WALKING STICK FOR BLIND PERSON USING ATMEGA 8

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ABSTRACT

The innovative Blind stick system is capable of operating in user friendly manner, so that the blind person can walk independently without getting help from others. This system assists the blind to navigate on their own. In case of emergency situations such as high traffic density the location of the member is shared to the family members The prototype model consists of a stick and a temperature and heartbeat sensor. The stick with sensors deployed can detect the obstacles in front with sensors and it will produce buzzer sound. The buzzer would alert the user. Furthermore, the Sensors on stick can detect the obstacle in front and path hole on road. The system is equipped with in built GPS , GSM, so that if the member pulse falls below a threshold level then his location will be shared to his family. The primary objective of this work is to permit blind persons to explore autonomously in the outside environment. The proposed work is to use a stick including a GPS Navigator. This work goes for giving the route to blind person by designing a cost effective and more flexible navigation system. The proposed system consists of hardware and software. Here the components we are using are Microcontroller, GPS module, etc. This project will help the blind people in improving their communication ability and not to depend on none during walking in even unknown areas.

I.INTRODUCTION

Visually impaired persons have difficulty to interact and feel their environment. They have little contact with surroundings. Physical movement is a challenge for visually impaired persons, because it can become tricky to distinguish obstacles appearing in front of them, and they are not able to move from one place to another. They depend on their families for mobility and financial support. Their mobility opposes them from interacting with people and social activities. In the past, different systems are designed with limitations without a solid understanding of the nonvisual perception. Researchers have spent the decades to develop an intelligent and smart stick to assist and alert visually impaired persons from obstacles and give information about their location. Over the last decades, research has been conducted for new devices to design a good and reliable system for visually impaired persons to detect obstacles and warn them at danger places. Smart walking stick is specially designed to detect obstacles which may help the blind to navigate care-free. The audio messages will keep the user alert and considerably reduce accidents. A voice enabled automatic switching is also incorporated to help them in private space as well. This system presents a concept to provide a smart electronic aid for blind people, both in public and private space The proposed system contains the ultrasonic sensor, water sensor, voice play back board, raspberry pi and speaker. The proposed system detects the obstacle images which are present in outdoor and indoor with the help of a camera. The Stick measures the distance between the objects and smart walking stick by using an ultrasonic sensor. When any objects or obstacles come in range of an ultrasonic sensor then the head phone tell the name of obstacle which is in front of the stick. The smart walking stick is a simple and purely mechanical device to detect the obstacles on the ground. This device is light in weight and portable. But its range is limited due to its own size. It provides the best travel aid for the person. The blind person can move from one place to another independently without the others help. The main aim of the system is to provide a efficient navigation aid for the blind persons which gives a sense of vision by providing the information about their surroundings and objects around them.

II.LITERATURE SURVEY

1.Pedestrian navigation algorithm using inertial-based walking stick

An algorithm for estimating the walking stick movement information is proposed using an inertial sensor attached on the stick. A standard inertial navigation algorithm using an indirect Kalman filter is applied to update velocity and position of the walking stick during movement. The proposed algorithm is verified with three-meter walking experiments.

2.Autonomous walking stick for the blind using echolocation and image processing

The smart walking stick, the Assistor, helps visually challenged people to identify obstacles and provide assistance to reach their destination. The Assistor works based on the technology of echolocation, image processing and a navigation system. The Assistor may serve as a potential aid for people with visual disabilities and hence improves their quality of life. There is a lot of work and research being done to find ways to improve life for visually challenged people. There are multiple walking sticks and systems which help the user to move around, indoor and outdoor locations but none of them provide runtime autonomous navigation along with object detection and identification alerts. The Assistor uses ultrasonic sensors to echo sound waves and detect objects. An image sensor is used to identify the objects in front of the user and for navigation by capturing runtime images and a Smartphone app is used to navigate the user to the destination using GPS (Global Positioning System) and maps.

III. EXISTING SYSTEM

1. Blind Cane
2. Trained Guide Dogs
3. Human Guide

DISADVANTAGES

1. Blind Cane

•Awkwardness.

• Recognition of obstacles up to knee level.
• Does not protect from obstacles at torso and face level.
• Prone to injuries.

2. Trained Guide Dogs

• 1% usage.
• Expensive to Train Dogs ($40k in USA).
• Training period on an average 6 months.
• Difficulty in dog up-keeping costs and lifestyle changes.

