

Review of a Multipurpose Smart Bag

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Abstract: Smart bag is an application-specific product that can be of use to almost everyone in society. Smart means smart, the bag will be smart enough to carry out a variety of features for daily use. The ATmega16 microcontroller, the brain of the proposed system, will control all distinguishable features. The solar panel attached to the front of the bag will not only charge electronic devices such as mobile phones, laptops, etc., but will also power the entire system. RF-ID Technology will be used to solve the problem of forgetfulness in order to pack the necessary objects. The object to be placed inside the bag will have these RF-ID tags attached to it. The RF-ID scanner will then read these tags. Another function addresses the problem of threatening situations. Emergency button on the bag that, when pressed, solves this problem in any emergency situation. When the button is pressed, the buzzer will be triggered and the location of the victim will be sent via SMS to three contacts and to the police control room. Another feature is the anti-theft feature that will track the mobile in the event of any theft. The Bluetooth Module will be used for tracking purposes.

Keywords: Smart Bag, Microcontroller ATmega16, RF-ID Scanner, Solar Panel, Bluetooth Module, GPS, Li-ion Battery, Buzzer, Anti-theft

INTRODUCTION

Now - a-days, everyone is using a Smart Phone. Including contact tools to online shopping or reservation of tickets, everything can be achieved using Smart Phones. Nevertheless, its regular use discharges the mobile battery more often than not. Often, when these mobile phones get older, it is found that the battery is drained regularly and needs to be charged at a short time. To overcome this problem, many smartphone users are buying power banks ranging from Rs.800 to 3000. But these power banks must also be charged separately on a daily basis. As a solution for this case, an energy source that is readily and easily available and safe to use can be used. Solar energy is best suited to this need. Nowadays, a growing number of applications that use solar energy are emerging. Solar Energy is one of the most important renewable energy sources and its technologies can be broadly categorized as either passive solar or active solar based on the way in which solar energy is captured and distributed or the methods by which it is converted into solar energy. Effective solar technology consists of the use of photovoltaic devices, concentrated solar power and solar water heating for the use of electricity. Passive solar strategies include positioning the building to the Sun, choosing materials with promising thermal mass or light dispersing properties, and designing spaces that naturally circulate air. India is heavily

populated and has high solar insolation, a perfect combination for the use of solar power in India. In addition, its other energy resources are relatively scarce. This paper also proposes a system that can be useful to forgetful people to some extent to overcome the problem of remembering things to be carried along. This is done with the help of the RF-ID reader and tags. RF-ID technology is one of the most speedily evolving technologies of 21st century providing enormous economic benefit for both business and consumers. According to the global survey of the Thomas Reuters Foundation, India is the "fourth most dangerous country" in the world for women². This takes place in a country where women make it a top political and managerial position. The proposed Smart Bag adds a feature to offer safety to women through an emergency button on the bag. When this button is pressed, the location of the victim will be monitored using a handheld GPS and an SMS will be sent to the victim's contact. The hacking of mobile phones and the theft of personal data have become a growing concern. Increased mobile costs have also led to an increase in the number of mobile phone robberies. There is therefore a need for a device that will instantly show that theft is taking[1]place and create an alarm to warn the thief and also to make people around them aware of such an incident. This can be achieved using the Bluetooth module, which will be placed inside the package[2]. The Bluetooth module is paired with a

handheld Bluetooth phone. If the connection between the smartphone and Bluetooth modules is lost, an alarm system will be triggered to indicate mobile theft. The mobile phone can be recovered by using the other person's phone to get its location[3].

PROPOSED SMART BAG

The solar panel to be mounted to the front of the bag was determined to be 12 Volt, 5 Watt. The charge from the solar panel[4] is deposited temporarily in a 12 Volt Li-ion rechargeable battery[5][6]. This voltage is converted to 5 volts using the 7805 voltage regulator. The battery drives the microcontroller and other electronics as well as the charging of electronic devices. RF-ID tags are attached to frequently required items. The RF-ID Reader with an operating frequency of 125 KHz is used to read the tags. The reader reads the tag and serially transmits the data to the microcontroller[7]. The missing object is then shown on the LCD to show it to the customer. The HC05 Bluetooth Module with a 2.4 GHz operating frequency is used to detect connectivity between the mobile phone and the bag. The Microcontroller receives information from both the Bluetooth and RF-ID Reader modules. When the patient pushes the emergency button that will be on the bag handle, the Microcontroller will trigger the buzzer. The Bluetooth module, which is serially interfaced with a microcontroller, communicates wirelessly with a cell phone in order to locate the victim using a handheld GPS and send SMS to emergency contacts. Fig. 1 block diagram multipurpose smart bag.

