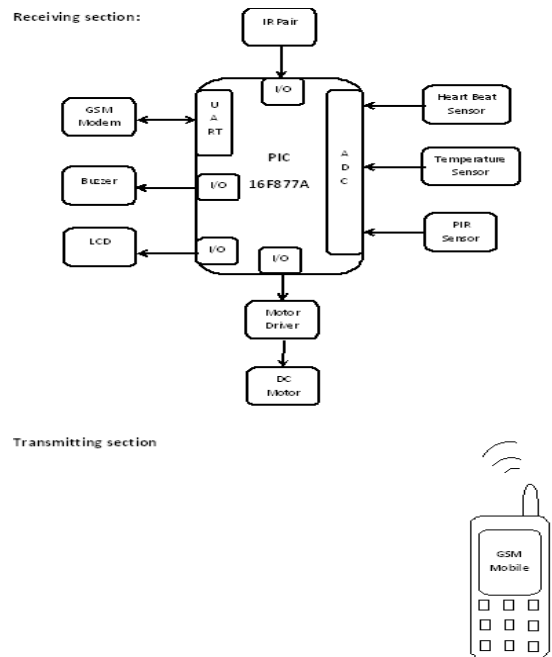


Figure 3: Block Diagram

BLOCK DIAGRAM DESCRIPTION

Interface the dc motor with PIC microcontroller of the medicine case for open and close operation of the medical case. The motor have separate motor driver circuit to operate for the instruction from the microcontroller. The RTC (Real Time Clock) is interfaced with the microcontroller for specific timing operations. This device is interfaced with the controller for real timing operations. .I2C (Inter-Integrated Circuit) generically referred to as "two-wire interface". It is used to interface the RTC with microcontroller.

A buzzer or beeper is used which gives sound. An infrared sensor is an electronic device that helps in emitting or detecting infrared radiation to sense aspects of its surroundings. A UART (Universal Asynchronous Receiver/Transmitter) is the microchip with programming that controls a computer's interface to its attached serial

SOFTWARE USED

A. EMBEDDED C

Embedded C is a set of language that is been most widely used in the field of embedded system. The main advantage of this language is writing a program is very very easy and efficient compared to all other languages. The program can be altered many number of times as per the user.

B. MPLAB

MPLAB Integrated Development Environment (IDE) is a comprehensive editor, project manager and design desktop for application development of embedded designs using Microchip PICmicro and dsPIC microcontroller. Finally combine all the programs which are written separately to a single module and execute it using an MPLAB Compiler

RESULTS

In our project, we divide the system into two sections – A Transmitter (GSM mobile User) and A Receiver (GSM Modem) for the medicine to open at regular interval for the cancer patient to take medicine and dosing information will be send as message to GSM Mobile User. We use EMBEDDED – C Program Coding for our PIC Microcontroller. We use MPLAB C Compiler software for implementation and execution of Program Coding. The power supply board has been designed in such a way that it converts incoming 230V AC supply to 5V or 12V or 24V DC supply for our use. The design of POWER SUPPLY and PIC circuit and component connections has been done using GENERAL PURPOSE BOARD.

Embedded C program coding has been implemented for the IR Sensors to detect the modules such as tablet taken or not from the medicine case. Also written Embedded C program coding for Heartbeat, Temperature and PIR Sensor. Heart rate is measured using heartbeat sensor and result is stored in LCD Modules. Temperature of the patient is monitored using LM35 and it is in abnormal condition, GSM Modem sends a message to caretaker mobile. If PIR Sensor detect the human movement and send a message GSM Mobile User.

CONCLUSION AND FUTURE WORK

Thus, the IR Sensor sense the presence of tablet in the medicine case and GSM Modem send a message to caretaker. Caretaker monitors the dosing condition and remains the patient to take the medicine. This project is implemented for monitoring of cancer patient health. RTC is used to set the dosing time. Therefore, it is noteworthy to summarize the fact that if the project is implemented fulfilling the demanding needs and criteria, an important change can be made possible in the cancer patient to take medicine at regular interval of time.

As future work, we will reinforce Dose care system using wifi technology for taking medicines for the cancer disease. So that it recognizes the type and quantity of medicines precisely.

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