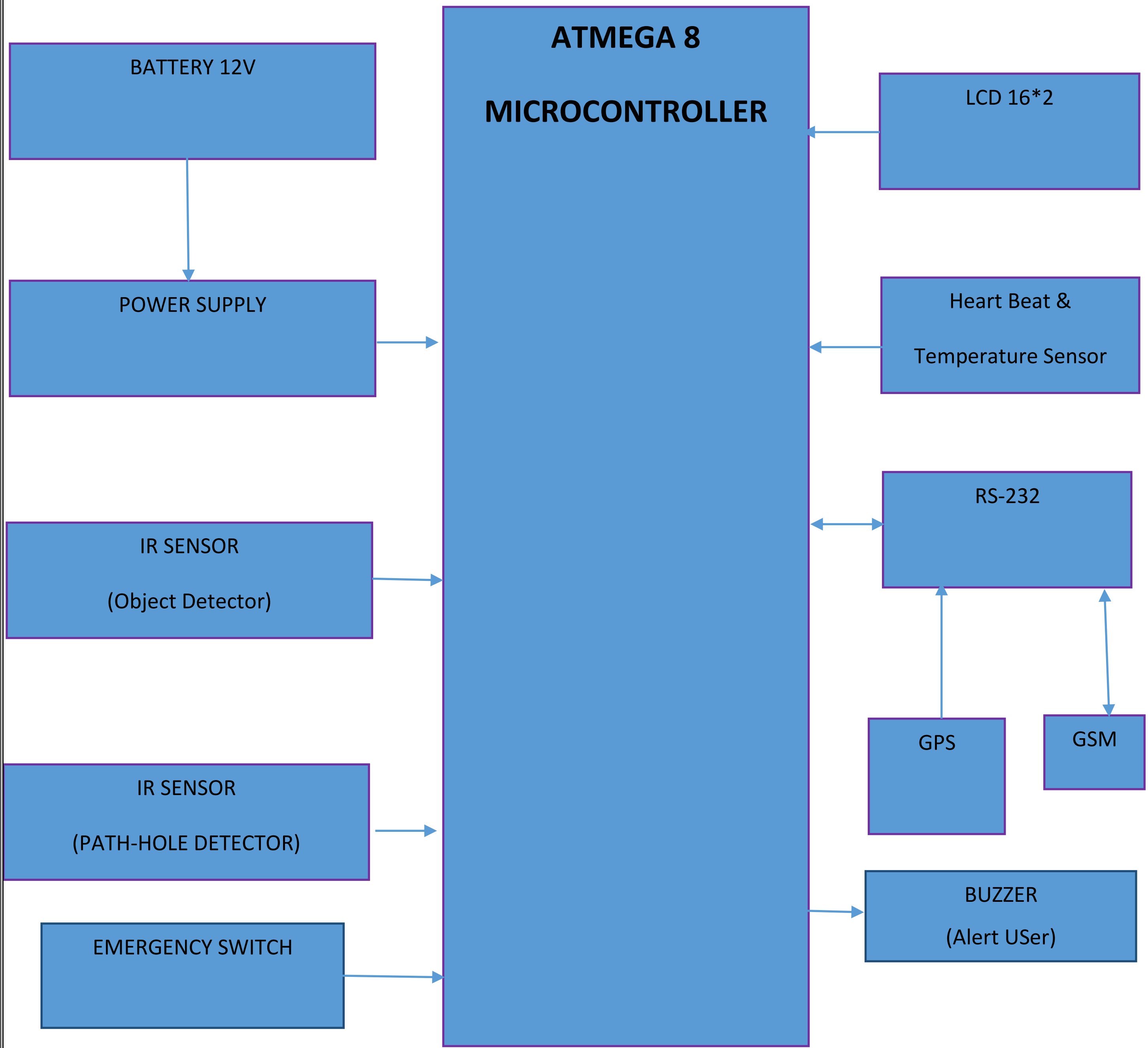
3. Human Guide

• Dependency.
• Feeling of being a burden.

