International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 08 Issue: 04 | April - 2024 SJIF Rating: 8.448 ISSN: 2582-3930

Health Monitoring System

Ms.J.Vijayalakshmi(Ap)

Atchaya.M, Dhanabalan.M, Arul Immanuel .T
Department of Artificial Intelligence and Data Science ,
Sri Shakthi Institute of Engineering and Technology Coimbatore – 641062

ABSTRACT

The system can be used to check the health condition of the person by using three sensor such as heart beat sensor, temperature sensor and pressure sensor and also to monitor the SPO2 condition of person in each person bed in rural public hospital or home. By installing the measuring modules in all person beds, the system will show SPO2 status of each person principle. Each of us requires a periodic monitoring of vital parameters and correct treatments based on this data. These processes become even more crucial when people reach a certain age and are not capable to follow their health condition properly without a special medical personnel or sophisticated equipment to perform the monitoring. Therefore, a particular interest is focused on continuous monitoring techniques. For continuous monitoring, Arduino Atmega328 microcontroller is used. In this case several sensor units are considered. Namely, Temperature sensor, Heart beat rate sensor, human Blood pressure sensor. All of sensors are used only for sensing purpose. If the sensed value is equal to normal value, it stops further process. Otherwise, it sends control signals to person via Actuator. Health monitoring systems where sensors that are either worn inside or outside the human body. The sensors collect the information of physical and logical conditions and the movements of the person. This research paper aims to develop a system which gives body temperature and heart rate using sensors LM35 and AD8232 heart rate monitor sensor respectively. These sensors are incorporated and interfaced with Arduino UNO board, LCD. The outcome of result on Thing speak is Data visualization. So that record of data can be stored and accessed over a period of time.

INTRODUCTION:

The modern healthcare provides a better caretaker for the patient worldwide with reasonable cost to improve patient monitoring devices. A new device designed to improve health monitoring using a microcontroller and biomedical sensors like temperature sensor, body rate sensors used for monitoring the health condition of the patient health condition on a single chip. If any changes take place the data will be updated on the cloud, this notification helps to take an appropriate action at an instance of time, it can help for the patient's future health problem which arises.

It also helps the patient's concern doctor to take an appropriate action at a proper time. A sensor network (SN) is a computer network consisting of spatially distributed autonomous devices using sensors to cooperatively monitor physical or environmental conditions, such as temperature, sound, vibration, pressure, motion or pollutants, at different locations. The development of wireless sensor networks was originally motivated by military applications such as battlefield surveillance. However, wireless sensor networks are now used in many civilian application areas, including environment and habitat monitoring, healthcare applications, home automation, and traffic control.

In addition to one or more sensors, each node in a sensor network is typically equipped with a radio transceiver or other wireless communications device, a small microcontroller, and an energy source, usually a battery. The size a single sensor node can vary from shoebox-sized nodes down to devices the size of grain of dust. The cost of sensor nodes is similarly variable, ranging from hundreds of dollars to a few cents, depending on the size of the sensor network and the complexity required of individual sensor nodes. Size and cost constraints on sensor nodes result in corresponding constraints on resources such as energy, memory, computational speed and bandwidth. In computer science, wireless sensor networks are an active research area with numerous workshops and conferences arranged each year.

The applications for SNs are many and varied. They are used in commercial and industrial applications to monitor data that would be difficult or expensive to monitor using wired sensors. They could be deployed in wilderness areas, where they would remain for many years (monitoring some variable) without the need to recharge/replace their power supplies. They could form a perimeter about a property and monitor the progression of intruders (passing information from one node to the next). There are a many uses for SNs. Typical applications of SNs include monitoring, tracking, and controlling. Some of the specific applications are habitat monitoring, object tracking, nuclear reactor controlling, fire detection, traffic monitoring, etc. In a typical application, a SN is scattered in a region where it is meant to collect data through its sensor nodes.

