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DESIGN OF A LOW COST HELMET MOUNTED DEAD RECKONING NAVIGATION SYSTEM

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ABSTRACT

This paper describes a navigation system that helps pedestrians to find his / her current position, using a technique known as a waiver GPS navigation systems proposed. GPS is a navigation system that provides information instantly sub meter positioning accuracy for users worldwide. Created on the basis of the selector in which the user specifies at the surface location using ranging information from multiple satellites. Because of its high performance and capabilities, GPS is scheduled to be the primary means of navigation for all sectors. However, GPS is susceptible to electrical noise and interference. Low power transmission in some intentional or unintentional radio-frequency bands can make GPS unusable in a wide geographical area. Dead reckoning is a form of navigation on the current position of pedestrians clearly knows the speed and direction of the course from the last known position. The main advantage of the calculation is based on the sensors contained within and therefore provides a navigation system that does not require interaction with the outside world. Stand-alone browser, it is especially desirable as a backup navigation system.

KEYWORDS: Dead Reckoning, Robust Pedestrian Tracking, Location Estimation

INTRODUCTION

Access the current position of the object or that living things are a vital part of today's life. It is well known in our technology is GPS. In some cases, we cannot get a signal for GPS- interference or other RF interference, then we can use with microcontroller -based backup systems. The microcontroller continuously reads data from GPS receiver and displays the information on the LCD Block. When the system is unable to read the data from the GPS receiver automatically switches to the backup Navigation system with the last recorded spot GPS.Backup navigation system also includes a digital Compass and pedometer sensor that helps in the search direction. Also heading direction is shown through the LCD display. The microcontroller is loaded with an effective program written using embedded 'C' language. The “Design of low cost helmet mounted dead reckoning navigation system” using PIC18F452 microcontroller is a very exclusive project with following advantages:-

- Developing a backup navigational system.
- Do not rely on GPS completely.
- Efficient and user friendly design.
- Low power consumption.
- Manageable
- Fast reaction.

The main part of the whole system is a PIC18F452 microcontroller. The hotel is a 40 pin microcontroller Located in DIL package with pin configuration similar to popular PIC16F877.Program memory address consists of 21 bits that can access 2Mbytes of space in the program memory. PIC 18F452 only has 32K bytes of program memory, which requires 15 bits. The remaining 6 bits of the address are redundant and not being used. Index table provides access to the tables and data stored in the program memory. Program memory stack contains 31 levels, which is usually used to store interrupt and return from the subroutine address. Memory bus 12 data bits wide, able to access areas 4Kbytes data memory. Data memory also consists of special-purpose registers (SFR) and general-purpose registers, they are arranged in banks.PIC18F452 consists timers / counters, registers capture / compare / PWM, USART, A / D converter and data memory EEPROM.

- 4 timer / counter
- 2 capture / compare / PWM modules
- 2 serial communication modules
- August 10 -bit A / D converter channels
- And 256 bytes EEPROM

Detailed diagram of the pin, as shown in Figure 1.There five ports, namely from A to E.PORTA is the name of the port data register .PORTB is an 8 - bit bidirectional port together with interrupt pins and pin serial device programming .PORTC multiplexed with several peripheral functions. Power- on reset, PORTC conclusions are configured as digital inputs. PORT D has Schmitt trigger input buffers. PORTD can be configured as an 8 -bit parallel port driven. PORTE is only 3 bits. Conclusions port shared with analog inputs and slave parallel port control read / write bits. At reset on power up , PORTE conclusions are configured as analog inputs ADCON1 register and must be programmed to change the checkboxes to digital I / O. PIC18F452 microcontroller has four programmable timers that can be used for many tasks, such as generating synchronization signals , causing the interrupt generated at regular intervals , measure the frequency and time intervals.

SOFTWARE DESCRIPTION

The main part of the software includes Express PCB, PIC C compiler and Proteus 7. Express PCB is a software tool for designing printed circuit boards dedicated to the production by the compiler PCB.PIC Express is software that is used where the machine language code is written and compiled. After compiling the source code is converted into machine hex code, which must be reset to the microcontroller for further processing. PIC Compiler supports C language code. It is important that you know, C language for microcontroller, which is commonly known as Embedded C. As we are going to use PIC compiler, so we call it PIC SA PCB, PCM, and PCH compiler specific. PCB for 12 - bit op codes, PCM for 14 – bit op codes and PCH is for 16 - bit op code PIC microcontrollers.

These compilers are specifically designed to meet the unique needs of PIC microcontroller Proteus is software which accepts only hex files. Once the machine code is converted to hex code, hex code that needs to be reset to the microcontroller, and this is done by using Proteus programmer, which itself contains a microcontroller in it, besides that is to be programmed.

This microcontroller has a program it is written so that it takes the hex file to PIC compiler and dumps this hex file to the microcontroller, which has to be programmed. Proteus programmer requires a power supply, this power supply

given from the supply circuit that is designed and connected to the microcontroller in Proteus. The program, to be dumped in to the microcontroller in Proteus edited and compiled, executed and verify all errors and thus after a successful program is compiled program to a microcontroller in reset via dump truck.

INTERFACING OF MODULES

The combination of each module of the microcontroller and the GPS module placement, which must be identified in accordance with user requirements are as shown in Figure 2. Crystal oscillator connected to pins 13 and 14 microcontroller and regulated power supply also connected to the microcontroller and LEDs are also connected to the microcontroller via a resistor. Crystal oscillator is connected to the microcontroller in such a way that the two pins of the generator connected to the contacts 13 and 14 microcontroller external crystal oscillator .goal is to accelerate the execution of the commands and then beat Crystal Oscillator with 20 MHz frequency. The first conclusion is connected to the reset input pins of the microcontroller. Pedometer is used to calculate the distance travelled. Since the distance step of each person varies, an informal calibration performed by the user is not required if the presentation of the distance travelled per unit length desired.

