RES MILITARIS
REVUE EUROPEENNE D ETUDES EUROPEAN JOURNAL OF MILITARY STUDIES
Social Science Journal

ADVANCED SOLDIER SAFETY: IOT-POWERED HEALTH AND POSITION TRACKING SOLUTION

[1]Gondesi Krishna Mohan,[2]Yerpula Nirmala,[3]Balem Sindhuja,[4]Manchikantla Priyanka

[123]Assistant Professor,[4]Student

Department of ECE

Abdul Kalam Institute of Technological Sciences, Kothagudem, Telangana

ABSTRACT:

These days, national security is the top concern for every country. Wars are being waged over territory, water, and the title of most powerful country. The army, navy, and air force are the three professional uniformed services that make up a nation's armed forces. The core of any armed force, its soldiers, frequently perish from a lack of access to emergency medical care. Additionally, soldiers on missions or in special operations may become lost in the battlefield and lose communication with the authorities. The system is made up of two units: the base station unit and the soldier's unit. As seen in the illustration below, the soldier's unit can be attached to their jacket. Major mobile is the base station unit. On their mobile device, he or she can view every parameter. Additionally, this project is improved by utilising NODE MCU and IOT technology. Additionally, an LED lamp is used to establish indication at the local setup.

Keywords: NODE MCU, steganography, cryptography, Internet of Things, soldier, base station

1.0 INTRODUCTION:

The soldier must be integrated with advanced healthcare monitoring, real time GPS (Global Positioning System) and data communications to send and receive information to/from the control unit. For that Soldier might need wireless networks not only to communicate with control unit but also with side by side military personnel. Apart from the nation's security, the soldier must need safety by protecting himself with advanced weapons and also it is necessary for the army control unit to monitor the health status of the soldier. To serve this purpose, in this paper bio medical sensors and monitoring devices are integrated with the soldiers. The integrated components must be light weight package and must provide desired result without requiring much power. One of the fundamental challenges in military operations lies that the soldiers are not able to communicate with control unit. In addition, the proper navigation between soldiers plays an important role for careful planning and co-ordination. So, the proposed work focuses on tracking the location of soldier which is useful for control room station to know the exact location of soldier and accordingly they will guide them. Control unit gets location of soldier using GPS. It is necessary for the base station to guide the soldier on correct path if he lost in the battlefield. In current world scenario, the security of a nation is the uttermost important factor and the security of nation depends on the army force. Without the soldier it would be nearly impossible to protect a nation. There is a necessity to develop a wearable technology which isn't bulky and dessipates very little power in the defense

sector so that the location and vital health parameters of the soldiers can be tracked in real time when he is on the battlefield. Using this soldier navigation system the base station can guide the soldier to reach the desired destination The nation's security is monitored and kept by army, navy and air-force. The important and vital role is of soldiers who sacrifice their life for their country. There are many concerns regarding the safety of the soldier. Soldiers entering the enemy lines often lose their lives due to lack of connectivity, it is very vital for the army base station to known the location as well as health status of all soldiers.

2.0 LITERATURE SURVEY:

Jasvinder Singh, et al., [1] proposed Global Positioning System (GPS) and Internet of Things (IoT) based soldier positioning and health signal system in 2019. Nonstop communication is possible. soldiers can communicate anywhere, which can help soldier to communicate among their other soldier whenever in need. Simple circuit and less power needed, use of low power needing peripherals and ARM processor lower the total power usage of module. Peripherals used are smaller size and also has low weight so that can be carried around safety and security for soldiers. GPS trace location of soldier anywhere on globe also health system monitors so soldiers important health parameters which gives safety and security for soldiers. Niket Patil, et al.,[2] proposed a health monitoring and tracking system in 2018. This paper turn-up an IoT based health monitoring and tracking system for soldiers. This suggested module can be horseback on the soldiers body to find their health condition and present position using GPS. These data will be sent to base station via IoT. The presented module it is possible to execute a low cost circuit to safeguard the valuable soldier life on the battle field. William Walker A L, et al., [3] proposed a mobile health monitoring in 2018. The authors had discussed on different wearable, portably low weight and small size biosensors that have been developed for monitoring of the soldier health status. The BSN consists of sensors such as heart beat, temperature and gas sensors which can be put on a soldier body for health condition monitoring in real time. In this paper suggest a methodology to develop a system for real time health monitoring of soldiers, consisting of interconnected BSNs. Akshay Gondalic, et al., [4] designed IoT Based Healthcare Monitoring System for War Soldiers using Machine Learning in 2018. This system enables to army base station to track the position and observe the medical status of soldiers using GPS, temperature sensor, heart beat sensor etc. The information from sensors and GPS values will be transmitted wirelessly using ZigBee system with the other soldiers.

