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Strategical Survey of Wireless Based Target Detection and Classification System Using seismic and PIR Sensors

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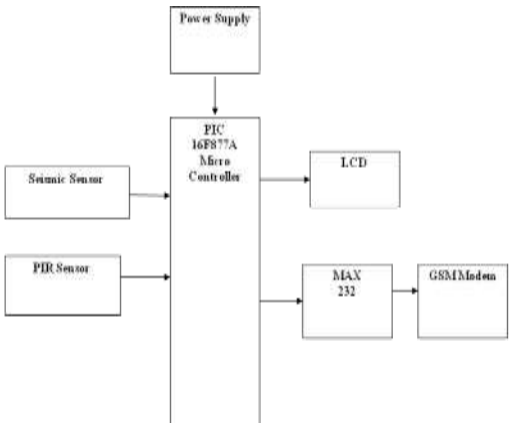
ABSTRACT
Wireless based target detection can also be used to detect the vehicles and human or animals. These systems are usually lightweight devices that automatically monitor the local activities in-situ, and transfer target detection and classification reports to the processing center through wireless. It is necessary that the monitoring system at borders must prove to be more efficient. This system based on Seismic sensor and PIR sensor is designed to find the target which is moving on the ground. Ref[1,2,3,4] In the existing system the Unattended Ground Sensors are used in target detection. The efficiency of the existing system is limited by false alarm rates. Also power consumption becomes a consideration in the existing system. In the proposed system PIR and seismic sensors are used in target detection. The PIR Sensor is used to track down whether the moving object is living body or machine. If it is living body, the seismic sensor is used to track down whether it is human being or animal based on the absorbed signals. If it is vehicle, then seismic sensor is used to classify the type of vehicle moving on the ground. All these process are monitored and controlled using PIC16F877A microcontroller. The status is sent through GSM as a message to the Mobile Section.

Introduction

An Unattended Ground Sensor (UGS) is a device placed on the ground which automatically gathers and interprets sensor data from emote “targets”, then transfers results back to some higher level processing center. Until now, UGS systems have been used in a variety of applications ranging from industrial monitoring to military information gathering.[1] Typically used sensors in UGS systems include acoustic and seismic sensors. Most of the target detection and classi£cation methods have been proposed based on acoustic signal processing because seismic waves are more complicate to analyze.

Seismic waves propagate in different forms, different directions, different speeds, and are highly dependent on the underlying geology. Acoustic vehicle recognition will be affected by Doppler effects, by noises introduced from various moving parts of vehicles, and by atmospheric and terrain variations, while seismic waves are less sensitive to these factors. Seismic waves are classified into two categories: body waves and surface waves. Body waves travel at a higher speed through the interior of the Earth and propagate in three dimensions, while surface waves travel near the surface of the Earth and propagate in two dimensions. Based on different processing domains, current feature extraction methods for seismic signals can be classi£ied into three categories: time domain methods, frequency domain methods, and time-frequency domain methods.

The power supply section is the important one. It should deliver constant output regulated power supply for successful working of the project. A 0-12V/1 mA transformer is used for this purpose. The primary of this transformer is connected in to main supply through on/off switch& fuse for protecting from overload and short circuit protection. The secondary is connected to the diodes to convert 12V AC to 12V DC voltage. And filtered by the capacitors, which is further regulated to +5v, by using IC 7805



Block diagram
Monitor section

Block Diagram Description
Block 1:PIC16F877A Microcontroller
Block 2: GSM
Block 3: Display unit
Block 4: Sensor unit
Block 5: MAX-232

Block 1: PIC Microcontroller

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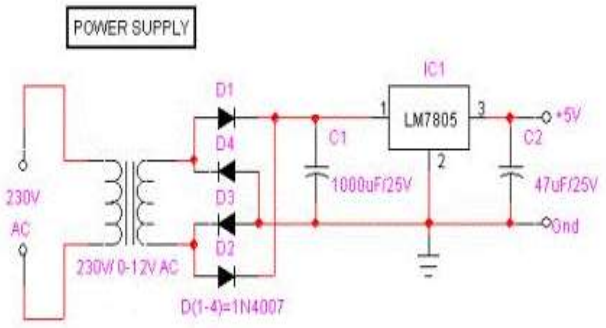


