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Emerging Trend in Mobile Technology for Aged People Monitoring and Parameter Reception Using GSM Technologies.

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ABSTRACT

In recent past, the criminals frequently target mentally and physically challenged people and aged people who live alone. Hence their safety is a matter of serious concern to their relatives. Moreover their health conditions are also of important concern to their relatives who are physically far away from them. Hence it becomes necessary to develop a monitoring system that will indicate the conditions of these aged people to their relatives. Such a monitoring system involves sensors, micro controller and web based Global Systems for Mobile Communication (GSM) services for mobile communication. The project aims at developing such a monitoring system that is to be placed at the aged people premises. The sensors continuously grab the temperature conditions and indicate it to the micro controller. Micro controller activates the corresponding services to the relative's mobile under abnormal conditions. The Ethernet system then communicates to the relative's mobile through serial communication port. The embedded GSM based monitoring system serves as a reliable watchdog for the aged people living alone. In case of any critical situation, the proposed monitoring system provides the information to the relatives through GSM modem. It also helps the relatives to know about the current location of the aged people.

Keywords: aged people, monitoring, relatives, GSM modem.

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INTRODUCTION

Current scenario forces aged people to live alone at least during the working hours of their relatives. These people face two different types of problems namely health conditions and threat to their safety. In recent past these people are more vulnerable to attacks by criminals. Moreover their health conditions are also unstable. Hence their safety and health conditions are of major concern to their relatives who have to work to meet their ends. Not only old people but also physically and mentally challenged people also face the same kind of problems as these old people. Usually mobile phones are land lines are used as modes of communication. However during critical stages the old age people cannot respond with these conventional modes of communication. This leaves their relatives worried and concerned. The above problems can be solved if a monitoring system which informs their status automatically to their relatives is developed and installed at these people's premises. Such a system involves a sensor for capturing the abnormal situations, Micro controller to activate the necessary actions and a GSM based server for communicating the conditions to the relatives.

Many such monitoring systems are available in the markets. However these models do have their limitations. Firstly, the cost of these monitoring systems is more making it impossible for a common man to avail it. Secondly, power consumption is extremely high. Above all web server dependency is more and only limited amount of data can be communicated between the aged persons and their relatives. Moreover these conventional monitoring systems do not provide the current location of the aged people if they move from one room to the other or from one place to the other. Hence to overcome all these limitations a GSM based monitoring system is proposed for aged people is proposed.

The proposed system overcomes web server dependency with an embedded web server. Hence the latency is reduced. As the web server can be personalized it allows flexible message transfer between the two parties. High end power supply is used to reduce the power consumption. The overall cost is reduced so that is affordable even by common man. In addition to these above features the current position of the aged people is also made available to the relatives at the other end. Another enhanced facility is that closed loop monitoring can be done i.e. the relatives can take command over the serious situation and can also issue certain commands to help the aged people. Hence a completely user friendly, highly secure and user friendly embedded web based monitoring system is proposed for the aged people.
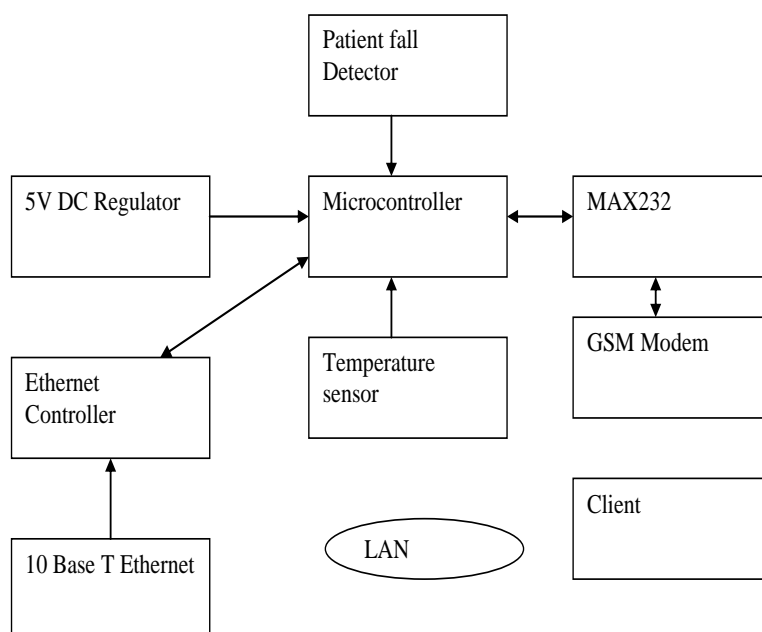
MATERIALS AND METHODS

