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Real-time Activity Recognition using Wearable RFID System by Radio Patterns

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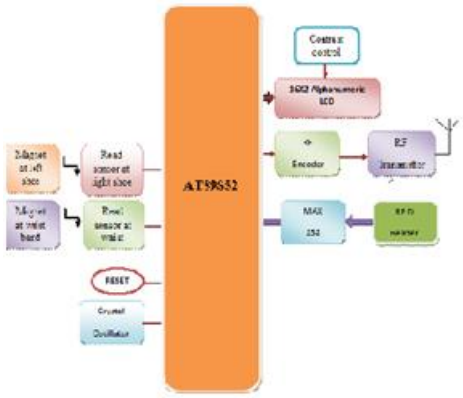
Introduction

With the rapid advances of wireless networking and sensing technologies in recent years, recognizing human activity based on wearable sensors has drawn much research interest. In this paradigm, wearable sensors with sensing and wireless communication capabilities are organized in a body sensor network (BSN) to capture different motion patterns of a user.

Existing Method

Elderly care is one of the many applications supported by real-time activity recognition systems. Traditional approaches use cameras, body sensor networks, or radio patterns from various sources for activity recognition. However, these approaches are limited due to ease-of-use, coverage, or privacy preserving issues. In this paper, we present a novel wearable Radio Frequency Identification (RFID) system aims at providing an easy-to-use solution with high detection coverage. Our system uses passive tags which are maintenance-free and can be embedded into the clothes to reduce the wearing and maintenance efforts.



Draw backs

However, these approaches are limited due to ease-of-use, coverage, or privacy preserving issues. In this paper, we present a novel wearable Radio Frequency Identification (RFID) system aims at providing an easy-to-use.

Proposed Method

A small RFID reader is also worn on the user's body to extend the detection coverage as the user moves. We exploit RFID radio patterns and extract both spatial and temporal features to characterize various activities. We also address the issues of false negative of tag readings and tag/antenna calibration, and design a fast online recognition system.

Antenna and tag selection is done automatically to explore the minimum number of devices required to achieve target accuracy. We develop a prototype system which consists of a wearable RFID system and a smart phone to demonstrate the working principles, and conduct experimental studies with four subjects over two weeks.

The results show that our system achieves a high recognition accuracy of 93.6% with a latency of 5 seconds. Additionally, we show that the system only requires two antennas and four tagged body parts to achieve a high recognition accuracy of 85%.

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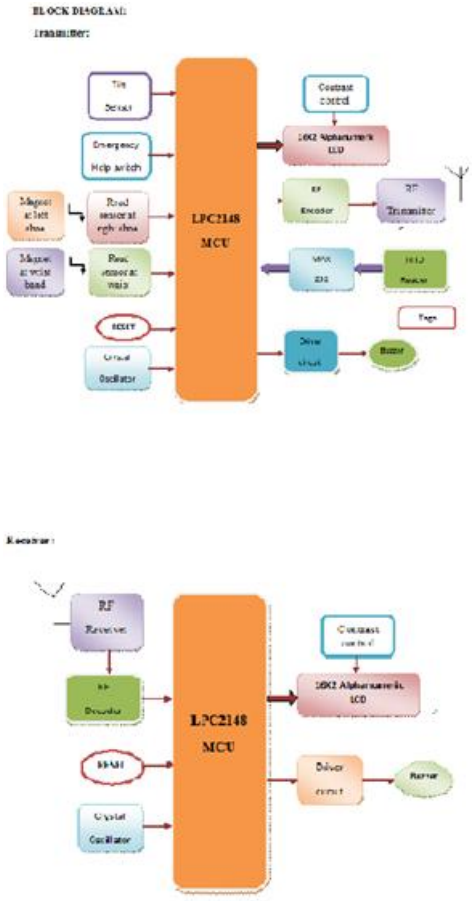
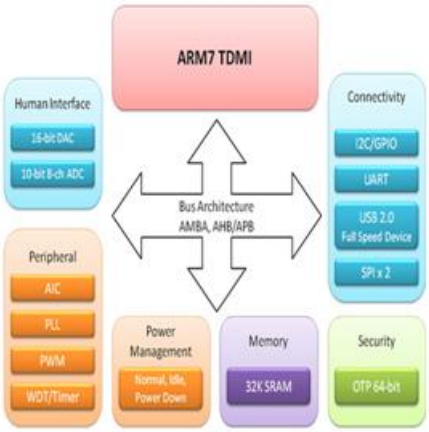


Modules used in this project

The **LPC2148** are based on a 16/32 bit ARM7TDMI-S™ CPU with real-time emulation and embedded trace support, together with 128/512 kilobytes of embedded high speed flash memory. A 128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at maximum clock rate. For critical code size applications, the alternative 16-bit Thumb Mode reduces code by more than 30% with minimal performance penalty.

