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A SOPHISTICATED IDENTIFICATION SYSTEM OF PERSONNEL IN AREAS AT RISK USING GPRS

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ABSTRACT:

In this paper , we present the design of a new embedded real time system that performs two main tasks , the localization based on the received signal strength indicator (RSSI) and the radio frequency identification (RFID). This proposed hardware platform is implemented using a RFID module an XBee , and an Arduino running a multitasking application , which respects the different time constraints required by the environment. In our case , the management was performed by an embedded real-time operating system , the FreeRTOS , running on the AT mega microcontroller. This application allows both locating personnel in areas at risk using wireless instruments installed in the site , and the verification of the required area security measures. This work is done according to the internationally recognized benchmark for management systems of health and safety OHSAS 18001, using RFID technology. A worker suit , equipped with appropriately distributed sensors to accomplish the required tasks of identification and localization is given here. The results obtained after testing the system are very encouraging , since the system based on a wireless sensor network is operating properly. The localization is done with an acceptable accuracy and the identification is achieved successfully.

.***Key words****: ARM7 TMI-S,* RFID Reader & Tags ,GPRS Module

INTRODUCTION

Many companies are implementing a management system for health and safety in the context of their risk management strategy, to respond to development in legislation in order to protect their employees. The objective of this system is to minimize the rate of workplace accidents by studying the punctual risks. However, in most cases, there are always accidents caused by workers neglecting safety measures in the site. Furthermore, in the manufacturing industry such as refineries, the toxic risk and even an explosion may occur. Therefore, it is necessary to know the location of each individual in the site, in order to protect workers' health and safety.

The use of an embedded system, to tackle the problem of localization and identification is a very attractive objective, as embedded systems are modem computing systems covering various ranges of applications. However, the need to reduce the development time of embedded systems, and the high degree of embedded software complexity have led to the use of a real-time operating system, which requires that each element of the system must be real-time, that is taking into account time constraints. Such an operating system is called a real-time operating system [1]. The problems involved with task scheduling, task synchronization, inter-task communications, resource management, and interrupt handlers should be solved in order to make the whole system functioning properly. The FreeRTOS [2] [3] [4] was used for this purpose in our implementation. The next parts of this paper describe the electronic circuit developed, the real-time kernel and the programming of the tasks in the environment of the embedded system used, as well as the analysis of the proposed system.

I. The Hardware System

Micro controller: This section forms the control unit of the whole project. This section basically consists of a

Microcontroller with its associated circuitry like Crystal with capacitors, Reset circuitry, Pull up resistors (if needed) and so on. The Microcontroller forms the heart of the project because it controls the devices being interfaced and communicates with the devices according to the program being written.

ARM7TDMI: ARM is the abbreviation of Advanced RISC Machines, it is the name of a class of processors, and is the name of a kind technology too. The RISC instruction set, and related decode mechanism are much simpler than those of Complex Instruction Set Computer (CISC) designs.

Liquid-crystal display (**LCD**) is a flat panel display, electronic visual display that uses the light modulation properties of liquid crystals. Liquid crystals do not emit light directly. LCDs are available to display arbitrary images 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 images are made up of a large number of small pixels, while other displays have larger elements.