LITERATURE REVIEW:

Infusion rates demanded of the infusion pump in many computer-controlled drug delivery applications are made to change at intervals much shorter than those encountered under routine clinical use. The purpose of this study was to validate the volumetric accuracy of three commercially available infusion pumps operating in a demanding computer-controlled application. In independent 2- h evaluations, the infusion rate demanded of each pump changed as often as every 5, 10, or 15 s using an algorithm for computer-controlled pharmacokinetic model-driven intravenous infusion. Accuracy of the infusion devices was determined gravimetrically. At all measurement times, each of the infusion pumps was accurate to within approximately +or-5% of the expected volumetric output under each of the infusion rate intervals tested. Flow rate accuracy of +or-5% is equal to the nominal expected accuracy of these infusion pumps in conventional clinical use.

An ink-drop sensor has been developed for use in ink-jet printers so that the function of the multi nozzle print head can be checked before printing starts or cyclically during printing. If the sensor detects that one or more nozzles have failed, the print head can be restored to correct operation in a service station. This process, which is completely automatic and requires no intervention on the part of the user, increases the reliability of the ink-jet printer. The sensor principle utilizes the electrical conductivity of the ink. When ink droplets from any nozzle in the print head are ejected onto comb like electrodes, conductive links are established between the prongs of these electrode combs, and changes in resistance can be measured at the sensor terminals. These changes in resistance are then converted in a signal- conditioning circuit into digital voltage signals. The author also discusses modified versions of the sensor suitable for special applications such as measuring the flight time of ink droplets and determining print position errors.

We present a model-based approach to synthesizing insulin infusion pump usage parameters against varying meal scenarios and physiological conditions. Insulin infusion pumps are commonly used by type-1 diabetic persons to control their blood glucose levels. The amounts of insulin to be infused are calculated based on parameters such as insulin-to carbohydrate ratios and correction factors that need to be calibrated carefully for each person. Frequent and careful calibration of these parameters is essential for avoiding complications such as hypoglycaemia and hyperglycaemia. In this paper, we propose to synthesize optimal parameters for meal bolus calculation starting from models of the person's insulin-glucose regulatory system and the infusion pump. Various off-the-shelf global optimization techniques are used to search for parameter values that minimize a penalty function defined over the predicted glucose sensor readings. The penalty function “rewards” glucose levels that lie within the prescribed ranges and “penalizes” the occurrence of hypoglycaemia and hyperglycemia. We evaluate our approach using a model of the insulin-glucose regulatory system proposed by Dalla Man et al. using this model; we compare various strategies for optimizing pump usage

International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 08 Issue: 04 | April - 2024 SJIF Rating: 8.448 ISSN: 2582-3930

parameters for a virtual population of in-silico persons.

EXISTING SYSTEM:

The modern healthcare provides a better caretaker for the patient worldwide with reasonable cost to improve patient monitoring devices. A new device designed to improve health monitoring using a microcontroller and biomedical sensors like temperature sensor, body rate sensors used for monitoring the health condition of the patient health condition on a single chip. If any changes takes place the data will be updated on the cloud, this notification helps to take an appropriate action at an instance of time, it can help for the patient's future health problem which arises. It also helps the patient's concern doctor to take an appropriate action at a proper time. It is healthcare facilities used worldwide in hospitals, and at home. It can deliver fluids both in medicines and nutrients such as pain reliever's chemotherapy drugs, hormones or insulin, and antibiotics into a person's body in any amounts. There are many types of pumps including insulin pumps, syringe, large volume, elastomeric, person- controlled analgesia (PCA), and enteral pump. Enteral pump is a pump that is used to deliver medications and liquid nutrients to a person's digestive tract. Person-controlled analgesia (PCA) pump is a pump that is used to deliver pain medication. Insulin pump is a pump that is used to deliver insulin to persons with diabetes which is frequently used in home. These devices are very important for nurses because they can show status of liquid that they give to persons. So, the devices are very popular in hospitals for checking status of medicine.

a) Health Monitoring System

PROPOSED SYSTEM:

The system can be used to check the health condition of the person by using three sensor such as heart beat sensor, temperature sensor and pressure sensor and also to monitor the SPO2 condition of persons in each person's bed in rural public hospital in health monitoring systems where sensors that are either worn inside or outside the human body. The sensors collect the information of physical and logical conditions and the movements of the person. This research paper aims to develop a system which gives body temperature and heart rate using sensors LM35 and heart rate monitor sensor respectively. These sensors are incorporated and interfaced with Arduino UNO board, the proposed system architecture consist of three main units namely monitor unit, sensor unit, and control unit.