IV. PROPOSED METHOD

In the proposed system, the ultrasonicsensor is used to sense the obstacle distance from the user. This reference distance can be used to decide whether the user can move or not. The ultrasonic sensors work on the basis of sound. The sound waves are transmitted ahead from the sensors towards the obstacle which can sense the distance up to a distance of 12 feet with a resolution of 0.3cm. The sensors are placed in five locations in order to cover maximum sides possible with minimum usage of the sensors. The sensors are placed in left, right, middle left, middle right and bottom respectively. Generally, the blind person cannot see the objects present on the ground. So the bottom sensor keeps track of the ground clearance providing necessary security measures. The proposed system tries to provide vision to the user so we need to consider and process the image ahead as well. The image is detected using image sensors (camera). The image manipulation here is done in order to detect the obstacles present ahead and also to detect the indoor objects. Raspberry pi keeps the image dataset which consists of lot of collected samples of the different obstacles. The images which were sent from the camera are compared with the images stored in the dataset using the image processing. The image is processed and classified using Haar classifier. A Haar classifiers are the object property files that describe an object in real world. A Haar-like feature considers neighbouring rectangular regions at a specific location in a detection window, sums up the pixel International Journal of Pure and Applied Mathematics Special Issue 4533 intensities in each region and calculates the difference between these sums. This difference is then used to categorize subsections of an image.

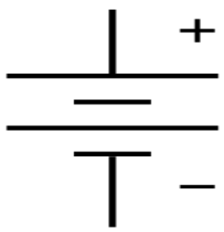
V.BLOCK DIAGRAM



VI. BATTERY

An electrical battery is one or more electrochemical cells that convert stored chemical energy into electrical energy.. Since the invention of the first battery (or "voltaic pile") in 1800 by Alessandro Volta and especially since the technically improved Daniel cell in 1836, batteries have become a common power source for many household and industrial applications. According to a 2005 estimate, the worldwide battery industry generates US$48 billion in sales each year,with 6% annual growth.

There are two types of batteries: primary batteries (disposable batteries), which are designed to be used once and discarded, and secondary batteries (rechargeable batteries), which are designed to be recharged and used multiple times. Batteries come in many sizes, from miniature cells used to power hearing aids and wristwatches to battery banks the size of rooms that provide standby power for telephone exchanges and computer data centers.



The symbol for a battery in a circuit diagram. It originated as a schematic drawing of the earliest type of battery, a voltaic pile.

In strict terms, a battery is a collection of multiple electrochemical cells, but in popular usage battery often refers to a single cell.. For example, a 1.5-volt AAA battery is a single 1.5-volt cell, and a 9-volt battery has six 1.5-volt cells in series. The first electrochemical cell was developed by the Italianphysicist Alessandro Volta in 1792, and in 1800 he invented the first battery, a "pile" of many cells in series.

1.BATTERY CAPACITY AND DISCHARGING

A battery's capacity is the amount of electric charge it can store. The more electrolyte and electrode material there is in the cell the greater the capacity of the cell. A small cell has less capacity than a larger cell with the same chemistry, and they develop the same open-circuit voltage.[43]

Because of the chemical reactions within the cells, the capacity of a battery depends on the discharge conditions such as the magnitude of the current (which may vary with time), the allowable terminal voltage of the battery, temperature, and other factors.[43] The available capacity of a battery depends upon the rate at which it isdischarged.If a battery is discharged at a relatively high rate, the available capacity will be lower than expected.

The capacity printed on a battery is usually the product of 20 hours multiplied by the constant current that a new battery can supply for 20 hours at 68 F° (20 C°), down to a specified terminal voltage per cell. A battery rated at 100 A·h will deliver 5 A over a 20-hour period at room temperature. However, if discharged at 50 A, it will have a lower capacity.

The relationship between current, discharge time, and capacity for a lead acid battery is approximated (over a certain range of current values) by Peukert's law:

$$t = \frac{Q_P}{I^k}$$

where

Q_P is the capacity when discharged at a rate of 1 amp.
I is the current drawn from battery (A).
t is the amount of time (in hours) that a battery can sustain.
k is a constant around 1.3.

For low values of I internal self-discharge must be included.

Internal energy losses and limited rate of diffusion of ions through the electrolyte cause the efficiency of a real battery to vary at different discharge rates. When discharging at low rate, the battery's energy is delivered more efficiently than at higher discharge rates,[45] but if the rate is very low, it will partly self-discharge during the long time of operation, again lowering its efficiency.