Analog Applications

10-bit, up to 8-channel Analog-to-Digital Converter (A/D), Brown-out Reset (BOR), Analog Comparator module with, Two analog comparators Programmable on-chip voltage reference (VREF) module, Programmable input multiplexing from device inputs and internal voltage reference, Comparator outputs are externally accessible

High-Performance Risc Cpu

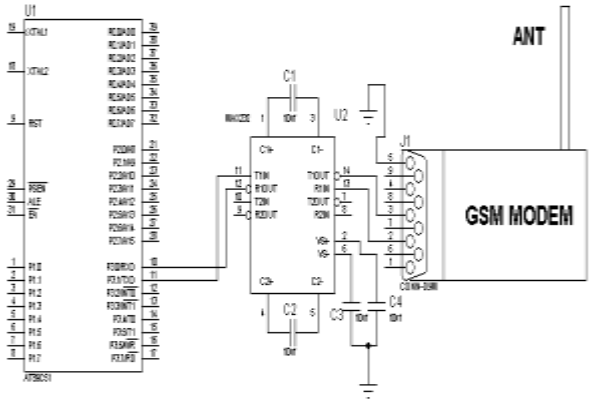
Only 35 single-word instructions to learn, All single-cycle instructions except for program branches, which are two-cycle, Operating speed: DC – 20 MHz clock input DC – 200 ns instruction cycle, Up to 8K x 14 words of Flash Program Memory, Up to 368 x 8 bytes of Data Memory (RAM), Up to 256 x 8 bytes of EEPROM Data Memory, Pinout compatible to other 28-pin or 40/44-pin PIC16CXXX and PIC16FXXX microcontrollers.

Block 2: Sensor unit

PIR-based remote thermometer: Designs have been implemented in which a PIR circuit measures the temperature of a remote object. In such a circuit, a non-differential PIR output is used. The output signal is evaluated according to a calibration for the IR spectrum of a specific type of matter to be observed. By this means, relatively accurate and precise temperature measurements may be obtained remotely. Without calibration to the type of material being observed, a PIR thermometerdevice is able to measure changes in IR emission which correspond directly to temperature changes, but the actual temperature values cannot be calculated.

Block 3: Gsm Modem

A GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem. The main difference between them is that a dial-up modem sends and receives data through a fixed telephone line while a wireless modem sends and receives data through radio waves. The working of GSM modem is based on commands, the commands always start with AT (which means ATtention) and finish with a <CR> character. For example, the dialing command is ATD<number>; ATD3314629080; here the dialing command ends with semicolon.

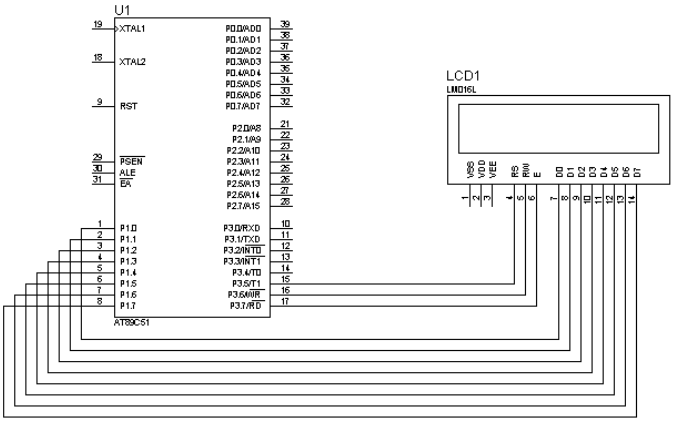


Block 4: LCD

The LCD standard requires 3 control lines and 8 I/O lines for the data bus. • 8 data pins D7:D0Bi-directional data/command pins.

Alphanumeric characters are sent in ASCII format.• RS: Register SelectRS = 0 -> Command Register is selected RS = 1 -> Data Register is selected • R/W: Read or Write 0 -> Write, 1 -> Read• E: Enable (Latch data) Used to latch the data present on the data pins.