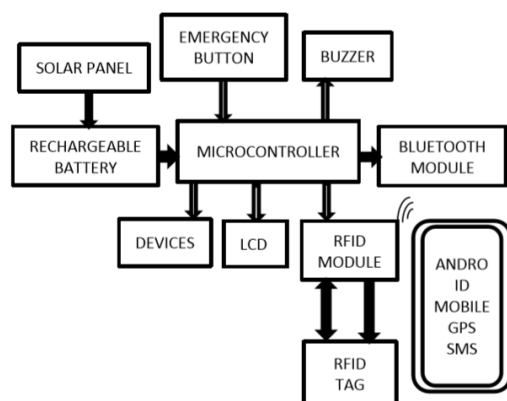


Figure 1: Block Diagram of Smart Bag

HARDWARE REQUIREMENTS

Microcontroller:

A microcontroller is a lightweight, single-chip integrated device consisting of processor core, memory, and programmable input / output peripherals. ATmega16 is a high-performance, low-power Atmel 8-bit AVR[8] RISC-based microcontroller. RISC (Reduced Instruction Set Computing) means that the instruction set has been reduced and most instructions can be executed in one computer cycle. It has 16 KB of programmable flash memory, 1 KB of SRAM, 512 bytes of EEPROM, a JTAG port for on-chip debugging, and an 8-channel built-in 10-bit A / D converter to remove the need for an external ADC adapter to ATmega16. The system works between 4.5 and 5.5 volts. Supports 16 MIPS throughput at 16 MHz by executing instructions in a single clock cycle, the system achieves throughputs of up to 1 MIPS per MHz, while balancing power consumption and processing speed.

Solar Panel:

The solar panel contains one or more solar photovoltaic (PV) modules that are electrically connected to each other. They are mounted on a supporting structure. Thin-film solar panels are ideal for single-device applications such as recharging a battery-operated user or running a particular appliance[10]. Photovoltaic or PV technology uses solar cells or solar photovoltaic arrays to convert energy from the sun to electricity. Solar cells generate direct energy from the sun's rays, which can then be used for driving or recharging batteries. Each module has a rating for its DC performance under standard test conditions and usually ranges from 100 to 320 watts.

Bluetooth Module:

Bluetooth is the standard of wireless technology. Bluetooth Module is a device that acts as a mediator between the built-in system and the Bluetooth communication device. It has a UART (Universal Asynchronous Receiver and Transmitter) interface for serial communication between the transmitter and the receiver. Data can be exchanged over short distances (using short-wave UHF radio waves in the ISM band from 2.4 to 2.485 GHz). It is a low-power consuming system with a short range of about 10 meters. In each unit, low-cost transceiver microchips are present. The

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Bluetooth device being a radio communication device does not allow a line of sight of each other[9][10].

RF-ID Module:

RF-ID, or Radio Frequency Identification, is a data collection system that uses low-power radio waves to send and receive data between tags and readers. The benefit of RF-ID is that there is no need for direct contact or line-of-view scanning. The RF-ID system consists of three components: an antenna and a transceiver (often combined into one reader) and a transponder (tag). The antenna uses radio frequency waves to relay a signal that activates the transponder¹¹. When triggered, the tag sends data back to the antenna. The data is used to tell the programmable logic controller that action should be taken. RF-ID uses a reader to read specific RF-ID^[11] tags attached to a particular item.

RF-ID Tags:

RF-ID tags have a built-in antenna that produces a magnetic field for contact between the RF-ID reader and the tag. RF-ID tags are typically of two types: active tags and passive tags. Active RF-ID and Passive RF-ID are fundamentally different technologies but are often tested together. Radio frequency energy is used for communication between the two tag forms and the user, but the tag Passive RF-ID depend on RF energy transferred from the reader to the tag. For this purpose, stronger signals are needed from the passive reader. The signal strength transmitted from the tag is limited to very low levels.¹² the low cost Passive Clamshell card and the shape of the credit card have been selected to be used in the device.

Li-ion Battery:

Lithium batteries are the main batteries that have lithium metal as an anode. Such types of batteries are also referred to as lithium metal batteries. These stand apart from other batteries due to their high charge density (long life) and lower cost per unit. Based on the configuration and the chemical compounds used, lithium cells can produce voltages ranging from 1.5 V (comparable to zinc-carbon or alkaline batteries) to approximately 3.7 V. Disposable primary lithium batteries must be differentiated from secondary lithium-ion or lithium-polymer batteries that are rechargeable batteries. Lithium is particularly useful because its ions can be distributed between the anode and the

cathode, using an intercalated lithium alloy as a cathode material, but without the use of lithium metal as an anode material. Simple lithium reacts immediately with water or even moisture in the air; lithium in lithium ion batteries is a less reactive material. Lithium batteries are widely used in portable consumer electronic devices and in electric vehicles ranging from full-size vehicles to radio controlled toys. The word "lithium battery" refers to a family of various lithium-metal chemistries, including many forms of cathodes and electrolytes, but all of them with metallic lithium as an anode. The battery requires between 0.15 and 0.3 kg of lithium per kWh. As planned, these primary systems use a charged cathode that is an electro-active material with crystallographic vacancy that is slowly filled during discharge.