Figure1: Block Diagram of Embedded Monitoring System

In order to develop a web based embedded monitoring system, proper sensor, micro controller and GSM modem are to be chosen. A temperature sensor has to be identified with higher temperature resolution. A suitable and efficient micro controller has to be designed and selected with adequate flash memory, cache memory and sufficient instruction set. The most important task involves selecting GSM based web server to communicate with the relatives. aGSM based web server activates the mobile phone and sends appropriate messages to the mobile phone. The relatives of the aged people then can send control messages to the aged people and can prepare them to face the critical situations. Suitable software has also to be written to activate the GSM modem and the micro controller.

A patient fall detector and temperature sensor are used for monitoring the patients. In case of abnormality i.e. when the person falls down or if the temperature of the person drops or increases suddenly, the sensor outputs trigger appropriate actions from the microcontroller. The microcontroller then activates the appropriate subroutines. The current condition of the person is sent to the relatives through GSM modem. The subroutines for activating the GSM modem and the appropriate messages are already embedded into the microcontroller. When the transmit (or receive) program is kick started by the micro controller, it runs the relevant set of instructions until it reaches the end and then it stops. For the period of this time it would have copied the contents of RAM to the Ethernet controller. The Ethernet controller is next triggered for transmission and the cycle will be repeated as soon as there is more data to transmit.

In addition to the above the position of the patient is also indicated to the relative. The relative i.e. the client if necessary sends control messages to the patients. The monitoring system not only indicates the current status but also the position of the patient. Based on this the client may send control messages to the patient and help him to come out of the critical stages.

Temperature sensor

The temperature sensor used is LM35.It gives the higher output voltage than thermocouples and it requires no amplification. The LM35 series which are precision integrated-circuit temperature sensors, and the output voltage is linearly proportional to the Celsius (Centigrade) temperature. It is Calibrated directly in ° Celsius (Centigrade). It has Linear + 10.0 mV/°C scale factor, 0.5°C accuracy guaranteeable (at +25°C). It is rated for full −55° to +150°C range and Suitable for remote applications. Nonlinearity only ±1⁄4°C typical and low impedance output, 0.1 W for 1 mA load. Temperature is measured more accurately than a using a thermistor.
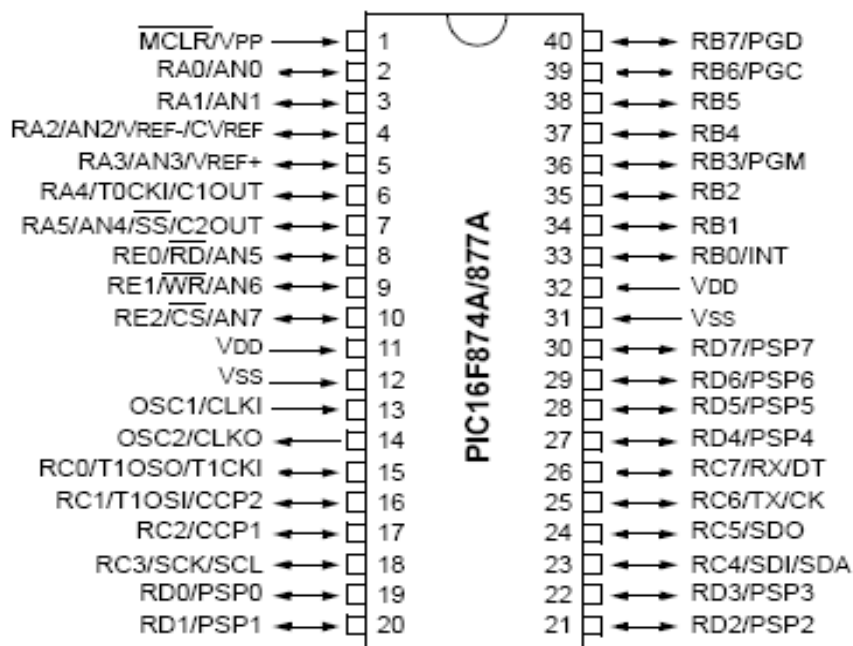

Figure 2: Pin diagram of micro controller

Micro Controller

The PIC16 instruction set is highly orthogonal and it is comprised of three basic categories: Byte-oriented operations, Bit-oriented operations & Literal and control operations. It has in built ADC module. The pin diagram of the micro controller is shown below.