Installing batteries with different A·h ratings will not affect the operation of a device (except for the time it will work for) rated for a specific voltage unless the load limits of the battery are exceeded. High-drain loads such as digital cameras can result in delivery of less total energy, as happens with alkaline batteries.[31] For example, a battery rated at 2000 mA·h for a 10- or 20-hour discharge would not sustain a current of 1 A for a full two hours as its stated capacity implies.

VII. MICROCONTROLLER – ATMEGA 8

1.High-performance, Low-power AVR®

1.1 8-bit Microcontroller

2.Advanced RISC Architecture

2.1 130 Powerful Instructions – Most

Single-clock Cycle Execution

2.2 32 x 8 General Purpose Working

Registers

2.3 Fully Static Operation

2.4 Up to 16 MIPS Throughput at 16

MHz

2.5 On-chip 2-cycle Multiplier

3.High Endurance Non-volatile Memory segments

3.1 8K Bytes of In-System Self-

programmable Flash program

memory

3.2 512 Bytes EEPROM

3.3 1K Byte Internal SRAM

3.4Write/ Erase Cycles: 10,000

Flash/100,000 EEPROM

3.5Data retention: 20 years at 85°C/100

years at 25°C (1)

3.6Optional Boot Code Section with

Independent Lock Bits

4.In-System Programming by On-chip Boot Program

4.1True Read-While-Write Operation

4.2Programming Lock for Software

Security

5.Peripheral Features

5.1 Two 8-bit Timer/Counters with

Separate Prescaler, one compare

6.Six Channels 10-bit Accuracy

6.1 Byte-oriented Two-wire Serial

Interface

6.2 Programmable Serial USART

6.3 Master/Slave SPI Serial Interface

6.4 Programmable Watchdog Timer with

Separate On-chip

7.Oscillator

7.1 On-chip Analog Comparator

8.Special Microcontroller Features

8.1 Power-on Reset and Programmable

Brown-out Detection

8.2 Internal Calibrated RC Oscillator

8.3 External and Internal Interrupt

Sources

8.4 Five Sleep Modes: Idle, ADC Noise

Reduction, Power-save

9.I/O and Packages

9.1 23 Programmable I/O Lines

9.2 28-lead PDIP, 32-lead TQFP, and 32-

pad QFN/MLF

10.Operating Voltages

10.1 2.7 - 5.5V (ATmega8L)

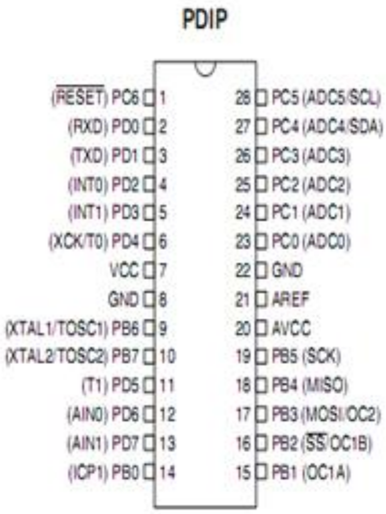
10.2 4.5 - 5.5V (ATmega8)

11.Power Consumption at 4 Mhz, 3V, 25°C

11.1 Active: 3.6 mA

11.2 Idle Mode: 1.0 mA

11.3 Power-down Mode: 0.5 µA

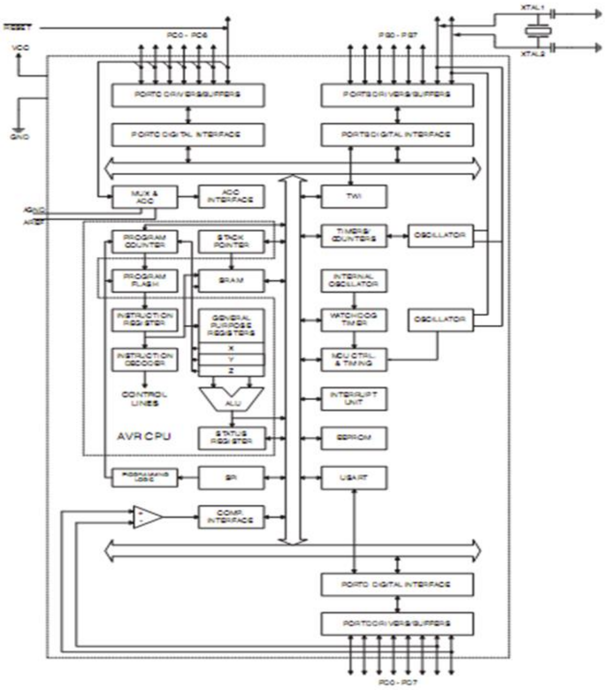


VIII. PIN CONFIGURATION

The ATmega8 is a low-power CMOS 8-bit microcontroller based on the AVR RISC architecture.