3.0 PROPOSED METHOD:

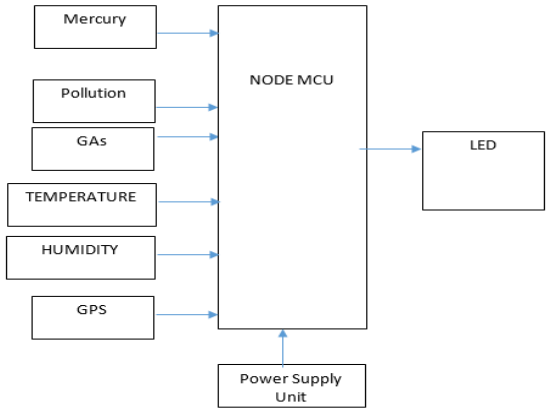

Fig1: Proposed block diagram

NODEMCU ESP8266:

The ESP8266 series, or family, of Wi-Fi chips is produced by Espressif Systems, a

fabless semiconductor company operating out of Shanghai, China. The ESP8266 series presently includes the ESP8266EX and ESP8285 chips.

ESP8266EX (simply referred to as ESP8266) is a system-on-chip (SoC) which integrates a 32-bit Tensilica microcontroller, standard digital peripheral interfaces, antenna switches, RF balun, power amplifier, low noise receive amplifier, filters and power management modules into a small package. It provides capabilities for 2.4 GHz Wi-Fi (802.11 b/g/n, supporting WPA/WPA2), general-purpose input/output (16 GPIO), Inter-Integrated Circuit (I²C), analog-to-digital conversion (10-bit ADC), Serial Peripheral Interface (SPI), I²S interfaces with DMA (sharing pins with GPIO), UART (on dedicated pins, plus a transmit-only UART can be enabled on GPIO2), and pulse-width modulation (PWM). The processor core, called "L106" by Espressif, is based on Tensilica's Diamond Standard 106Micro 32-bit processor controller core and runs at 80 MHz (or overclocked to 160 MHz). It has a 64 KiB boot ROM, 32 KiB instruction RAM, and 80 KiB user data RAM. (Also, 32 KiB instruction cache RAM and 16 KiB ETS system data RAM.) External flash memory can be accessed through SPI. The silicon chip itself is housed within a 5 mm × 5 mm Quad Flat No-Leads package with 33 connection pads — 8 pads along each side and one large thermal/ground pad in the center. The ESP8266 is a System on a Chip (SoC), manufactured by the Chinese company Espress if. It consists of a Tensilica L106 32-bit **micro controller** unit (MCU) and a **Wi-Fi transceiver**. It has **11 GPIO pins*** (General Purpose Input/Output pins), and an **analog input** as well. This means that you can program it like any normal Arduino or other microcontroller. And on top of that, you get Wi-Fi communication, so you can use it to connect to your Wi-Fi network, connect to the Internet, host a web server with real web pages, let your smartphone connect to it, etc ... The possibilities are endless! It's no wonder that this chip has become the most popular IOT device available.

The ESP8266 WiFi Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your WiFi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware, meaning, you can simply hook this up to your Arduino device and get about as much WiFi-ability as a WiFi Shield offers (and that's just out of the box)! The ESP8266 module is an extremely cost effective board with a huge, and ever growing, community.

This module has a powerful enough on-board processing and storage capability that allows it to be integrated with the sensors and other application specific devices through its GPIOs with minimal development up-front and minimal loading during runtime. Its high degree of on-chip integration allows for minimal external circuitry, including the front-end module, is designed to occupy minimal PCB area. The ESP8266 supports APSD for VoIP applications and Bluetooth co-existance interfaces, it contains a self-calibrated RF allowing it to work under all operating conditions, and requires no external RF parts.

