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DIGITAL PRESSURE SENSOR TRACKING USING DEPTH OF FIELD

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ABSTRACT

The paper proposes the design of accurate positioning system with outdoor and indoor coverage with highly needed tool for increasing safety in emergency response. The project aim is to design a 3D inertial navigation system that track the soldier movement (left, right, up and down) accurately with a GPS denied environment in multi-floor building. The location and movement of all the soldiers known among themselves and to the military troop outside the building. The system help them efficiently to lead the task force in urban operations and to rescue the injured persons faster.

Key words: 3-Axis magnetometers, Barometric digital MEMS pressure sensor, 6-DOF Digital MEMS geo-magnetic module, IEEE 802.15.4, ARM Cortex-M3, IMU, ZUPT.

INTRODUCTION

Unobtrusive navigation systems that operate in GPS denied environments are a huge challenge that is seeing a very broad number of approaches pursued in the research and development community. An accurate and reliable positioning system with outdoor and indoor coverage significantly increase the safety of military person .it should be lightweight, small, inexpensive, power efficient and provides meter-level accuracy during extended indoor operation. The project design a 3D inertial navigation system that would track a soldier movement (left, right, up and down) accurately and reliably within a GPS denied environment such as a multi-floor building. The solution for personal navigation by using inertial sensors with accurate step length and step count[2]. IMU is attached on different segment of human body for different uses[3]. The problem can be solved using zero velocity update (ZUPT) method to reset the foot speed of each step[5,3,4]. The PDR system uses 6-DOF inertial measurement unit[4]. The wearable monocular visual and inertial sensors are

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estimated[6]. The implementation of pedestrian dead reckoning (PDR) for indoor localization is proposed in[7].

Proposed system

The project aim is to design a 3D inertial navigation system that tracks the soldier movement (left, right, up and down) accurately with a GPS denied environment in multi-floor building. The location and movement of all the soldiers known among themselves and to the military troop outside the building. The system helps them efficiently to lead the task force in urban operations and to rescue the injured persons faster. For a soldier, the device must be small, light weight, highly accurate and consume very low power.

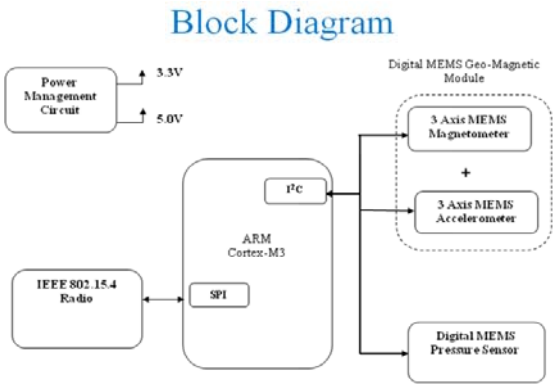

Fig. 1: Soldier mote

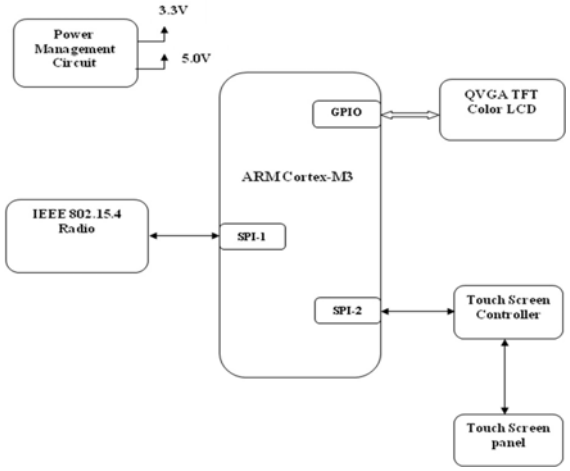

Fig. 2: Monitor mote

Digital pressure sensor

The BMP085 is fully pin and function compatible successor of the SMD500, a new generation of high precision digital pressure sensors for consumer applications. The BMP085 is based on peizo-resistive technology for EMC robustness, high accuracy and linearity as well as long term stability.

Accelerometer

The LIS302DL is an ultra compact low-power three axes linear accelerometer. it includes a sensing element and IC interface able to provide the measured acceleration to the external world through I²C/SPI serial interface. it has dynamically uer selectable full scales of ±2g/±8g and is capable of measuring accelerations with an output data rate of 100Hz or 400Hz.

Arm Cortex- M3

The LPC1311/13/42/43 is ARM Cortex-M3 based microcontrollers for embedded applications featuring a high level of integration and low power consumption. The ARM Cortex-M3 is a next generation core that offers system enhancements such as enhanced debug features and a higher level of support block integration. The LPC1311/13/42/43 operates at CPU frequencies of up to 72 MHz The ARM Cortex-M3 CPU incorporates a 3-stage pipeline and uses Harvard architecture with separate local instruction and data buses as well as a third bus for peripherals. The ARM Cortex-M3 CPU also includes an internal prefetch unit that supports speculative branching. The peripheral complement of the LPC1311/13/42/43 includes up to 32 kB of flash memory, up to 8 kB of data memory, USB Device (LPC1342/43 only), one Fast-mode Plus I2C-bus interface, one UART, four general purpose timers, and up to 42 general purpose I/O pins. ARM Cortex-M3 built-in Nested Vectored Interrupt Controller (NVIC).

Lpc1313

The LPC1313 operates at CPU frequencies of up to 72 MHz is shown Fig. 3. The ARM Cortex-M3 CPU incorporates a 3-stage pipeline and uses Harvard architecture with separate local instruction and data buses as well as a third bus for peripherals. The peripheral complement of the LPC1313 includes up to 32 kB of flash memory, up to 8 kB of data memory, one Fast-mode Plus I2C-bus interface, one UART, four general purpose timers, and up to 42 general purpose I/O pins.

SPI (Serial peripheral interface)

SPI provide good support for communication with slow peripheral devices that are accessed intermittently. SPI specifies four signals: clock (SCLK); master data output, slave data input (MOSI); master data input, slave data output (MISO); and slave select (ÇSS). The SPI mode allows 8-bits of data to be synchronously transmitted and received, simultaneously.

Qvga Tft Color Lcd

In RGB interface and VSYNC interface mode, the combined use of high-speed RAM write function and window address function enables to display a moving picture at a position specified by a user and still pictures in other areas on the screen simultaneously, which makes it possible to transfer display the refresh data only to minimize data transfers and power consumption. It can operate with 1.65V I/O interface voltage, and an incorporated voltage follower circuit to generate voltage levels for driving an LCD.

Hardware description

Fig. 3: Soldier mote

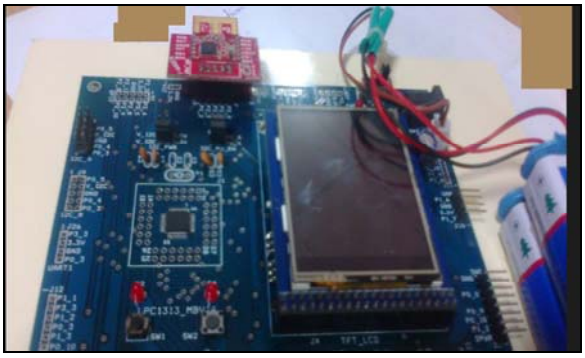

Fig. 4: Monitor mote

CONCLUSION

The system is a secure system in accurate positioning system for outdoor and indoor coverage, which increases the safety in military operation. The location and movement of all the soldiers would be known among themselves inside the building and to the military troop outside the building. It also helps them to more efficiently to lead the task force in urban operations and rescue the injured persons faster.

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