By executing powerful instructions in a single clock cycle, the ATmega8 achieves throughputs approaching 1 MIPS per MHz, allowing the system designer to optimize power consumption versus processing speed.

IX. BLOCK DIAGRAM



X.PIN DESCRIPTIONS

1.VCC :Digital supply voltage.

2.GND:Ground.

3.Port B(PC7..PB0) :It is an 8-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The Port B output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, Port B pins that are externally pulled low will source current if the pull-up resistors are activated. The Port B pins are tri-stated when a reset condition becomes active,even if the clock is not running.

4.Port C (PC5..PC0) :Port C is an 7-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The Port C output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, Port C pins that are externally pulled low will source current if the pull-up resistors are activated. The Port C pins are tri-stated when a reset condition becomes active, even if the clock is not running.

5.Port D (PD7..PD0) :Port D is an 8-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The Port D output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, Port D pins that are externally pulled low will source current if the pull-up resistors are activated. The Port D pins are tri-stated when a reset condition becomes active,even if the clock is not running.

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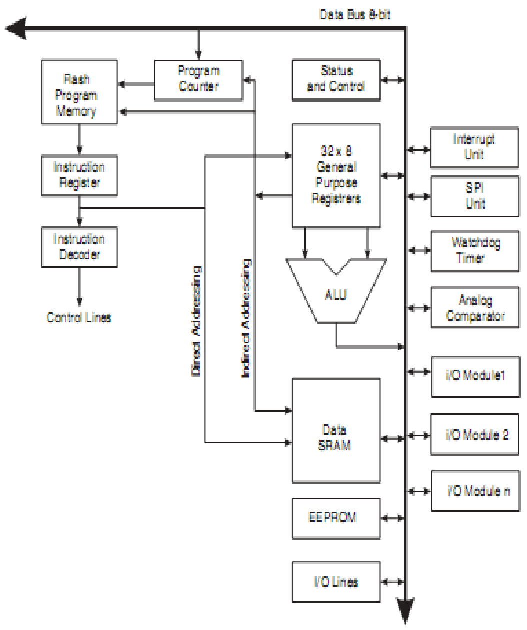
6.RESET (Reset input):A low level on this pin for longer than the minimum pulse length will generate a reset, even if the clock is not running. The Shorter pulses are not guaranteed to generate a reset.

7.AVCC: AVCC is the supply voltage pin for the A/D Converter, Port C (3..0), and ADC (7..6). It should be externally connected to VCC, even if the ADC is not used. If the ADC is used, it should be connected to VCC through a low-pass filter.

8.AREF:AREF is the analog reference pin for the A/D Converter.These pins are powered from the analog supply and serve as 10-bit ADC channels.

9.Basic Function: The main function of the CPU core is to ensure correct program execution. The CPU must therefore be able to access memories,perform calculations, control peripherals, and handle interrupts.



XI.Interfacing Of Data Bus With Different Units

In order to maximize performance and parallelism, the AVR uses a Harvard architecture with separate memories and buses for program and data.

Instructions in the Program memory are executed with a single level pipelining. While one instruction is being executed, the next instruction is pre-fetched from the Program memory. This concept enables instructions to be executed in every clock cycle.

The Program memory is In-System Reprogrammable Flash memory.The fast-access Register File contains 32 x 8-bit general purpose working registers with a single clock cycle access time. This allows single-cycle

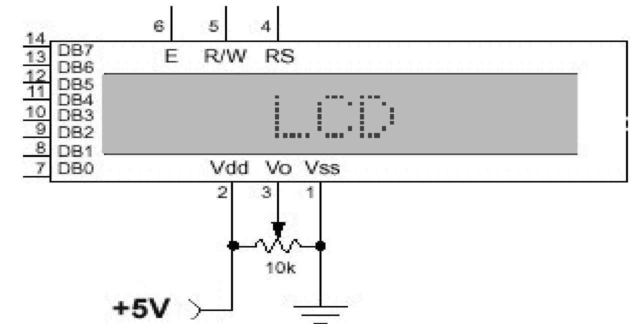
Arithmetic Logic Unit (ALU) operation. In a typical ALU operation, two operands are output from the Register File, the operation is executed, and the result is stored back in the Register File in one clock cycle.

