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Distributed Personal Authentication System

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Abstract- It is known that currently India is facing big issues like terror attacks by terrorists. So our borders are protected by Iron Spike fences, and a watchtower containing soldiers. Those persons are fully responsible to prevent any intrusion. This project will not fully remove the responsibility of the soldiers, but manages to take the maximum responsibility and thus help soldiers at the border. The basic purpose of the project is to enhance the border security electronically with automation. By using GPS, system can track position of gun and also can be used for security purpose using password.

Keywords- Automatic gun control, Password authentication, GPS, Wireless Communication, ARM7, Keil, Embedded based.

INTRODUCTION

It is a common story that weapons of policemen or soldiers are stolen. This results into the use of these weapons for various crimes. Each year there are thousands of fatal gunshot victims in India. What makes these weapons preferable to another user is, no authentication is required for using the weapons. So to overcome these problems this system checks the identity of the person who holds the gun before user can fire it by using proper password for authentication.

The solution is a Wireless Link between two or more objects. There will be a wireless link between the gun and the module on the body of the policeman or soldier. This means that the gun will operate only if it gets the correct password from the soldier. At war-field soldier can use this automatic gun to distract enemies by using his password.

SYSTEM ARCHITECTURE

In this system there are three sections, defined as follows:

PERSON SECTION

In person section input is taken through the keypad from the user is in the form of 4 digit code and then this code is transmitted to the HT12 encoder. Encoder converts this code into digital form and then it is transmitted by using a STT 433Mhz transmitter. Radio frequency (RF) is a frequency or rate of oscillation within the range of about 3 Hz to 300 GHz. This range corresponds to frequency of alternating current electrical signals used to produce and detect radio waves. Since most of this range is beyond the vibration rate that most mechanical systems can respond to, RF usually refers to oscillations in electrical circuits or electromagnetic radiation.

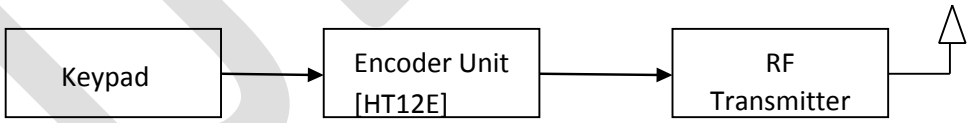

Fig.1 Person section

Device section

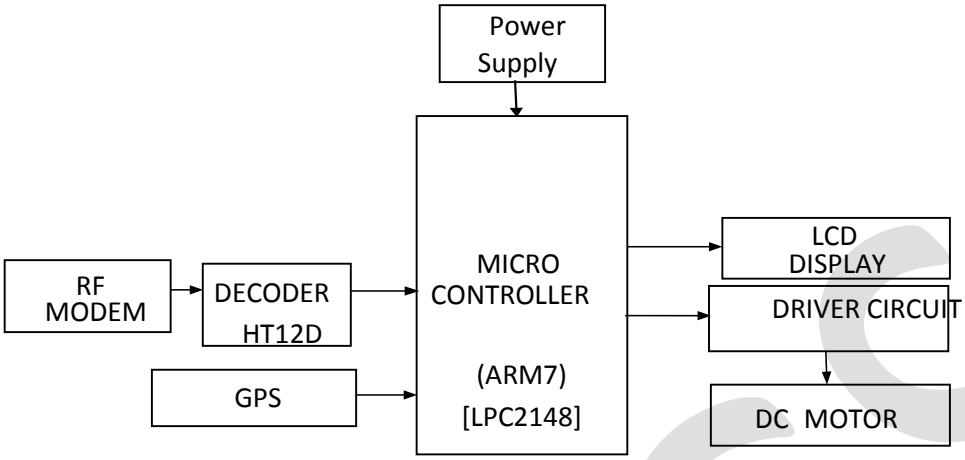

Fig.2 Device section

Device section is mounted on weapon. In device section there is a receiver which can receive the signal transmitted by the STT 433 MHz transmitter .The receiver used is STR 433Mhz which will receive only the 433 MHz frequency then this received signal is decoded using HT12D decoder.

Then the decoded output is given to ARM 7 microcontroller. If the output of the decoder matches the code given by the user then the DC motor is started. In the ARM microcontroller there is program present which can be written in embedded C. This program compares the output of decoder to the user code. The ARM microcontroller can be activated and deactivated by using external switch. Here relay is used to control the DC motor. If the gun operates successfully then on LCD display there will be a message displayed that is "DEVICE IS OPERATING". And if device is not operating then it will display" DEVICE IS NOT OPERATING".