The sensor unit acquires the multi parametric medical data such as Electro Cardiogram (ECG), body temperature, glucose levels, heart beat etc. from different sensors using various signal processing techniques. Better proactive analysis can be given only if the data collected from the person is classified properly. The collected parameters

are given to controller unit. It compares collected data values to original values. If any deviation occur, it produce control signal to person via actuator. For monitoring purpose LCD display is used.

BLOCK DIAGRAM:

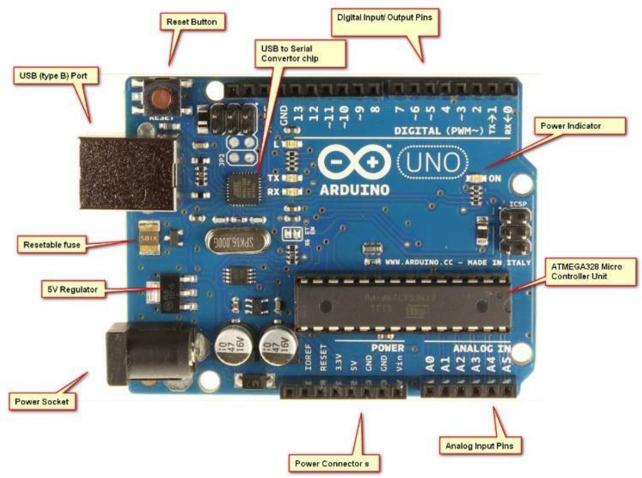
b) proposed system

Smart Healthcare is important for people who need continuous monitoring which cannot be provided outside hospitals. It is also important at rural areas or villages where nearby clinics can be in touch with city hospitals about their patient's health condition. This work presents a smart health monitoring system that uses biomedical sensors to check patient's condition and uses internet to inform the concerned. The biomedical sensors here are connected to Arduino UNO controller to read the data which is in turn interfaced to an LCD display/serial monitor to see the output. The main objective of our paper is a remote health monitoring system using IOT and the data can be stored in the cloud. The data can be retrieved from the cloud over the internet. The system incorporates sensors that generate data and the information is collected from different sensors and the collected data sent to the cloud. The data can be analysed and maintained by the doctors. A database is to be maintained by the centralized server so the data can be retrieved from the patient's previous record history and provide better medical treatment. This digital output can be connected to microcontroller directly to measure the Beats per Minute (BPM) rate. It works on the principle of light modulation by blood flow through finger at each pulse. Various other sensors like the blood pressure sensor, Heartbeat sensor, temperature sensor, can be added to the patient kit in response to the patient's medical condition. Finally, IoT based Health Monitoring System which records the patient heartbeat rate and body temperature and also an email/SMS alert can be sent whenever those readings go beyond critical values. Patient pulse per minutes and temperature data can be monitored and recorded over Thing Speak. So the patient's medical history can be monitored from anywhere in the world over the internet.

SYSTEM REQUIREMENTS:

The Arduino Uno R3 is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button.

It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2(Atmega8U2 up to version R2) programmed as a USB-to-serial converter. Revision 2 of the Uno board (A000046) has a resistor pulling the 8U2 HWB line to ground, making it easier to put into DFU mode.



c) Arduino board

1.0 pin out: added SDA and SCL pins that are near to the AREF pin and two other new pins placed near to the RESET pin, the IOREF that allow the shields to adapt to the voltage provided from the board. In future, shields will be compatible with both the board that uses the AVR, which operates with 5V and with the Arduino Due that operates with 3.3V. The second one is a not connected pin, that is reserved for future purposes.

• Stronger RESET circuit.

• Atmega 16U2 replace the 8U2.

