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ENHANCED EMBEDDED SYSTEM FOR PERSONAL DATA ACQUISITION SYSTEM

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ABSTRACT:

Emerging low power, embedded, wireless sensor devices are useful for wide range of applications, yet have very limited processing, storage and especially energy resources. Thus a key design challenge is to support application-specific optimizations in a highly flexible manner. This paper deals with Embedded Systems in which the main emphasis is made on its architecture, characteristics, real-time systems, design and typical hardware and software, how it is differentiated from a Personal Computers, types of Embedded Systems, the products made with Embedded Systems, Input/Output of Embedded Systems, problems while dealing with Embedded Systems and its applications.

KEYWORDS: Wireless Communications, Military, optimizations, personal data assistant (PDA), Global Positioning System (GPS), Processor implants

INTRODUCTION:

Embedded Systems ABSTRACT Emerging low power, embedded, wireless sensor devices are useful for wide range of applications, yet have very limited processing, storage and especially energy resources. Thus a key design challenge is to support application-specific optimizations in a highly flexible manner. This paper deals with Embedded Systems in which the main emphasis is made on its architecture, characteristics, real-time systems, design and typical hardware and software, how it is differentiated from a Personal Computers, types of Embedded Systems, the products made with Embedded Systems, Input/Output of Embedded Systems, problems while dealing with Embedded Systems and its applications The most important industry of our days, Data Communication, is based on Embedded Systems. Embedded Software is not software for small computers . WIt executes on machines that are not computers (cars, airplanes, telephones, audio equipment, robots, security systems…). Its principal role is not the transformation of data but rather the interaction with the physical world. Since it interacts with the physical world must acquire some properties of the physical world. It takes time. It consumes power. It does not terminate until it fails Embed: Def1: to fix (something) firmly and deeply.Def2: to enclose closely in a surrounding mass System: Implicitly a controlling system What is an Embedded System? "An embedded system is a special purpose computer system built in to a larger device. An embedded system is typically required to meet very different requirements than a general purpose personal computer. An embedded system is a computer system contained within some larger device or product with the intent purpose of providing monitoring and control services to that device. Reasons: Convenience:-It makes the equipment more useful. Cost: - Control functions have been handled mechanically, but an embedded computer system is cheaper and more reliable. Real-Time Systems: Embedded systems are a part of another system that must respond to event in the real world. Hence time inside the program

is tied to time in the real world. A modern car is more as "a computer system" than a personal computer in the sense that tens of microprocessors are controlling different functions of it. Also the most important industry of our days, Data Communication, is based on Embedded Systems. Types of Real-Time Embedded Systems: Hard:-Where not meeting a deadline failure. Soft:-Where deadline can be missed and the system may still work. Slow:-The system will have to respond with in seconds. Fast:-The system will have to respond with in a second (mille or microsecond). Characteristics: Two major areas of differences are cost and power consumption. Since Embedded Systems are produced in the ten thousands to millions of units range, reducing cost is a major concern. Embedded Systems often use a (relatively) slow processor and small memory size 1. Application and Domain Specific. 2. Reactive and Real-time. 3. Distributed. 4. Heterogeneus. 5. Operate in harsh environments. 6. Must meet high integrity quality attribute requirements. 7. Small Size and Weight. 8. Power concerns. Embedded systems have several common characteristics that distinguished such systems from other computing systems. 1. Single-Functioned: An embedded system usually executes a specific program repeatedly for example, a pager is always a pager in contrast, a desktop system executes a variety of programs like spreadsheets, word processors and video games with new programs added frequently of course there are some exceptions. One case is where an embedded system's program is updated with a newer program version for example; some cell phones can be updated in such a manner. Tightly-Constrained: All computing systems have constraints on design metrics, but those on Embedded Systems can be especially tight. A design metric is a measure of an implementation features such as cost, size, performance and power. Embedded Systems must be fit on a single chip, must perform fast enough to process data in real time. Reactive and Real-Time: Many Embedded Systems must continually react to changes in the systems environment and must compute certain results in real time without delay. KEY DIFFERENCES WITH PC's: React to external events that may be particularly rapid. - Elevator on sky-scrapper at 7:45 am or 4:55 pm. - Missile flying at low altitude over a mountainous area. Must handle unusual events - A user blocking an elevator door, power blackout, memory failure. Task request with deadlines. WHAT MADE EMBEDDED SYSTEMS POSSIBLE: 1971: Intel 4004, first microprocessor (4 bits), initially for a calculator. 1981: IBM chooses Intel 8088 for the first PC. Microprocessors get so cheap that microprocessor-based control system become rule. Only limit: Processing time.