I. Design Of Proposed Hardware System:

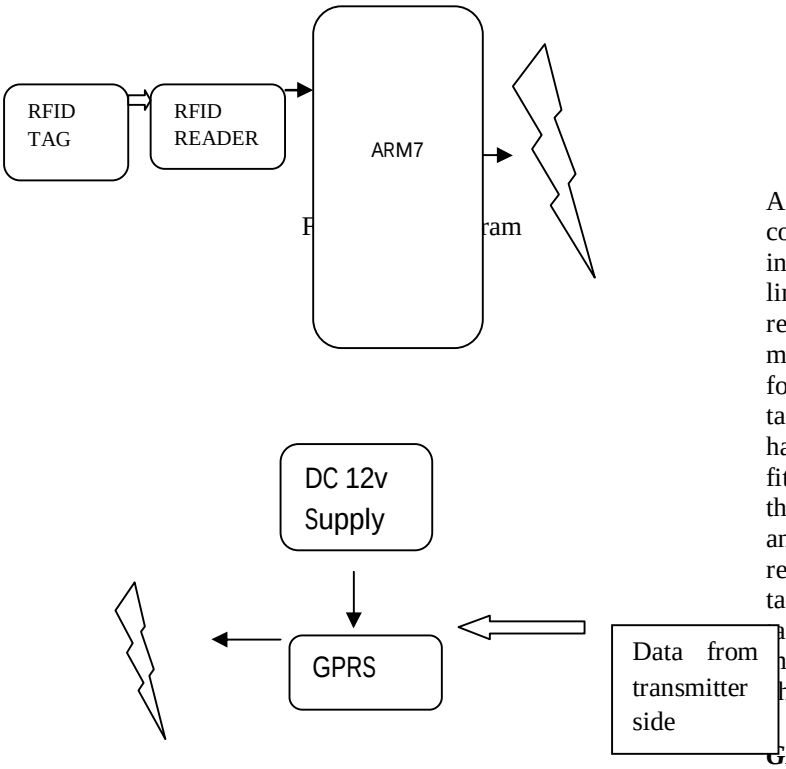

Fig.2.Block diagram

In this paper, we present the design of a new embedded real time system that performs two main tasks, the localization based on the received signal strength indicator (RSSI) and the radio frequency identification (RFID). This proposed hardware platform is implemented using a RFID module and GPRS modem. This application allows both locating personnel in areas at risk using wireless instruments installed in the site, and the verification of the required area security measures. A worker suit, equipped with appropriately distributed sensors to accomplish the required tasks of identification and localization is given here. The localization is done with an acceptable accuracy and the identification is achieved successfully.

I. Board Hardware Resources Features

RFID Many types of RFID exist, but at the highest level, we can divide RFID devices into two classes:

active and passive.

Active tags require a power source i.e., theyare either connected to a powered infrastructure or use energy stored in an integrated battery. In the latter case, a tag's lifetime is limited by the stored energy, balanced against the number of read operations the device must undergo. However, batteries make the cost, size, and lifetime of active tags impractical for the retail trade. Passive RFID is of interest because the tags don't require batteries or maintenance. The tags also have an indefinite operational life and are small enough to fit into a practical adhesive label. A passive tag consists of three parts: an antenna, a semiconductor chip attached to the antenna and some form of encapsulation. The tag reader is responsible for powering and communicating with a tag. The tag antenna captures energy and transfers the tag's ID (the ag's chip coordinates this process). The encapsulation aintains the tag's integrity and protects the antenna and hip from environmental conditions or reagents.

GPRS:

General packet radio service (**GPRS**) is a packet oriented mobile data service on the 2G and 3G cellularcommunication system's global system for mobile communications(GSM). GPRS was originally standardized by

European Telecommunications Standards Institute (ETSI) in response to the earlier CDPD and i-mode packet-switched cellular technologies. It is now maintained by the 3rd Generation Partnership Project (3GPP).

GPRS usage is typically charged based on volume of data transferred, contrasting with circuit switched data, which is usually billed per minute of connection time. Usage above the bundle cap is either charged per megabyte or disallowed.

GPRS is a best-effort service, implying variable throughput and latency that depend on the number of other users sharing the service concurrently, as opposed to circuit switching, where a certain quality of service (QoS) is guaranteed during the connection. In 2G systems, GPRS provides data rates of 56–114 kbit/second.[3] 2G cellular technology combined with GPRS is sometimes described as *2.5G*, that is, a technology between the second (2G) and third (3G) generations of mobile telephony.[4] It provides moderate-speed data transfer, by using unused time division multiple access (TDMA) channels in, for example, the GSM system. GPRS is integrated into GSM Release 97 and newer releases.

I. CONCLUSION

In this paper, we have presented the design of an embedded system based on a wireless sensor network implemented on Arduino platform, XBee modules and the FreeRTOS. During this work, we were faced with the real-time operating mode and the multitasking problems. Thus, we proposed the necessary mechanisms that solved these problems. The overall performance of the designed application was acceptable. The localisation and the identification achieved tasks, allowed us to state that the proposed system is able to protect a person in its workspace with a limited accuracy. The overall obtained results are very encouraging, the reason why we are continuing this work. Indeed, we noticed that we need to improve the proposed localization technique. In order to achieve this objective we are working on the fusion of the inertial data, the acceleration and the velocity, together with the position of the target using the Kalman filter. We believe that by estimating the next target position this will help us to precisely locate the target.

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