SPECIFICATION:

• Microcontroller: ATmega328

• Operating Voltage: 5V

• Input Voltage (recommended): 7-12V

• Input Voltage (limits): 6-20V

• Digital I/O Pins:14(of which 6 provide PWM output)

• Analog Input Pins: 6

• DC Current per I/O Pin: 40mA

• DC Current for 3.3V Pin: 50mA

• Flash Memory: 32KB (ATmega328) of which 0.5 KB used by boot loader

• SRAM: 2KB(ATmega328) • EEPROM: 1KB(ATmega328)

• Clock Speed: 16MHz • Revision 3 of the board (A000066) has the following new features: ATmega16U2 instead 8U2 as USB-to-Serial converter

• 1.0 pin out: added SDA and SCL pins for TWI communication placed near to the AREF pin and two other new pins placed near to the RESET pin, the IOREF that allow the shields to adapt to the voltage provided from the board and the second one is a not connected pin, that is reserved for future purposes

• Stronger RESET circuit

Power:

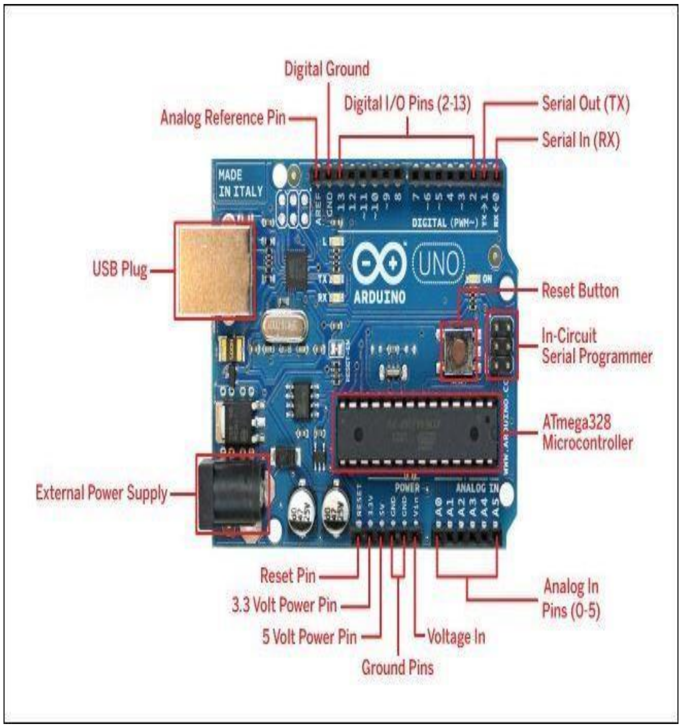
The Arduino Uno can be powered via the USB connection or with an external power supply. The power source is selected automatically. External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm centre-positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and Vin pin headers of the POWER connector.

The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

VIN: The input voltage to the Arduino board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.

5V: The regulated power supply used to power the microcontroller and other components on the board. This can come either from VIN via an on-board regulator, or be supplied by USB or another regulated 5V supply.

3V3: A 3.3volt supply generated by the on-board regulator. Maximum current draw is 50 mA. GND. Ground pins.



d) Pin structure

Communication:

The Arduino Uno has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers. The ATmega328 provides UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). An ATmega8U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer.

The '8U2 firmware uses the standard USB COM drivers, and no external driver is needed. However, on Windows, a .inf file is required. The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the Arduino board. The RX and TX LEDs on the board will flash when data is being transmitted via the USB-to-serial chip and USB connection to the computer (but not for serial communication on pins 0 and 1). A Software Serial library allows for serial communication on any of the Uno's digital pins.

The ATmega328 also supports I2C (TWI) and SPI communication. The Arduino software includes a Wire library to simplify use of the I2C bus; see the documentation for details. For SPI communication, use the SPI library.