Admin section

The admin section is mainly used for backup plan. In case of any accident, if the device where the authentication is done is misplaced or damaged then the user can use the admin section for further working. The admin section can be used for both the purposes as to permanently disable the weapon or permanently enable it. To make permanently enable or disable the weapon user need to request to admin section. The weapon can be controlled by the soldier and the administrator in control room by using personal section and admin section respectively.

In admin section user need to enter a code or password via keyboard which will be connected to the computer or mobile. And then by using RF transmitter that admin section will do as per requirements of the user. This admin section is also useful when soldier is died and further use of that weapon is carried through control room.

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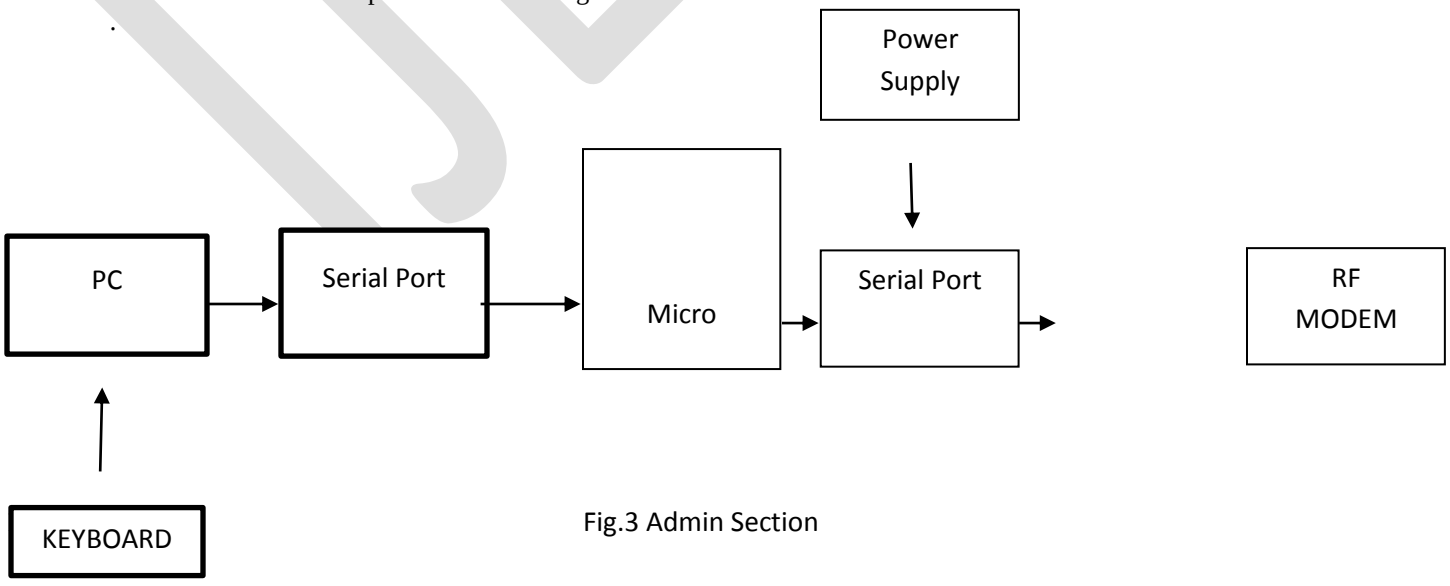

Fig.3 Admin Section

HARDWARE COMPONENTS

Following components are used in this system:

ARM 7 Microcontroller- The principle feature of the ARM 7 microcontroller is that it is a register based load-and store architecture with a number of operating modes. While the ARM7 is a 32 bit microcontroller, it is also capable of running a 16-bit instruction set, known as "THUMB". This helps to achieve a greater code density and enhanced power saving. While all of the register-to-register data processing instructions are single-cycle, other instructions such as data transfer instructions are multi-cycle. To increase the performance of these instructions the ARM 7 has a three stage pipeline.

In order to keep the ARM 7 both simple and cost-effective, the code and data regions are accessed via a single data bus. Thus while the ARM 7 is capable of single-cycle execution of all data processing instructions, data transfer instructions may take several cycles since they will require at least two accesses onto the bus (one for the instruction and one for the data). In order to improve performance, a three stage pipeline is used that allows multiple instructions to be processed simultaneously. The pipeline has three stages; FETCH, DECODE and EXECUTE.

Power supply- The main building block of any electronic system is the power supply to provide required power for their operation and is as shown in the Figure 5. For the microcontroller, keyboard, LCD, RTC, GSM, +5V, 3.3V and +12V is required.