Ethernet controller chips suitable for direct interfacing to embedded systems. The most popular pair is the Realtek 8019 and the Cirrus 8900.

GSM (Global System for Mobile Communication)

A GSM modem is a wireless modem so as to works with a GSM wireless network. A wireless modem acts like a dial-up modem. The main important dissimilarity between them is that a dial-up modem send and receives data through a fixed telephone line while a wireless modem send and receives data through radio waves. A GSM modem could be an external device or a PC Card / PCMCIA Card. Characteristically, an external GSM modem is linked to a computer through a serial cable or a USB cable. Like a GSM mobile phone, a GSM modem requires a SIM card from a wireless carrier in order to work. Computers make use of AT commands to manage modems. Both GSM modems and dial-up modems maintain a general set of standard AT commands. GSM modems maintain an extended set of AT commands for the operations of GSM modem such as to read, write and delete SMS messages, to send SMS messages, to monitor the strength of the signal, to monitor the charge status and charge level of the battery. The following is the process for detecting and using the GSM modem.

Check if GSM phone or modem supports SMS text mode:

Press AT+CMGF=1 <ENTER> Modem responds with "OK"

Sending the message: Type the following command: AT+CMGS="+31638740161" <ENTER> Replace the above phone number with cell phone number. The modem will respond with: >

Typing the message text and sending the message:

Hello World! <CTRL-Z>

ACKNOWLEDGEMENT

After some seconds the modem responds with the message ID of the message, indicates the message was sent correctly: +CMGS: 62

Software Description

Orcad PSPICE is used for simulating the power supply and MPLAB IDE is used for developing the project. Two major features of MPLAB IDE are projects and workspaces. Two major features of MPLAB IDE are projects and workspaces. MPLAB IDE will create a project file with the extension. mcp and a workspace file with the extension .mcw. The following is the procedure for setting up a project - set up language tools. To add language tools for use in the project, select *Project>Set Language Tool Locations* or right click on the project name in the Project window and select Set Language Tool Locations from the pop-up menu.

Click on a registered tool in a toolsuite to select it. Type in the "Location" or browse to the location of the tool executable by clicking Browse. Repeat this for each tool wish to use in the project. When finished, click OK. Now assign a toolsuite to the project. To select a toolsuite for use in the project, select *Project>Set Language Toolsuite* or right click on the project name in the Project window and from the pop-up menu select Set Language Toolsuite. The project toolsuite is selected from the "Active Toolsuite" list by clicking OK. The toolsuite would depend on the device for which code is developed. Microchip MPASM/C17/C18 Toolsuites - for most PIC MCU, Microchip memory and KeeLoq security IC devices.Microchip ASM30/C30 Toolsuites - for PIC24 MCU and dsPIC DSC devices. Third Party Toolsuitess - for various Microchip devices. At this point save project by selecting *Project>Save* or right clicking on the project name in the Project window and selecting