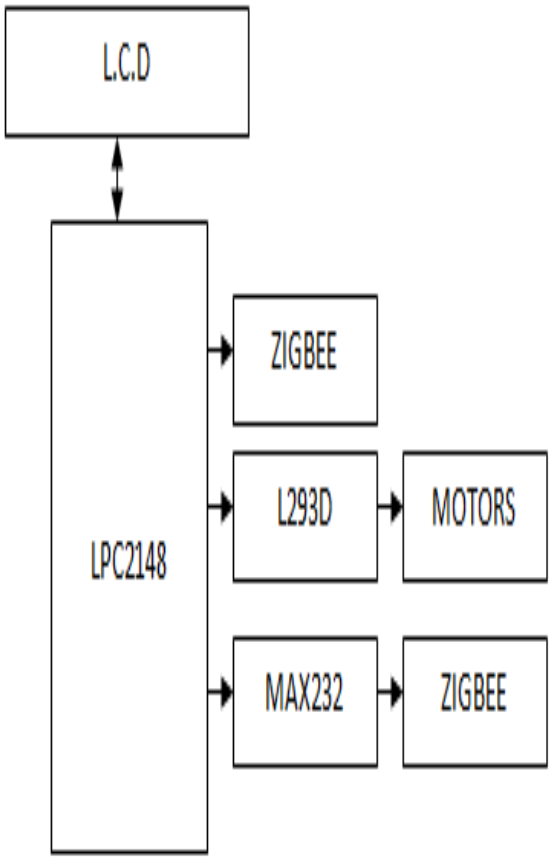

Fig:Transmitter side

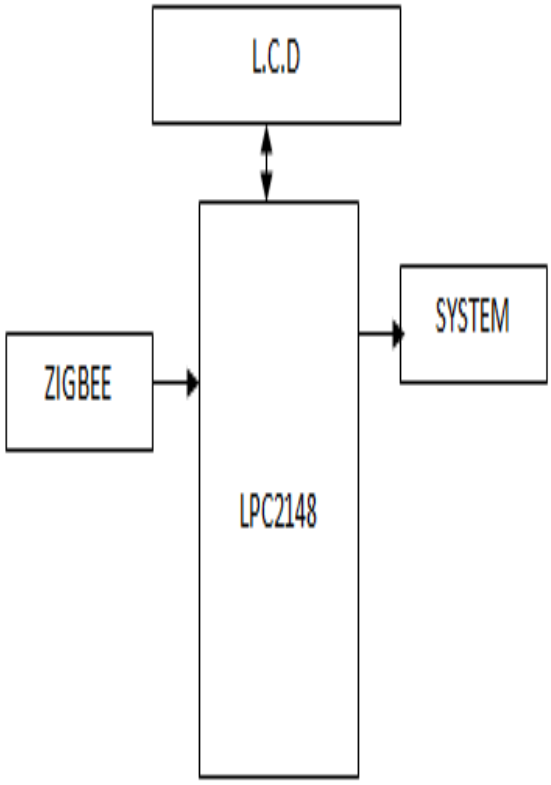

Fig: Receiver side

Above block diagrams shows, both transmitter and receiver parts of this project. Here, zigbee is used as wireless communication device for transmitting and receiving data from control station to robo and robo to control station

The working environment of PDA is very hardness. For example, the weather maybe cold or hot with a -40□c~50 □c temperature range when people use PDA for getting information or reporting personal information. When march in a rainy day, the equipments of people shall be shower wet. Sometimes, swimming across rivers to accomplish task is needed. So there are many technical targets must be considered into design the device.

_ Working temperature is -40c~80 c .
_ Water-proof.
_ Impact resistance.
_ Wireless communication.
_ Global position system.
_ Portable design.
_ Low power consumption.

In order to achieve high reliability and performance, all the components include CPU, Li-ion battery, LCD screen, chips, resistors, capacitors and other elements used in the device can undergo a rigorous trial or examination.