RF Transmitter- the STT-433 is ideal for remote control applications where low cost and longer range is required. The transmitter operates from a1.5-12V supply, making it ideal for battery-powered applications. The transmitter employs a SAW-stabilized oscillator, ensuring accurate frequency control for best range performance. The manufacturing-friendly SIP style package and low-cost make the STT-433 suitable for high volume applications.

RF Receiver- The data is received by the RF receiver from the antenna pin and this data is available on the data pins. Two Data pins are provided in the receiver module. Thus, this data can be used for further applications. Operating voltage: 2.4V~12V.Low power and high noise immunity CMOS technology.

HT-12E encoder- The 2^{12} encoders are a series of CMOS LSIs for remote control system applications. They are capable of encoding information which consists of N address bits and 12_N data bits. Each address/data input can be set to one of the two logic states. The programmed addresses/data are transmitted together with the header bits via an RF or an infrared transmission medium upon receipt of a trigger signal. The capability to select a TE trigger on the HT12E further enhances the application flexibility of the 2^{12} series of encoders.

HT-12D decoder- The decoders are a series of CMOS LSIs for remote control system applications. They are paired with Hole 2^{12} series of encoders. For proper operation, a pair of encoder/decoder with the same number of addresses and data format should be chosen. The decoders receive serial addresses and data from a programmed 2^{12} series of encoders that are transmitted by a carrier using an RF or an IR transmission medium. They compare the serial input data three times continuously with their local addresses. If no error or unmatched codes are found, the input data codes are decoded and then transferred to the output pins. The VT pin also goes high to indicate a valid transmission. The 2^{12} series of decoders are capable of decoding information's that consist of N bits of address and 12_N bits of data. Of this series, the HT12D is arranged to provide 8 address bits and 4 data bits, and HT12F is used to decode 12 bits of address information.

GPS section- The Global Positioning System (GPS) is a satellite-based navigation system consists of a network of 24 satellites located into orbit. The system provides essential information to military, civil and commercial users around the world and which is freely accessible to anyone with a GPS receiver. GPS works in any weather circumstances at anywhere in the world. Normally no subscription fees or system charges to utilize GPS.

A GPS receiver must be locked on to the signal of at least three satellites to estimate 2D position (latitude and longitude) and track movement. With four or more satellites in sight, the receiver can determine the user's 3D position (latitude, longitude and altitude). Once the vehicle position has been determined, the GPS unit can determine other information like, speed, distance to destination, time and other. GPS receiver is used for this research work to detect the vehicle location and provide information to responsible person through GSM technology.

