

# Animal Health Monitoring System Using GPS & GSM Modem

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**Abstract** - This project presents an autonomous animal health monitoring system using GSM. Here the physiological conditions of the animals are monitored by sensors and the output of these sensors is transmitted via GSM there to a server system i.e. a mobile phone. The remote wireless monitor is constructed of GSM, GPS and a phone. The measured signal has to be sent to the mobile phone, which can be data collection. The advantage of this project is that it will consider more parameter like temperature, heart beat there by prior detection of possible diseases are done. In particular, when measured signals cross the standard value, the GSM will send a message to the caretaker's mobile phone. This project gives an idea of tracking the location of animals as well as health status of them. So for their security purpose, many instruments are mounted on them to view their health status as well as ammunitions present with them. Bio-sensor systems comprise various types of small physiological sensors, transmission modules and processing capabilities, and can thus facilitate low-cost wearable unobtrusive solutions for health monitoring. The GPS receiver is used to log the longitude and latitude of animals so that direction can be known easily, which is stored in microcontroller memory. GPS Receiver receives and compares the signal from orbiting GPS satellite to determine geographic position. The caretaker's phone gets the location of soldier through GSM.

**Key Words:** Arduino, Monitoring System, Time Management.

## 1. INTRODUCTION

In recent times, the livestock farmers faced cattle health problems around the world because of continuous rise in air temperature in the troposphere. The variations in temperature on animals health has harmful effect leading to diseases such as foot and mouth disease, swine fever, bovine spongiform encephalopathy (mad cow disease), bovine rhinotracheitis, squamous cell carcinoma, warts, web tear, necroticpododermatitis, polioencephalomalacia, hypomagnesaemia, clostridia disease and hypoglycemia. WHO report stated that the severe acute respiratory syndrome corona virus (SARS-CoV) is said to be an animal virus that spread easily to other animals and have also affected human being directly. The evidence of humans getting infected is first reported in the Guangdong province of southern China in 2002 and since then till 2003 the 26 countries across the globe reported infections caused by SARS. This has resulted in the economic loss to the tune of approximately 2% of the total East Asian GDP (gross domestic product). For these reasons a system is needed to be in place for continuously monitoring the

animal health and to control and prevent the eruption of diseases at large scale. Technology is already part of modern farming and is playing an increasing role as more advanced systems and tools become available. In recent years, one of the biggest areas of development has been in electronic livestock farming. Many researches are focused on the development of animal health tele-monitoring systems. The health monitoring is depending on two methods such as direct contact (invasive) or in indirect contact (noninvasive).

Basically a prototype telemonitoring system consists of sensing unit and receiving unit. In our system we are basically focusing on animal's health in terms of his heartbeats and his body temperature. If animal gets injured and becomes unconscious due to any other reason, then the heart beats start increasing or decreasing gradually. In this type of situation where the information about current heart beat rate becomes the indispensable part of that animal, this project emerges out as best to acknowledge the caretakers at server site with the correct and fast information.

If heart beat either increases above critical level or decreases below the critical level, a message is automatically sent to caretaker with the help of GSM modem. GPS tracker will give the current location of the animal which will be useful for locating animal's location and providing medical help as early as possible. In case if animal is injured then by using the GSM modem attached to the device an SMS will be sent to caretaker to provide help. All these technologies provides the importance of wearable sensors. They can give accurate information about health parameters to veterinary staff. Thus they can provide proper treatment and can prevent wide spread diseases.