With their compact 64 pin package, low power consumption, various 32-bit timers, 4- channel 10-bit ADC, USB PORT,PWM channels and 46 GPIO lines with up to 9 external interrupt pins these microcontrollers are particularly suitable for industrial control, medical systems, access control and point-of-sale.

With a wide range of serial communications interfaces, they are also very well suited for communication gateways, protocol converters and embedded soft modems as well as many other general-purpose applications.



This project uses regulated 3.3V, 500mA power supply. Unregulated 12V DC is used for relay. 7805 three terminal voltage regulator is used for voltage regulation. Bridge type full wave rectifier is used to rectify the ac output of secondary of 230/12V step down transformer.

ARM7TDMI Processor Core

- Current low-end ARM core for applications like digital mobile phones
- TDMI
  - T: Thumb, 16-bit compressed instruction set
  - D: on-chip Debug support, enabling the processor to halt in response to a debug request
  - M: enhanced Multiplier, yield a full 64-bit result, high performance
  - I: Embedded ICE hardware
- Von Neumann architecture

RFID

Radio-frequency identification (RFID) is the use of a wireless non-contact system that uses radio-frequency electromagnetic fields to transfer data from a tag attached to an object, for the purposes of automatic identification and tracking. Some tags require no battery and are powered by the electromagnetic fields used to read them.

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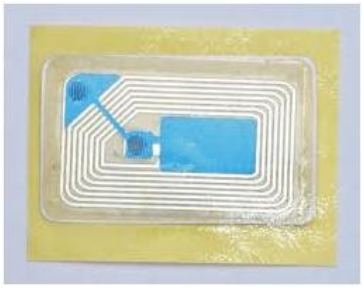
Others use a local power source and emit radio waves (electromagnetic radiation at radio frequencies).



TILT SENSOR

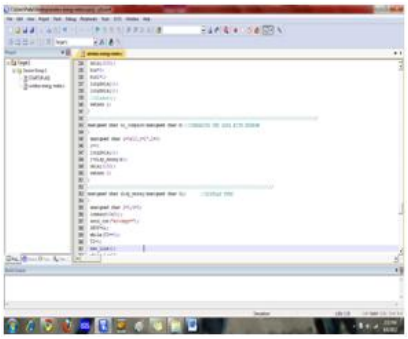
A tilt sensor is an instrument that is used for measuring the tilt in multiple axes of a reference plane. Tilt sensors measure the tilting position with reference to gravity, and are used innumerous applications. They enable the easy detection of orientation or inclination. Similar to mercury switches, they may also be known as tilt switches or rolling ball sensors.

GLOBAL SYSTEM FOR MOBILE COMMUNICATION

It is a globally accepted standard for digital cellular communication. GSM is the name of standardization group established in 1982 to create a common European mobile telephone standard that would formulate specifications for a pan-European mobile cellular radio system operating at 900MHZ.

Software Tools

Keil compiler is a software used where the machine language code is written and compiled. After compilation, the machine source code is converted into hex code which is to be dumped into the microcontroller for further processing. Keil compiler also supports C language code.



Flash Magic

Flash Magic is a tool which is used to program hex code in EEPROM of micro-controller. It is a freeware tool. It only supports the micro-controller of Philips and NXP. It can burn a hex code into that controller which supports ISP (in system programming) feature. Flash magic supports several chips like **ARM Cortex M0, M3, M4, ARM7 and 8051.**

Advantages

- Ease of operation
- Low maintenance cost
- Fit and forget system
- No wastage of time
- Durability
- Accuracy

Applications

- Hospitals
- Remote heart rate monitoring applications
- Local monitoring applications
- Designed for Home and Clinical Applications

CONCLUSION

Here we have designed a simple, low-cost controller based wireless A wireless electrocardiogram detection (heart beat), and body temperature for personal health monitoring

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