Six of the 32 registers can be used as three 16-bit indirect address register pointers for Data Space addressing enabling efficient address calculations. One of the these address pointers can also be used as an address pointer for look up tables in Flash Program memory. These added function registers are the 16-bit X, Y and Z-register.The ALU supports arithmetic and logic operations between registers or between a constant and a register. Single register operations can also be executed in the ALU.After an arithmetic operation, the Status Register is updated to reflect information about the result of the operation.The Program flow is provided by conditional and unconditional jump and call instructions, able to directly address the whole address space. Most AVR instructions have a single 16-bit word format. Every Program memory address contains a 16- or 32-bit instruction.

Program Flash memory space is divided in two sections, the Boot program section and the Application program section. Both sections have dedicated Lock Bits for write and read/write protection. The SPM instruction that writes into the Application Flash memory section must reside in the Boot program section.During interrupts and subroutine calls, the return address Program Counter (PC) is stored on the Stack. The Stack is effectively allocated in the general data SRAM, and consequently the Stack size is only limited by the total SRAM size and the usage of the SRAM. All user programs must initialize the SP in the reset routine (before subroutines or interrupts are executed). The Stack Pointer SP is read/write accessible in the I/O space.The data SRAM can easily be accessed through the five different addressing modes supported in the AVR architecture.The memory spaces in the AVR architecture are all linear and regular memory maps.

A flexible interrupt module has its control registers in the I/O space with an additional global interrupt enable bit in the Status Register. All interrupts have a separate Interrupt Vector in the Interrupt Vector table. The interrupts have priority in accordance with their Interrupt Vector position. The lower the Interrupt Vector address, the higher the priority.The I/O memory space contains 64 addresses for CPU peripheral functions as Control Registers, SPI, and other I/O functions. The I/O Memory can be accessed directly, or as the Data Space locations following those of the Register File, 0x20 - 0x5F.

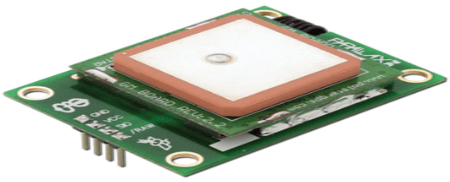
XII. LCD



Pin Diagram of LCD

A liquid-crystal display (LCD) is a flat-panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals. Liquid crystals do not emit light directly, instead using a backlight or reflector to produce images in colour or monochrome. LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed images with low information content, which can be displayed or hidden, such as present 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.

XIII. GPS



The Global Positioning System (GPS) is a space-based satellite navigation system that provides location and time information in all weather conditions, anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites. The system provides critical capabilities to military, civil and commercial users around the world. It is maintained by the United States government and is freely accessible to anyone with a GPS receiver.

The GPS project was developed in 1973 to overcome the limitations of previous navigation systems,integrating ideas from several predecessors, including a number of classified engineering design studies from the 1960s. GPS was created and realized by the U.S. Department of Defense (DoD) and was originally run with 24 satellites. It became fully operational in 1994. Bradford Parkinson, Roger L. Easton, and Ivan A. Getting are credited with inventing it.Advances in technology and new demands on the existing system have now led to efforts to modernize the GPS system and implement the next generation of GPS III satellites and Next Generation Operational Control System (OCX). Announcements from Vice President Al Gore and the White House in 1998 initiated these changes. In 2000, the U.S. Congress authorized the modernization effort, GPS III.

XIV. DATA PUSHER

Data pusher is the most common type of GPS tracking unit, used for asset tracking, personal tracking and Vehicle tracking system.

Also known as a GPS beacon, this kind of device pushes (i.e. "sends") the position of the device as well as other information like speed or altitude at regular intervals, to a determined server, that can store and instantly analyze the data.