CIRCUIT DISCRIPTION

POWER SUPPLY

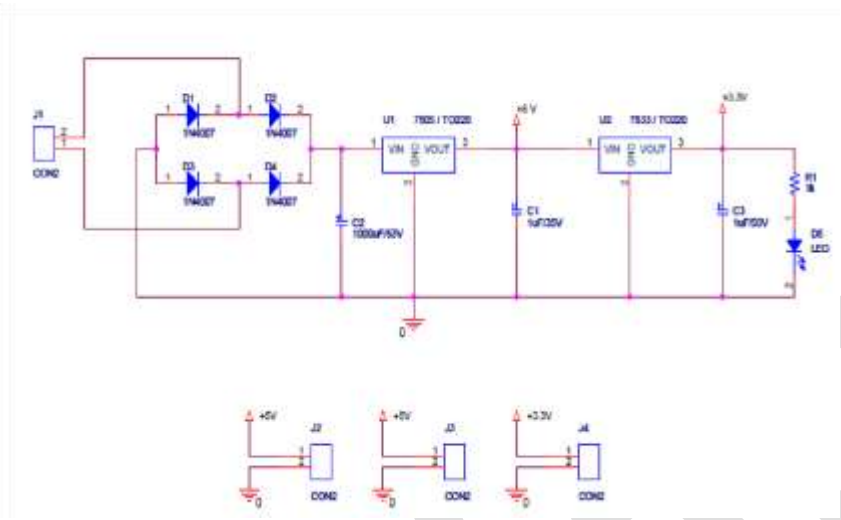

Fig.4 Power supply

Device section

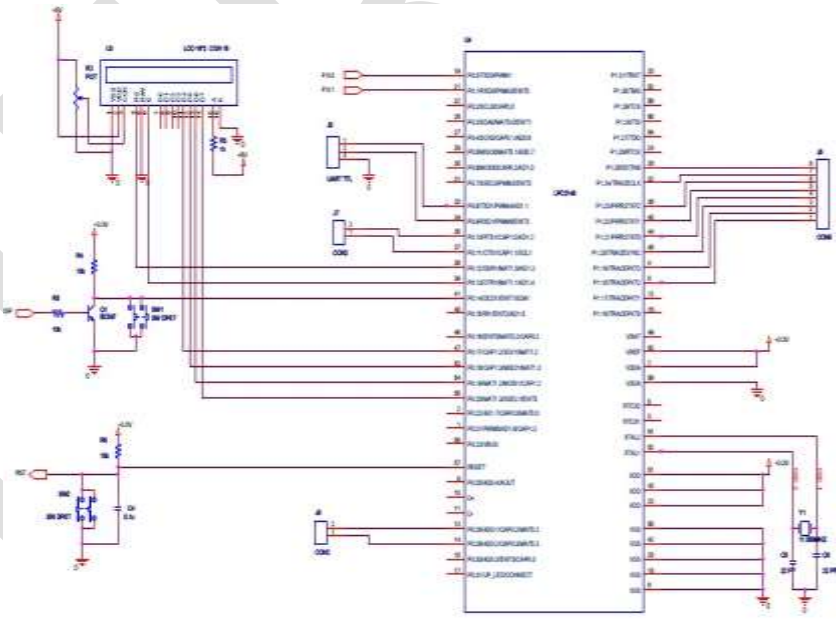

Fig.5 (a) Device section

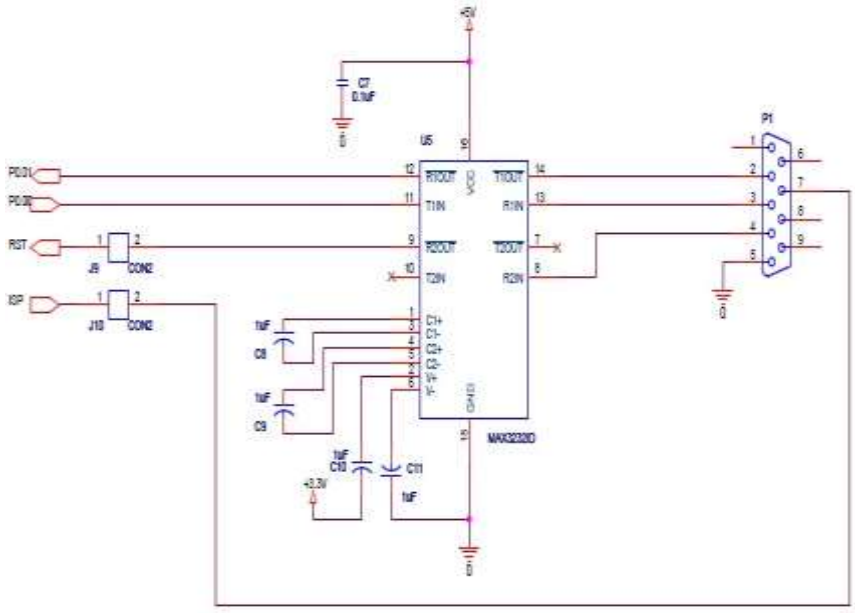

Fig.5 (b) Device section

SOFTWARE IMPLIMENTATION

Operation of the system requires following software:

Embedded C- Source code is written in C. Writing in c simplifies code development for large projects. It can be reused, and is easy to maintain and debug.

Flash Magic- It is a tool which supports ISP (In System Programming) feature. It is used to burn a hex code in EEPROM of microcontroller.

Kiel vision IDE- The vision IDE from Kiel combines project management, source code editing, programed debugging, and complete simulation in one powerful environment. The vision editor and debugger are integrated in a single application that provides a seamless embedded project development environment.

The Kiel µVision Debugger accurately simulates on-chip peripherals (I²C, CAN, UART, SPI, Interrupts, I/O Ports, A/D Converter, D/A Converter, and PWM Modules) of 89S52 device. Simulation helps to understand hardware configurations and avoids time wasted on setup problems. With simulation, we can write and test applications before target hardware is available. The system program written in embedded C using KEIL IDE software will be stored in Microcontroller.

Keil development tools for the Microcontroller Architecture support every level of software the professional applications engineer to the student for learning about embedded software development. The industry standard Kiel C Compilers, Macro Assemblers, Debuggers, Real-time Kernels, Single-board Computers, and Emulators support all 89S52 derivatives. The Kiel Development Tools are designed to solve the complex problems facing embedded software developers.