4.0 MERCURY TILT SENSOR

When the sensor is in "Not Tilted" position, the mercury ball will be at the bottom and shorting the contacts as shown in the image below. This will turn ON the LED and the output will be LOW.

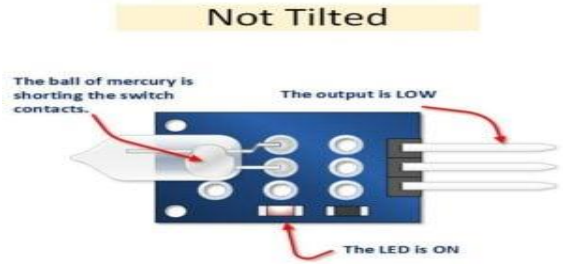

Fig 2: Not titled

When the sensor is in "Tilted" position, the mercury ball will move away from the contacts as shown in the image below. This will turn OFF the LED and the output will be HIGH.

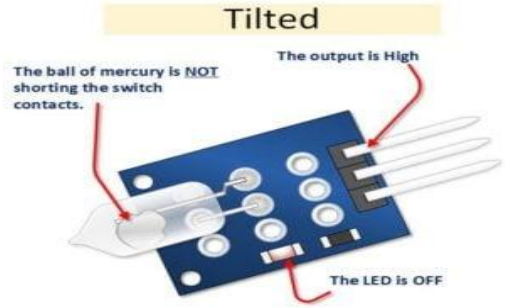

Fig 3: Tilted

POLLUTION SENSOR:

MQ135:

Through connecting leads, the sensing element is exposed to current. The gases that come close to the sensing element are ionized and absorbed by the sensing element as a result of this current, which is known as heating current. This affects the resistance of the sensing element, hence changing the value of the current leaving it.

Fig 4: Pollution sensor

When no gas is present, digital output is 1 and analog output gives 1023 max value. When gas is present, digital output is 0 and analog output is much less than 1023. Using potentiometer on chip we can control the turning OFF point of digital pin at some value of analog pin. The sensor needs a load-resistor at the output to ground. Its value could be from 2kOhm to 47kOhm. The lower the value, the less sensitive is the sensor. The higher the value, the less accurate is sensor for higher concentrations of gas. If only one specific gas is measured, the load-resistor can be calibrated by applying a known concentration of that gas. If the sensor is used to measure any gas (like in a air quality detector) the load-resistor could be set for a value of about 1V output with clean air. Choosing a good value for the load-resistor is only valid after the burn-in time

MQ-135 Sensor Module Overview

MQ-135 gas sensor module features both analog output fetched from its AO pin and digital output fetched from its DO pin.

The analog output voltage lies between 0-5V where the output voltage increases relatively with the concentration of gas vapors coming in contact with the sensor. Under standard conditions, this output voltage from the sensor is directly proportional to the concentration of CO2 gas in PPM. This output voltage is converted to a digital value (0-1023) via

the analog to digital converter in Arduino. This value is equal to the gas concentration in PPM.

Whereas the digital output voltage (0/1) is obtained after passing the analog output from LM393 comparator situated at the backside of the sensor module. The in built potentiometer is manually calibrated to change the sensitivity of the digital output and set a threshold value. This is done with the help of the DOUT LED. When the concentration of gas vapors will be greater than the threshold value set, the digital output will be LOW. This will be easily monitored when the DOUT LED lights up. Additionally, rotating the potentiometer clockwise results in a higher sensitivity.

GAS SENSOR:

MQ2 SENSOR:

MQ2 is one of the commonly used gas sensors in MQ sensor series. It is a Metal Oxide Semiconductor (MOS) type Gas Sensor also known as Chemiresistors as the detection is based upon change of resistance of the sensing material when the Gas comes in contact with the material. Using a simple voltage divider network, concentrations of gas can be detected.

Fig 5: MQ2

MQ2 Gas sensor works on 5V DC and draws around 800mW It can detect LPG, Smoke, Alcohol, Propane, Hy drogen, Methane and Carbon Monoxide co ncentrations anywhere from 200 to 10000 ppm.

DHT11 FOR TEMPERATURE AND HUMIDITY:

The DHT11 humidity and temperature sensor makes it really easy to add humidity and temperature data to your DIY electronics projects. It's perfect for remote weather stations, home environmental control systems, and farm or garden monitoring systems.