"Save Project". Now it is ready to build project. Right click on the project name in the Project window and select "Build All" from the pop-up menu. For MPASM assembler, a status window will open showing the progress and final outcome of the build. It will close when complete. The Output window will also open. This will contain information about the build, including any errors encountered. If project has not been build effectively then check the following items and then build the project again: Check the spelling and format of any code entered in the editor window. If there are reported errors in the Output window, then double clicking on an error will indicate the corresponding line in source code with a green arrow in the gutter of the source code window. Check that the correct language tool is being used for the project and for the project files. Upon a successful build, the debug file (*.cof, *.elf, etc.) generated by the language tool will be loaded. This file would allow debugging using source code and view variables symbolically in Watch windows.
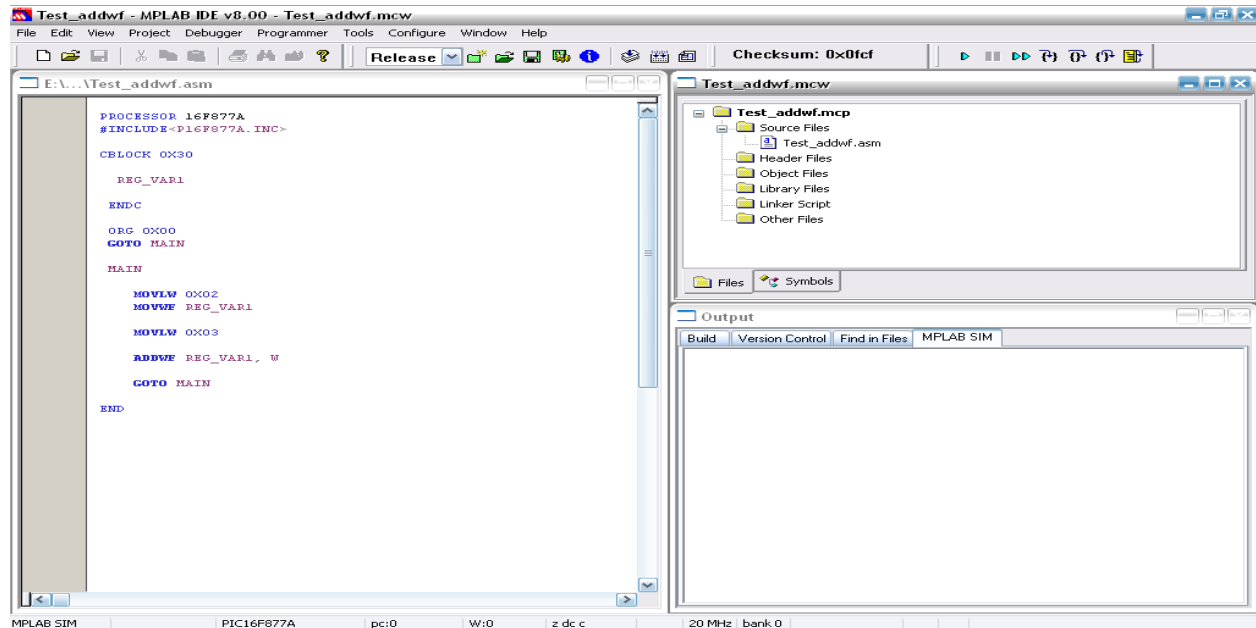

Figure 3: A sample window in MPLAB

RESULTS AND DISCUSSION

Check if GSM phone or modem supports SMS text mode
Press AT+CMGF=1 <ENTER>
Modem responds with "OK"
Sending the message
Type the following command:
AT+CMGS="+9841169303" <ENTER>
Replace the above phone number with cell phone number.
The modem will respond with: >
Typing the message text and sending the message
Patient Fallen Down ! <CTRL-Z>
Acknowledgement
After some seconds the modem responds with the message ID of the message, and indicates that the message was sent correctly:
+CMGS: 62
Then the client is been indicated of the status "Patient Fallen Down" in his mobile. The below mentioned addresses used by modem for communication
IP Address   : 192.198.1.78
Subnet Mask   :255.55.255.0
Default Gateway   :192.168.1.1
Preferred DNS server   :203.145.184.13
Alternate DNS Server   :203.145.182.32

The monitoring system is located at the aged people premises. The temperature sensor senses the temperature and if there is an abnormality that is detected by the micro controller. Micro controller activates the GSM modem. GSM modem then sends the appropriate already typed messages to the relatives mobile. An acknowledgement is also received at the GSM modem. Hence a monitoring system is developed to ensure the safety of the aged people. The conditions if abnormal are immediately sent to the relatives. The relatives may also send commands to take charge of the situation. However the closed loop control can be enhanced further for health care.

The monitoring system can also be used for watching kids, physically and mentally challenged people. If installed in vehicles these monitoring system are also useful in finding the location of the theft vehicles. Using these monitoring systems family doctors can also be informed of the patient's current status which enables them to prepare the bed for the patient's treatment.

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