RESULT

Three section with casing are as shown in figure

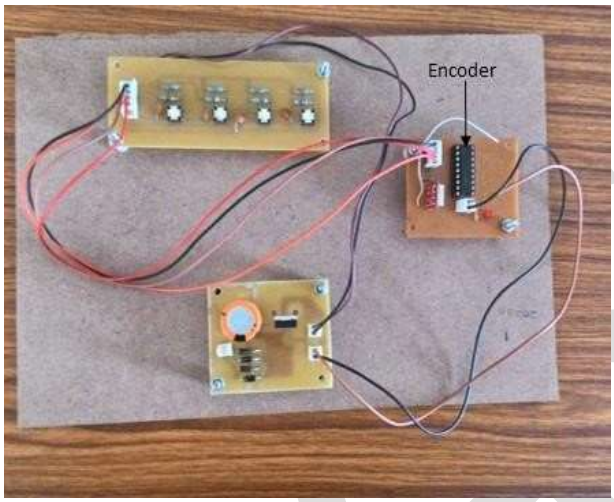

Fig.6 Person section

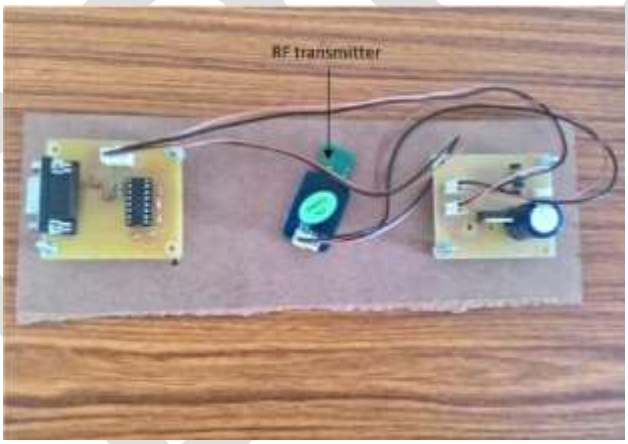

Fig.7 Admin section

Person section as shown in figure 6 is with soldier in warfield. Password is known to only soldier and control room admin. As soon as authentication is successful, then motor in device section rotates.Admin control room is for backup support when soldier is dead or injured. Then admin can access that gun with the password.

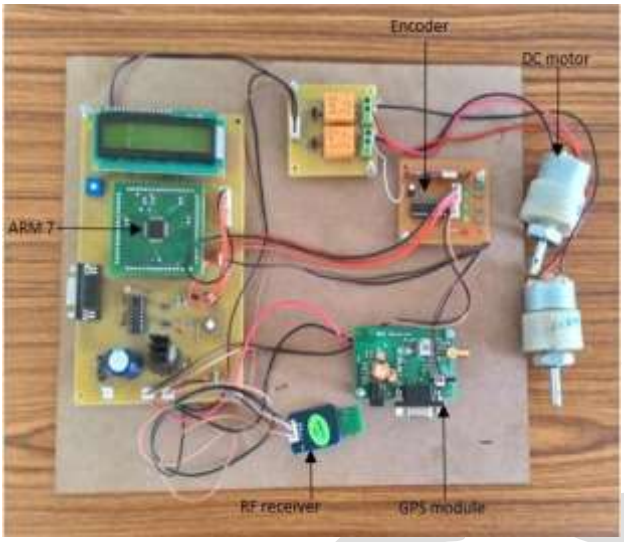

Fig.8 Device section

Truth table for person section:

Table no. 1

Switch position				Motor		SYSTEM
S1	S2	S3	S4	M1	M2	
1	1	1	1	-	-	ON
1	0	0	0	ON	-	-
0	1	0	0	OFF	-	-
0	0	1	0	-	ON	-
0	0	0	1	-	OFF	-
1	0	1	0	ON	ON	-
0	1	1	0	OFF	ON	-
1	0	0	1	ON	OFF	-
0	1	0	1	OFF	OFF	-

Truth table for admin section:

Code	Motor		System
123	-	-	ON
M1N	ON	-	-
MIF	OFF	-	-
M2N	-	ON	-
M2F	-	OFF	-
GPS	-	-	1846.4404,N 7383.2024,E

Table no. 2

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CONCLUSION

Now a days India is sick off massive terror attacks and bomb explosions. To avoid such disaster this DPAS system is useful as technical power. In today's world this system will be very useful for the security purpose in defence service. The hardware and software both can be further modified according to the requirement. Multiple weapons can be operated by a single soldier. Injured soldier also can battle using this system.

This paper can be used as a simple didactic reference which proposes introducing a complete top down system design flow, touching clearly all steps of a system design, hardware components selection, power supply section designing, microcontroller firmware programming, PCB board designing, GUI software programming, high level data elaboration and system testing.

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