In our calculation we have taken 0.7 meters in length as one step, which is the average estimated length of the face, and we took electromechanical pedometer in our scheme. A good starting point for selection to step foot switch is the location of contacts. The HMC6352 is a fully integrated compass module that combines 2-axis magneto-resistive sensor with the required analog and digital support circuits, and algorithms for heading computation. By combining the sensor elements, processing electronics, and firmware into a 6.5mm by 6.5mm by 1.5mm LCC package, it offers a complete, ready to use electronic compass. This provides design engineers with the simplest solution to integrate high volume, cost effective compasses into wireless phones, consumer electronics, vehicle compassing, and antenna positioning

CALCULATIONS AND RESULTS

As soon as the assumption that the GPS signal is available at the starting point the microcontroller reads data from the GPS and it is displayed on the LCD display system is initialized. However, if the microcontroller cannot read the data, then automatically switches to GPS navigation system and back- calculate the current latitude and longitude of taking the last reading of the GPS reference. Figure 3 shows the demo diagram.

X1, y1, d, and θ are assumed in Figure 3

$X2 = \cos(\theta) * d * (0.00010) + x1$

$Y2 = \sin(\theta) * d * (0.000009) + y1$

(X1, y1) = (17.431988, 78.446955)

{d = distance between (x1, y1) to (x2, y2)}

θ = 22.93 degrees

Substituting the values found in the above equations, we can calculate the (x2, y2) All of which are the latitude and longitude of the current person. Values of 0.0001 x2 and y2 in and0.000009 calculations are added, respectively, as the correction of errors.

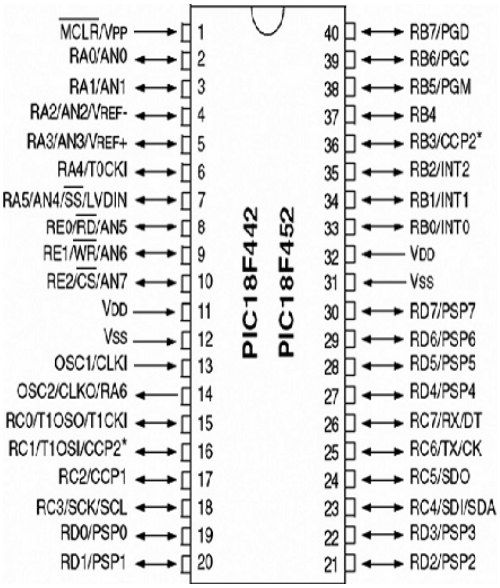

Figure 1: Pin Diagram of PIC 18F452

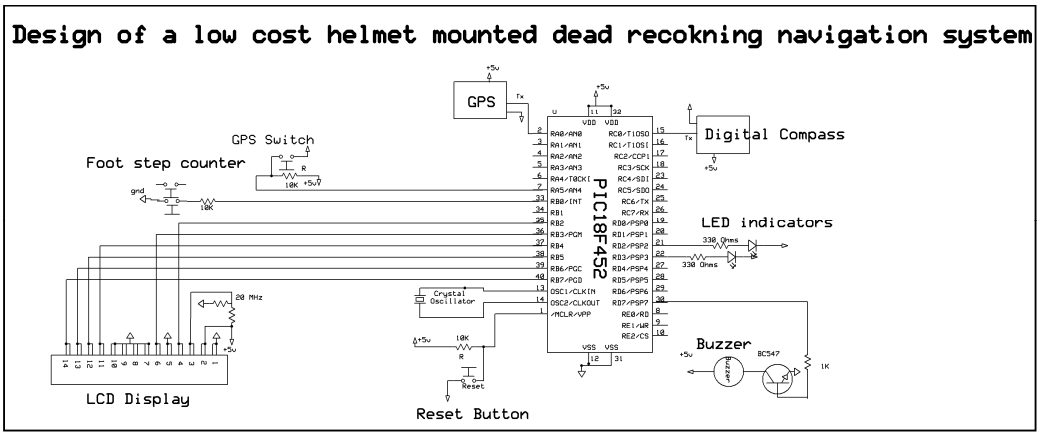

Figure 2: Block Diagram of Interfacing of Microcontroller with Each Module

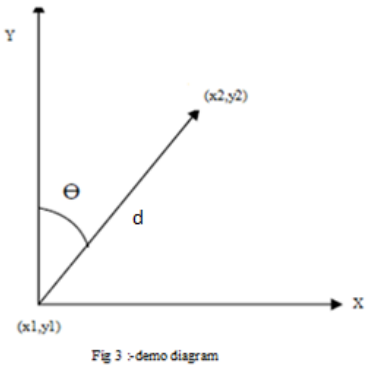

Figure 3: Demo Diagram

CONCLUSIONS

The integration of all the features of the hardware components used in it has been developed. The presence of each module - was thought, and placed carefully, Malthus's contribution to a better operation. Second, using a highly integrated circuit with technology growing, the project was successfully implemented. Malthus project has been successfully developed and tested.

FUTURE AREA

Control unit of the whole system is the microcontroller. The microcontroller reads data from continuously GPS (Global Positioning System) receiver and displays on the LCD display unit such information. When the system is unable to read data from a receiver GPS, it automatically switches to the backup navigation system with the last recorded spot GPS. This backup navigation system sensor has a digital compass and accelerometer which helps in the search direction. Also heading direction is shown through the LCD display. The microcontroller is loaded with an effective program written using embedded 'C' language. This project can be extended by using high performance GPS receiver module and GPRS. GPRS module gives a hint rights to this system via SMS and via predetermined web link.

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