A high-to-low edge is needed to latch the data.The 8 data lines are connected to PORT 1 of 8051 microcontroller. The three control lines(RS,RW and EN) are connected to PORT 3.5,3.6 and 3.7 respectively.



Block 5: MAX232

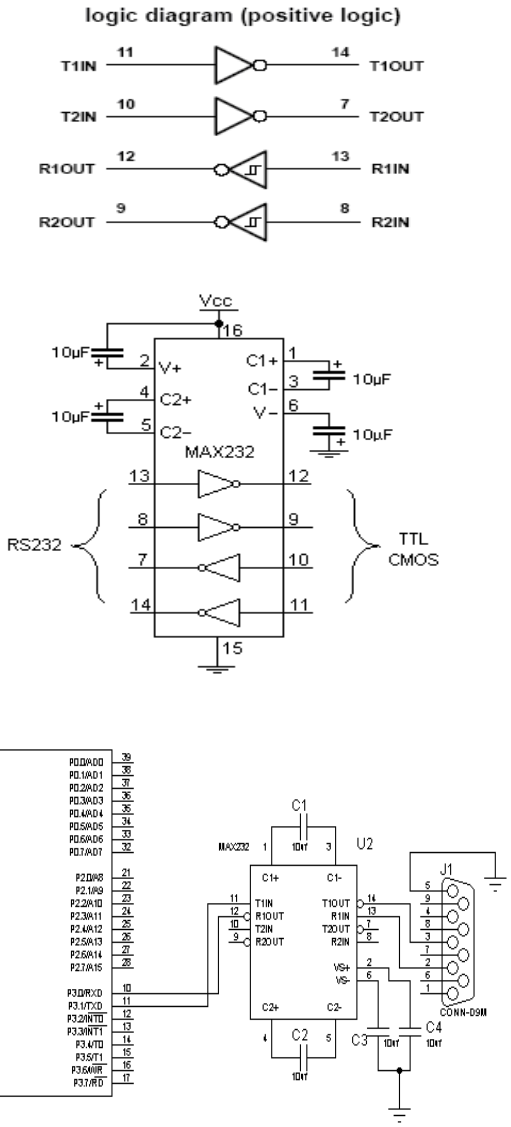
The MAX232 is a dual driver/receiver that includes a capacitive voltage generator to supply RS 232 voltage levels from a single 5v supply. Each receiver converts RS-232 to 5v TTL/CMOS levels. Each driver converts TLL/CMOS input levels into EIA-232 levels. The P3_0 (RX) and P3_1 (TX) pin of controller is connected to the max 232 driver and the TX and RX pin of max 232 is connected to the GSM modem or PC.

Application

It can be used in traffic areas It can be used in traffic areas to reduce the pollution. It can also be used in hospitals In the hospital region CO2 emission is the major problem in that location it is very use full to reduce the pollutions.

Future Enhancement

While there are many research issues that need to resolve before exploring commercial applications of the proposed method,The following topics are under active research: Enhancement of target detection and classification performance by fusion of seismic and PIR sensor signals. Real-time field implementation of the proposed method on low-cost low-power microprocessors for different types of deployment (e.g., UGS fencing to secure a region).



Hardware Requirment

PIC16F877A Microcontroller with Power Supply
GSM Modem
Max 232
PIR sensor
Seismic sensor
LCD.

Conclusion

This paper presents a symbolic feature extraction method for target detection and classification, where the features are extracted as statistical patterns by symbolic dynamic modeling of the wavelet coefficients generated from time series of seismic and PIR sensors. By appropriate selection of wavelet basis and scale range, the wavelet-transformed signal is denoised relative to the original time-domain signal. In this way, the symbolic images generated from wavelet coefficients capture the signal characteristics with larger fidelity than those obtained directly from the time domain signal. The symbolic images are then modeled using probabilistic finite state automata (PFSA) that, in turn, generate low-dimensional statistical patterns, also called feature vectors. A distinct advantage of the proposed feature extraction method is that the low-dimensional feature vectors can be computed in-situ and communicated in real time over a limited-bandwidth wireless sensor network with limited-memory nodes.

Acknowledgment

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