## 2. METHODOLOGY

The block diagram and circuit diagram for that project is as follow

2.1 BLOCK-DIAGRAM

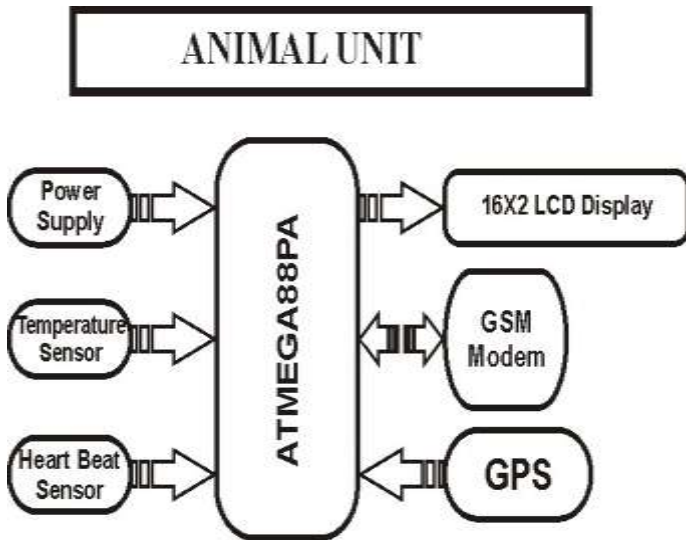


Fig.1: Block diagram of animal health monitoring system

The above diagram represents the architecture of the animal unit. This unit includes a microcontroller, temperature sensor, GPS, GSM, LCD display and a Buzzer shown in figure above. The system consists of a microcontroller as shown in the above architecture of the system. This microcontroller is used to control the complete operation of the monitoring system. For this purpose we have used Atmega88PA microcontroller in this system. Here we have used a temperature sensor to continuously monitor the body temperature of the animal. This temperature sensor is also interfaced with the microcontroller and provides the monitored data to it. Here in this system we have used LM-35 temperature sensor for this purpose

The GSM MODEM is used to provide the information of the soldier like the heartbeat rate and the body temperature to a remote location. It is similar to a mobile which requires a SIM card for its operation but the advantage of GSM modem over mobile is that it has an serial connectivity that can be directly connected to the Micro controller for sending the AT (Attention) commands for sending SMS.

Here we have used a heart beat sensor to continuously monitor the beat rate of the animal. This sensor is also interfaced with the microcontroller and provides the monitored data to it. The location of the animal can be tracked with the help of a GPS MODEM. The GPS modem receives the signals from the satellite and calculates the Latitude and Longitude of the location of animal and sends it to the controller in the form of the serial data. The LCD display is used to display the geographical location of the animal that is longitude and latitude values received by the GPS. Also to display the health status of the animals i.e. body temperature and heart beat rate.

2.2 CIRCUIT DIAGRAM:

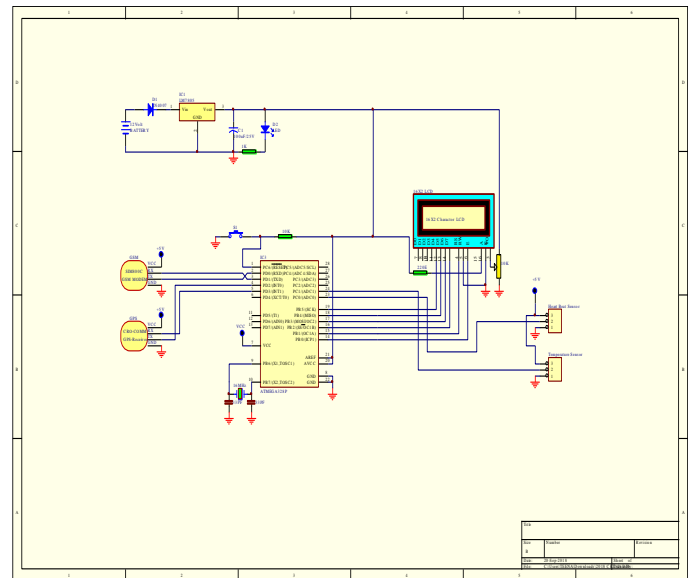


Fig.2 Circuit diagram of Animal Health Monitoring System

In this system two units are designed animal unit and a base unit. The animal unit will be implemented on the body of that animal. This unit consists of various components for the efficient working of the system. The animal monitoring System allows owner to track the current GPS position of animals. The system also consists extra feature with the help of that owner can be able to monitor the health status of that animal. The GPS modem sends the latitude and longitude position with link pattern with the help of that owner or the care taker of the animals can track the current position of the animals. The system is very helpful for getting location information of soldier and providing them instant help. The animal unit consists of Atmega88PA microcontroller. It is used as the brain of this project. The function of this section is to collect the information from GPS unit which find location of the animal in each minute. Then it sends this information to the base unit. The microcontroller and circuit components require power for their operation. For the fulfilment of this power requirement of the unit a 12v battery followed by a voltage regulator IC LM7805 is used. This regulator IC provides regulated 5V supply to the microcontroller and to the required circuit components. A robust accurate positioning system with seamless indoor and outdoor coverage is highly needed tool for increasing safety in emergency response and military operation. GPS-based positioning methods mainly used to animal rescue. This GPS modem provides the location of the animal in longitude and latitude parameters. These parameters will be displayed on the LCD display connected in the unit. This LCD display is interfaced with the microcontroller in 4 bit mode for the display purpose. The LCD display will also display the measured health parameters of the soldier. After gathering all the parameters related to the location of the animal, microcontroller generates a SMS and sends it to the base station through GSM implemented in the