Here are the ranges and accuracy of the DHT11:

- Humidity Range: 20-90% RH
- Humidity Accuracy: ±5% RH
- Temperature Range: 0-50 °C
- Temperature Accuracy: ±2% °C
- Operating Voltage: 3V to 5.5V

GLOBAL POSITIONING SYSTEM

GPS receivers use a constellation of satellites and ground stations to compute position and time almost anywhere on earth.

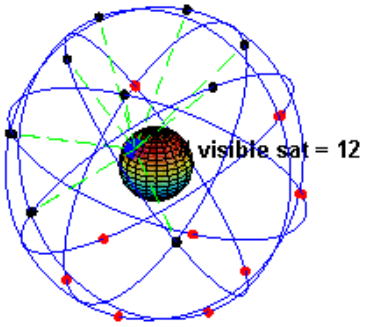

Fig 6: the moving point on the globe and the number of visible satellites.

At any given time, there are at least 24 active satellites orbiting over 12,000 miles above earth. The positions of the satellites are constructed in a way that the sky above your location will always contain at most 12 satellites. The primary purpose of the 12 visible satellites is to *transmit* information back to earth over radio frequency (ranging from 1.1 to 1.5 GHz). With this information and some math, a ground-based *receiver* or GPS module can calculate its position and time.

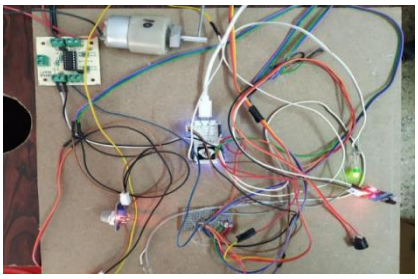

Fig 7: Proposed hardware model

5.0. CONCLUSION:

The paper reports an IoT based system for the health monitoring and tracking of the soldiers. NODE MCU board is used which is a low cost solution for the possessing purpose. Biomedical sensors provides heartbeat, body temperature, and environmental parameters of every soldier to control room. This technology can be helpful to provide the accurate location of missing soldier in critical condition and overcome the drawback of soldiers missing in action. The addressing system is also helpful to improve the communication between soldier to soldier in emergency situation and provide proper navigation to control room. Thus we can conclude that this system will act as a lifeguard to the army personnel of all over the globe. In future, a portable handheld sensor device with more sensing options may be developed to aid the soldiers. A suitable and better routing algorithm can be used to make this system more reliable and energy efficiency. Improve security of data by encryption and decryption techniques. Can use LoraWAN along with zigbee for increasing the range of data transmission.

REFERENCES:

1. P. S. Kurhe, S. S. Agrawal, "Real Time Tracking & Health Monitoring System of Remote SoldierUsing Arm7" International Journal of Engineering Trends and Technology Volume 4 Issue 3-2013.
2. Pankaj Verma, J.S Bhatia, "Design and Development of GPS-GSM Based tracking System with Google Map Based Monitoring", International Journal of Computer Science, Engineering and Applications. (IJCSEA) Vol.3, No.3, June 2013
3. Subhani Sk. M. Sateesh G.N.V, Chaitanya Ch. And Prakash Babu G., "Implementation of GSM Based Heart Rate and Temperature Monitoring System", Research Journal of Engineering Sciences ISSN 2278 – 9472 Vol. 2(3), 43-45, April (2013)
4. Sweta Shelar, Nikhil Patil, Manish Jain, Sayali Chaudhari, Smita Hande (8th March, 2015)." Soldier Tracking and Health Monitoring Systems". Proceedings of 21st IRF International Conference, Pune India. ISBN :978-93-82702-75-7 pages: 82- 87.
5. Dineshwar Jaiswar, Sanjana S. Repal (2015, July)." Real Time Tracking and Health Monitoring of Soldier using ZigBee Technology". International Journal of Innovative Research in Science, Engineering and Technology: a Survey. Vol 4, Issue 7 pages 5560-5574.
6. Pangavne S. M. , Choudhary Sohanlal & Pathak Bhavik (2015)."Real Time Soldier Tracking System". IOSR Journal of Electronics and Communication Engineering (IOSR-JECE), Nashik, Maharashtra: pp. 21-24.
7. Health Monitoring and Tracking System for Soldiers Using Internet of Things (IoT), International Conference on Computing,

Communication and Automation (ICCCA2017)