Programming:

The Arduino Uno can be programmed with the Arduino software. Select "Arduino Uno from the Tools > Board menu (according to the microcontroller on your board). For details, see the reference and tutorials. The ATmega328 on the Arduino Uno comes preburned with a boot loader that allows you to upload new code to it without the use of an external hardware programmer. It communicates using the original STK500 protocol (reference, C header files). You can also bypass the boot loader and program the microcontroller through the ICSP (In Circuit Serial Programming) header; see these instructions for details. The ATmega8U2 firmware source code is available . The ATmega8U2 is loaded with a DFU boot loader, which can be activated by connecting the solder jumper on the back of the board (near the map of Italy) and then resetting the 8U2. You can then use Atmel's FLIP software (Windows)or the DFU programmer (Mac OS X and Linux) to load a new firmware. Or you can use the ISP header with an external programmer (overwriting the DFU boot loader). See this user contributed tutorial for more information.

Automatic (Software) Reset:

Rather than requiring a physical press of the reset button before an upload, the Arduino Uno is designed in a way that allows it to be reset by software running on a connected computer. One of the hardware flow control lines (DTR) of the ATmega8U2 is connected to the reset line of the ATmega328 via a 100 nanofarad capacitor. When this line is asserted (taken low), the reset line drops long enough to reset the chip.

The Arduino software uses this capability to allow you to upload code by simply pressing the upload button in the Arduino environment. This means that the boot loader can have a shorter timeout, as the lowering of DTR can be well coordinated with the start of the upload. This setup has other implications. When the Uno is connected to either a computer running Mac OS X or Linux, it resets each time a connection is made to it from software (via USB). For the following half second or so, the boot loader is running on the Uno. While it is programmed to ignore malformed data (i.e. anything besides an upload of new code), it will intercept the first few bytes of data sent to the board after a connection is opened.

If a sketch running on the board receives one-time configuration or other data when it first starts, make sure that the software with which it communicates waits a second after opening the connection and before sending this data. The Uno contains a trace that can be cut to disable the auto-reset. The pads on either side of the trace can be soldered together to re-enable it. It's labelled "RESET-EN". You may also be able to disable the auto-reset by connecting a 110 ohm resistor from 5V to the reset line; see this forum thread for details.

HEART RATE SENSOR:

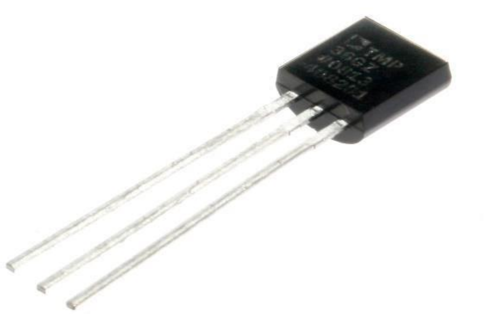
A heart rate monitor is a personal monitoring device which allows one to measure his heart rate in real time or record the heart rate for later study. It is largely used by performers of various types of physical exercise.

e) Heart Rate Sensor

TEMPERATURE SENSORS:

Temperature sensors are vital to a variety of everyday products. For example, household ovens, refrigerators, and thermostats all rely on temperature maintenance and control in order to function properly. Temperature control also has applications in chemical engineering.

Examples of this include maintaining the temperature of a chemical reactor at the ideal setpoint, monitoring the temperature of a possible runaway reaction to ensure the safety of employees, and maintaining the temperature of streams released to the environment to minimize harmful environmental impact. While temperature is generally sensed by humans as "hot", "neutral", or "cold", chemical engineering requires precise, quantitative measurements of temperature in order to accurately control a process. This is achieved through the use of temperature sensors, and temperature regulators which process the signals they receive from sensors.



f) Temperature Sensor

From a thermodynamics perspective, temperature changes as a function of the average energy of molecular movement. As heat is added to a system, molecular motion increases and the system experiences an increase in temperature. It is difficult, however, to directly measure the energy of molecular movement, so temperature sensors are generally designed to measure a property which changes in response to temperature. The devices are then calibrated to traditional temperature scales using a standard (i.e. the boiling point of water at known pressure). The following sections discuss the various types of sensors and regulators.

LCD:

A liquid crystal display (LCD) is a flat panel display, electronic visual display, or video display that uses the light modulating properties of liquid crystals. Liquid crystals do not emit light directly.LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed images which can be displayed or hidden, such as preset words, digits, and 7-segment displays as in a digital clock.