system. This GSM modem is interfaced with the microcontroller through MAX232 circuit, used for CMOS and TTL level matching between microcontroller and the GSM modem. The SMS contains geographical location parameters of the soldier. Similarly this parameter will also display on the LCD display in the unit. The mobile number of the base unit to which SMS should be forwarded is saved in the SIM of that GSM modem. The system is designed in such a way that any authorized person can call the system anytime, when he need to know the position of the animal. This information will be very helpful the owner to plan the health and security of the animals. When an authorized person calls the system from his mobile phone, the system automatically disconnects the call. After disconnecting the call the system performs all the above process of measurement of geographical location as well as physical parameters of the animal with the help of GPS modem and relative sensors. Microcontroller collects all the data process it as per the program and send it to number from which call was obtained. This data will be sent in the form of a text message through GSM modem. In this system the animal unit is also equipped with a 16\*2 LCD display for displaying all the monitored parameters by the system. The parameters measured by the system are displayed on this LCD display which is interfaced with the microcontroller in 4 bit mode. In 4-bit mode, only four data pins of LCD are connected to the controller. This mode, thus, saves four pins of the controller unlike 8-bit mode. In 4-bit mode only 4 bit data is send to LCD. Since 8-bit microcontrollers contains data in 8-bit form so we divide our data in to two nibbles(1 nibble=4-bits). First higher 4-bits (nibble) are send to LCD and then the lower 4-bits (nibble). Only D4,D5,D6,D7 data pins of LCD are used in 4-bit mode. D1,D2,D3,D4 are left empty. D4 is our least significant bit and D7 is highest significant bit. Interfacing LCD with Arduino microcontroller is simple. Port-B first 4 bits (PB2,PB3,PB4,PB5) of microcontroller are used to send 4-bit data and commands to LCD. These four Pins(PB2,PB3,PB4,PB5) are Connected to four data pins of 16x2 LCD (D4,D5,D6,D7).Port-C0 pin no 23 is connected to RS pin of LCD. Port-B0 pin no 14 is connected to EN (Enable) pin of 16x2 LCD.

HARDWARE COMPONENT	DESCRIPTION
<b>ATMEGA88PA Microcontroller:</b>	The ATmega88PA is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega88PA achieves throughputs approaching 1 MIPS per MHz allowing the system designer to optimize power consumption versus processing speed. The AVR core combines a rich instruction set with 32 general purpose working registers. All the 32 registers are directly connected to the Arithmetic Logic Unit (ALU), allowing two independent registers to be accessed in one single instruction executed in one clock cycle. The resulting architecture is more code efficient while achieving throughputs up to ten times faster than conventional 8-bit microcontrollers. The ATmega48A/PA

/88A/PA/168A/PA/328/P provides the following features: 4K/8Kbytes of In-System Programmable Flash with Read-While-Write capabilities, 256/512/512/1Kbyte EEPROM, 512/1K/1K/2Kbytes SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible Timer/Counters with compare modes, internal and external interrupts, a serial programmable USART, a byte-oriented 2-wire Serial Interface, an SPI serial port, a 6-channel 10-bit ADC (8 channels in TQFP and QFN/MLF packages), a programmable Watchdog Timer with internal Oscillator, and five software selectable power saving modes. The Idle mode stops the CPU while allowing the SRAM, Timer/Counters, USART, 2-wire Serial Interface, SPI port, and interrupt system to continue functioning. The Power-down mode saves the register contents but freezes the Oscillator, disabling all other chip functions until the next interrupt or hardware reset. In Power-save mode, the asynchronous timer continues to run, allowing the user to maintain a timer base while the rest of the device is sleeping. The ADC Noise Reduction mode stops the CPU and all I/O modules except asynchronous timer and ADC, to minimize switching noise during ADC conversions. In Standby mode, the crystal/resonator Oscillator is running while the rest of the device is sleeping. This allows very fast start-up combined with low power consumption.

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