ARM LPC2148:

The LPC2141/2/4/6/8 microcontrollers are based on a 32/16 bit ARM7TDMI-S CPU with real-time emulation and embedded trace support, that combines the microcontroller with embedded high speed flash memory ranging from 32 kB to 512 kB. A 128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at the maximum clock rate.

Features of ARM Processor • 16/32-bit ARM7TDMI-S microcontroller in a tiny LQFP64 package. • 8 to 40 kB of on-chip static RAM and 32 to 512 kB of on-chip flash program memory. 128 bit wide interface/accelerator enables high speed 60 MHz operation. • In-System/In-Application Programming (ISP/IAP) via on-chip boot-loader software. Single flash sector or full chip erase in 400 ms and programming of 256 bytes in 1 ms. • EmbeddedICE RT and Embedded Trace interfaces offer real-time debugging with the on-chip RealMonitor software and high speed tracing of instruction execution.• Single 10-bit D/A converter provides variable analog output. • Two 32-bit timers/external event counters (with four capture and four compare channels each), PWM unit (six outputs) and watchdog • Low power real-time clock with independent power and dedicated 32 kHz clock input. • Multiple serial interfaces including two UARTs (16C550), two Fast I2C-bus (400 kbit/s), SPI and SSP with buffering and variable

data length capabilities. • Power saving modes include Idle and Power-down. • Processor wake-up from Power-down mode via external interrupt, USB, Brown-Out Detect (BOD) or Real-Time Clock (RTC).• Single power supply chip with Power-On Reset (POR) and BOD circuits: – CPU operating voltage range of 3.0 V to 3.6 V (3.3 V ± 10 %) with 5 V tolerant I/O pads.

ZIGBEE:

ZigBee is an IEEE 802.15.4-based specification for a suite of high-level communication protocols used to create personal area networks with small, low-power digital radios. The technology defined by the ZigBee specification is intended to be simpler and less expensive than other wireless personal area networks (WPANs), such as Bluetooth or Wi-Fi. Applications include wireless light switches, electrical meters with in-home-displays, traffic management systems, and other consumer and industrial equipment that requires short-range low-rate wireless data transfer.Its low power consumption limits transmission distances to 10–100 meters line-of-sight, depending on power output and environmental characteristics.[1] ZigBee devices can transmit data over long distances by passing data through a mesh network of intermediate devices to reach more distant ones. ZigBee is typically used in low data rate applications that require long battery life and secure networking (ZigBee networks are secured by 128 bit symmetric encryption keys.) ZigBee has a defined rate of 250 kbit/s, best suited for intermittent data transmissions from a sensor or input device

L.C.D:

Liquid Crystal Display
The LCD is used for the purpose of displaying the words which we are given in the program code. This code will be executed on microcontroller chip. By following the instructions in code the LCD display the related words

L293D:

The L293 is an integrated circuit motor driver that can be used for simultaneous, bi-directional control of two small motors. Small means small. The L293 is limited to 600 mA, but in reality can only handle much small currents unless you have done some serious heat sinking to keep the case temperature down. Unsure about whether the L293 will work with your motor? Hook up the circuit and run your motor while keeping your finger on the chip. If it gets too hot to touch, you can't use it with your motor. (Note to ME2011 students: The L293 should be OK for your small motor but is not OK for your gear motor.)

Global Positioning System: Our world depends on the Global Positioning System (GPS). With GPS – our soldiers are safer, first responders are faster, banking and investing is instantaneous, industry is more efficient and everyday living is simply easier. GPS technology is found in everything from cell phones and wristwatches, to shipping containers and ATM's. The system boosts productivity in almost every aspect of society and across a wide swath of the economy, to include farming, construction mining, surveying, supply chain management and more. Major communications networks, banking systems, financial markets, and power grids depend on GPS and the technology is embedded in virtually every component of U.S. military operations.

CONCLUSION:

Finally, This project is useful for multipurpose applications using designed enhanced applications. On demand of soldiers or workers in field, the PDA

components include CPU, memory, LCD touch screen, wireless communication module, GPS, barcode laser scanner and interfaces etc. are integrated. The features of PDA have a wide working temperature range (-40□c~80 □c), impact resistance, portableand low powoer consumption design. The trial production shows the PDA is suitable for the applications of soldier or workers in the harsh environment. The laser scanner has decoded the book barcode successfully decoded.

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