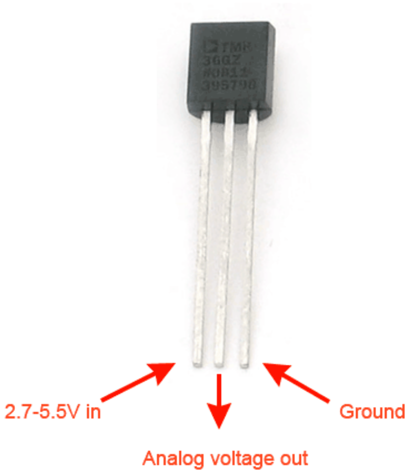
A GPS navigation device and a mobile phone sit side-by-side in the same box, powered by the same battery. At regular intervals, the phone sends a text message via SMS or GPRS, containing the data from the GPS receiver .

XV.PRODUCT CONCEPT

Designed for global market, SIM300 is a Tri-band GSM/GPRS engine that works on Frequencies EGSM 900 MHz, DCS 1800 MHz and PCS 1900 MHz SIM300 features GPRS Multi-slot class 10/ class 8 (optional)and supports the GPRS coding schemes CS-1, CS-2, CS-3 and CS-4.

XVI.SIM CARD INTERFACE

You can use AT Command to get information in SIM card. The SIM interface supports the functionality of the GSM Phase 1 specification and also supports the functionality of the new GSM Phase 2+ specification for FAST 64 kbps SIM (intended for use with a SIM application Tool-kit).Both 1.8V and 3.0V SIM Cards are supported. The SIM interface is powered from an internal regulator in the module having nominal voltage 2.8V. All pins reset as outputs driving low.

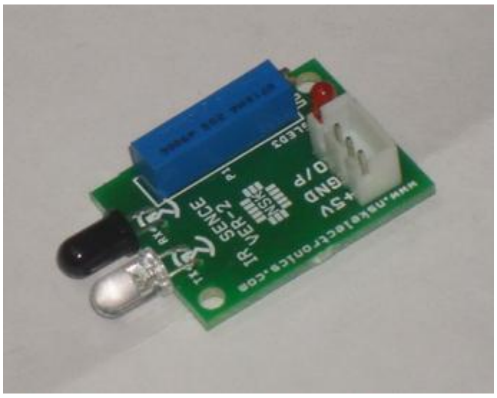


XVII. TEMPERATURE SENSOR

An analog temperature sensor is pretty easy to explain, its a chip that tells you what the ambient temperature is!

These sensors use a solid-state technique to determine the temperature. That is to say, they don’t use mercury (like old thermometers), bimetalic strips (like in some home thermometers or stoves), nor do they use thermistors (temperature sensitive resistors). Instead, they use the fact as temperature increases, the voltage across a diode increases at a known rate. (Technically, this is actually the voltage drop between the base and emitter - the Vbe - of a transistor. By precisely amplifying the voltage change, it is easy to generate an analog signal that is directly proportional to temperature. There have been some improvements on the technique but, essentially that is how temperature is measured.

XVIII. IR SENSOR



IR sensors use infra red light to sense objects in front of them and gauge their distance. The commonly used Sharp IR sensors have two black circles which used for this process, an emitter and a detector (see image right).

A pulse of infra red light is emitted from the emitter and spreads out in a large arc. If no object is detected then the IR light continues forever and no reading is recorded. However, if an object is nearby then the IR light will be reflected and some of it will hit the detector. This forms a simple triangle between the object, emitter and detector. The detector is able to detect the angle that the IR light arrived back at and thus can determine the distance to the object. This is remarkably accurate and although interference from sunlight is still a problem, these sensors are capable of detecting dark objects in sunlight now.

XIX.SOFTWARE

1. AVR

The AVR is a modified Harvard architecture8-bitRISC single chip microcontroller which was developed by Atmel in 1996. The AVR was one of the first microcontroller families to use on-chip flash memory for program storage, as opposed to one-time programmable ROM, EPROM, or EEPROM used by other microcontrollers at the time.

1.1.AVR DRAGON

The Atmel Dragon is an inexpensive tool which connects to a PC via USB. The Dragon can program all AVRs via JTAG, HVP, PDI , or ICSP. The Dragon also allows debugging of all AVRs via JTAG, PDI, or DebugWire; a previous limitation to devices with 32 kB or less program memory has been removed in AVRstudio 4.18. The Dragon has a small prototype area which can accommodate an 8, 28, or 40-pin AVR, including connections to power and programming pins. There is no area for any additional circuitry, although this can be provided by a third-party product called the "Dragon Rider".