They use the same basic technology, except that arbitrary image are made up of a large number of small pixels, while other displays have larger elements. LCDs are used in a wide range of applications including computer monitors, televisions, instrument panels, aircraft cockpit displays, and signage. They are common in consumer devices such as video players, gaming devices, clocks, watches, calculators, and telephones, and have replaced cathode ray tube (CRT) displays in most applications.

They are available in a wider range of screen sizes than CRT and plasma displays, and since they do not use phosphors, they do not suffer image burn-in. LCDs are, however, susceptible to image persistence. The LCD screen is more energy efficient and can be disposed of more safely than a CRT. Its low electrical power consumption enables it to be used in battery-powered electronic equipment.

It is an electronically modulated optical device made up of any number of segments filled with liquid crystals and arrayed in front of a light source (backlight) or reflector to produce images in color or monochrome. Liquid crystals were first discovered in 1888. By 2008, worldwide sales of televisions with LCD screens exceeded annual sales of CRT units; the CRT became obsolete for most purposes

g) LCD

IC Voltage regulators:

Voltage regulators comprise a class of widely used ICs. Regulator IC units contain the circuitry for reference source, comparator amplifier, control device, and overload protection all in a single IC. IC units provide regulation of either a fixed positive voltage, a fixed negative voltage, or an adjustably set voltage.

The regulators can be selected for operation with load currents from hundreds of milli amperes to tens of amperes, corresponding to power ratings from milli watts to tens of watts.

CONCLUSION:

As a conclusion, a prototype of Health monitoring system using has been successfully developed. In this model patient information are collected using various sensors and the collected data are put in the cloud through Thing Speak. The collected data are also displayed through LCD. Doctors can access the data from anywhere and there is no problem even if patients forgot to bring their report while consulting a physician.

The future scope of this project is to integrate all the sensors into single chip by the use of fabrication in Nano scale and by making it as bio patch that can be attached to the skin and transmit the data through wireless medium. From the evaluation and the result obtained from analysis, the system is better for patients and also for the doctors to improve their patient's medical evaluation.

REFERENCES:

[1] UN, “World Population Aging 2013,” 2013, pp. 8–10.

[2] R. Weinstein, “RFID: A technical overview and its application to the enterprise,” IEEE IT Prof., vol. 7, no. 3, pp. 27–33, May/Jun. 2005.

[3] P. Gope, T. Hwang, “Untraceable Sensor Movement in Distributed IoT Infrastructure,” IEEE Sensors Journal, Vol. 15 (9), pp. 5340 – 5348, 2015.

[4] P. Gope, T. Hwang, “A Realistic Lightweight Authentication Protocol Preserving Strong Anonymity for Securing RFID System,” Computers & Security (Elsevier Journal), Vol. 55, pp. 271–280, 2015.

[5] P. Kumar and H. Lee, “Security Issues in Healthcare Applications Using Wireless Medical Sensor Networks: A Survey.” Sensors (Basel, Switzerland) 12.1 (2012): pp. 55–91.

[6] D. Malan, T. F. Jones, M. Welsh,S. Moulton, "CodeBlue: An Ad Hoc Sensor Network Infrastructure for Emergency Medical Care," Proceedings of the MobiSys 2004 Workshop on Applications of Mobile Embedded Systems (WAMES 2004); Boston, MA, USA. 6–9 June 2004.

[7] K. Lorincz, D. J. Malan, T. R. F. Fulford-Jones, A. Nawoj, A. Clavel, V. Shayder, G. Mainland, M. Welsh, "Sensor Networks for Emergency Response: Challenges and Opportunities", Pervas. Comput. vol.3, pp.16–23, 2004.

[8] A. Wood, G. Virone, T. Doan, Q. Cao, L. Selavo, Y. Wu, L. Fang, Z. He , S. Lin, J. Stankovic, "ALARM-NET: Wireless Sensor Networks for Assisted-Living and Residential Monitoring," Department of Computer Science, University of Virginia; Charlottesville, VA, USA: 2006. Technical Report CS-2006-01;