SOFTWARE REQUIREMENTS AND IMPLEMENTATION*Bascom AVR:*

Apart from the hardware design specifications, need to use software to write separate routines for various interface devices and to test them on the hardware. The software is written in basic programming language and compiled using BASCOM AVR. This is a versatile and easy-to-use Windows Basic compiler and IDE for the AVR family.

PCB Design and Etching:

Printed circuit boards (PCBs) are specially designed for each circuit. These are not only lightweight but also cheaper than the already available ready-made modules or boards. There are many software applications available on the Internet that are used to draw circuit schematics. Express SCH was used to draw a diagram. Express PCB, including Express SCH, is open source software. Fig.2 shows the schematic of development board.

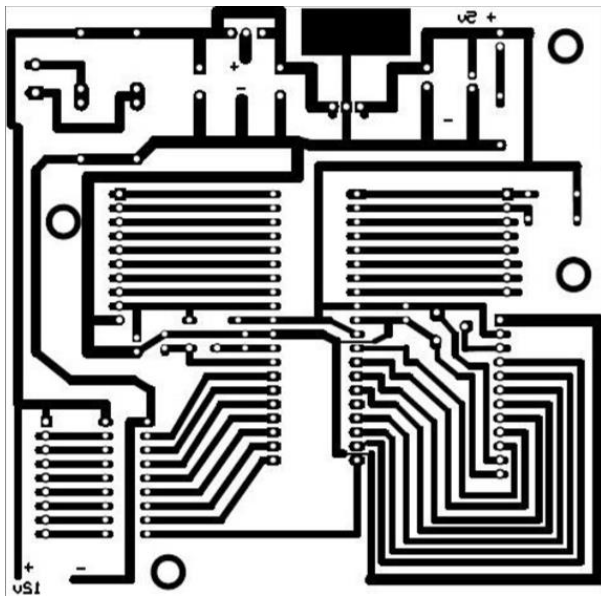


Figure 2: Schematic of Development Board

The schematic above is a self-designed development board for ATmega16. The design shall be based on the circuit shown in Figure 2.

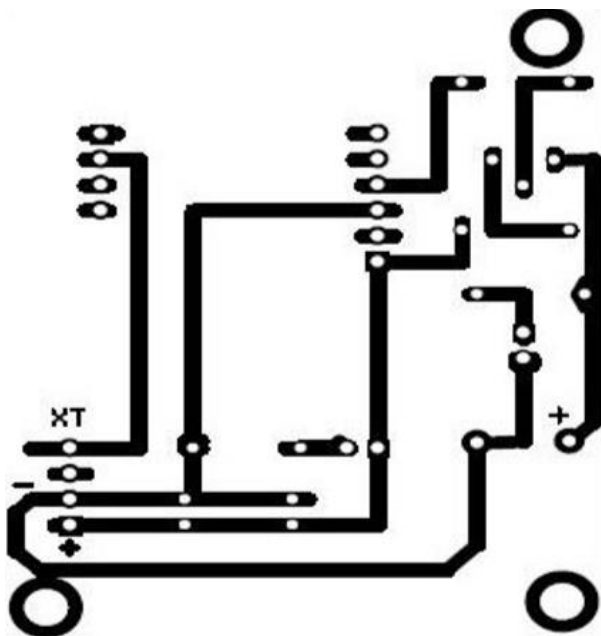


Figure 3: Schematic of RF-ID TTL Module

The RF-ID TTL circuit mentioned above has an on-board LED (Fig 3), an additional LED and a Buzzer which together indicate the presence of an RF-ID card. RF-ID cards with a width of 8-10 cm are observed. The EM18 reader must read the 12-

digit specific Tag ID and transmit it as an ASCII character through a serial output of 9600 bits per second. The circuit contains a buzzer that beeps when the tag is successfully read. The board is operated by 5 V and includes a direct connection to the Serial Rx pin of the Microcontroller. Card data is transmitted serially when the card is brought close to the panel.

RESULTS

The PCB and RF-ID modules are painted and the parts are soldered. The solar panel is attached to the Li-ion battery and the ON / OFF switch is fixed to the battery. When the ON switch is made, the LED signal on the development board and the reader module glows signaling the proper functioning of the circuit. "Smart Bag" is shown on the LCD. When any of the RF-ID tags are close to the Reader, they are identified and their unique ID number is shown on the LCD. When the tag is read, there is a beep sound and an LED signal.

CONCLUSIONS

New inventions in science and technology have increased massively. This Smart Bag powered solar energy is very simple to use and provides the necessary day-to-day functionality. This bag is less cumbersome and lightweight, which can be used to perform difficult tasks. This pack, being user-friendly, can be used by people of any age group according to their requirements. The paper essentially highlights two features of the proposed system. The most important aspect of this concept has been the powering of the entire circuitry and the charging of mobile phones by solar energy using the solar panel. Another functionality that is currently being worked on is the reading of RF-ID tags by RF-ID reader using RFID technology. Those two features solve the problem of forgetfulness and quick discharge of the batteries. The weight of the circuitry in the bag can be minimized with the aid of new emerging technologies.

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