Butterfly demo board:

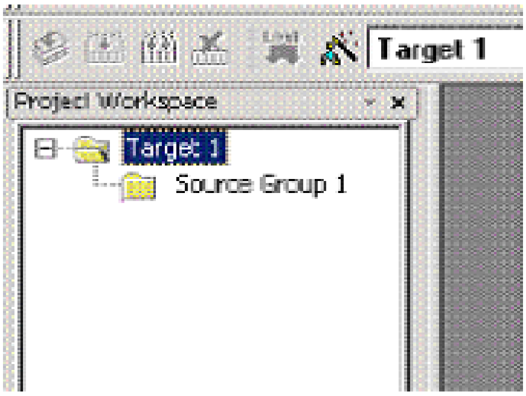
1.2 AVR BUTTERFLY

The very popular AVR Butterfly demonstration board is a self-contained, battery-powered computer running the Atmel AVR ATmega169V microcontroller. It was built to show-off the AVR family, especially a new built-in LCD interface. The board includes the LCD screen, joystick, speaker, serial port, real time clock (RTC), flash memory chip, and both temperature and voltage sensors. Earlier versions of the AVR Butterfly also contained a CdS photoresistor; it is not present on Butterfly boards produced after June 2006 to allow RoHS compliance. The small board has a shirt pin on its back so it can be worn as a name badge.

The AVR Butterfly comes preloaded with software to demonstrate the capabilities of the microcontroller. Factory firmware can scroll your name, display the sensor readings, and show the time. The AVR Butterfly also has a piezo speaker that can be used to reproduce sounds and music.

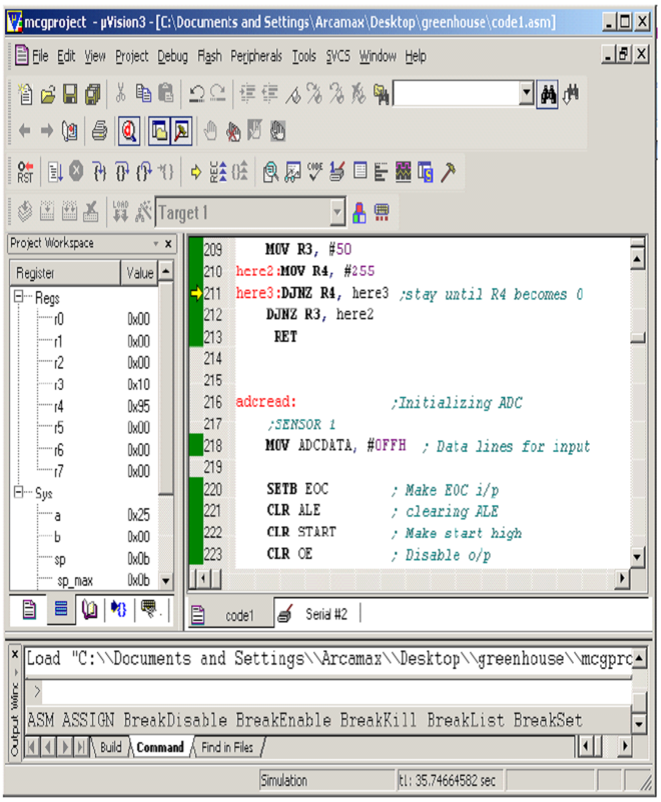
The AVR Butterfly demonstrates LCD driving by running a 14-segment, six alpha-numeric character display.

XX.PROJECT WORKSPACE



XXI.DEBUGGER WINDOW

At the left side of the debugger window, a table is displayed containing several key parameters about the simulated microcontroller, most notably the elapsed time (circled in the figure below). Just above that, there are several buttons that control code execution. The “Run” button will cause the program to run continuously until a breakpoint is reached, whereas the “Step Into” button will execute the next line of code and then pause (the current position in the program is indicated by a yellow arrow to the left of the code).



µVision3 Debugger window

XXII.CONCLUSION

This article proposed an intelligent system which can assist the blind to walk, which consists of a cane and an embedded system. After testing, the system proposed in this paper helps users walk in a relatively safe environment reliably, such as indoors, parks, and schools. The system not only makes them free, but also liberates their mind and throw away many worries and doubts. However, in some specific open environment, such as on the road, the blind still need someone accompany them if they have to take a long trip. What's more, the effect of the system will be reduced obviously in crowded environment.

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