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A Cloud Based Online Cattle Healthcare and Monitoring System Using Internet of Things (IoT)

Sengeni D.[1] & Suresh Kumar K.[2]

[1]UG Student, IFET College of Engineering, Villupuram, Tamil Nadu, India.
[2]Associate Professor, IFET College of Engineering, Villupuram, Tamil Nadu, India.

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ABSTRACT

Farmers take more concern in protecting their cattle. But the environmental factors greatly affect the health of the cattle such that they may get affected due to various diseases. The project is based on monitoring the health conditions of the cattle by comparing the present health condition required for normal cattle. The parameters like heartbeat, temperature, pressure are compared with standard parameters and the information is transmitted through IOT and the farmer gets notified and inspected when the veterinary doctors are not available at the instance.

Keywords: *Environmental Factors, Heartbeat, Temperature, Pressure, IOT, Veterinary Doctors.*

1. Introduction

In this modern era, many technologies are introduced in our environment. In this electronic world microcontroller plays a major role in the development of smart systems. In this day by day improvement and the development of new technologies, microcontrollers act as a heart of the system. These microcontrollers consist of a single chip processor which is suitable for automation and control process for an accurate result.

To overcome the arising problem of monitoring the temperature, this project is designed and implemented. The monitoring of temperature is a process in which the temperature of space or object is changed. The project describes the monitoring of temperature.

This system is designed and implemented using an arduino program which is written in arduino uno and the temperature is displayed in LCD.

The smart farming relays on basic needs of farmers such as helping the farmers by reducing their work such as, the farmer visit the cattle again and again for observing health condition, so to overcome the workload of farmers a computing and sensor based methods controlled by arduino module is installed in cattle sheds through sensor to monitor the health condition of cattle.

The data is measured through sensors are then stored in the consumer database, where the consumers are allowed to extract data through the software. It includes another feature of alarming i.e., if the temperature of cattle increases, the sensor senses the temperature and compares it with the safe range.

If it exceeds the safe range the alarm starts ringing.

2. Literature Survey

1) Mr.V.Gokul et al proposed a system along with a sink node that consists of wearable devices that can monitor cattle's activities through IOT.

2) lM.Sneha et.al proposed a scheme that uses various sensors to measure the respiration, heartbeat, temperature and rumination of the cattle by using those values illness of cattle will be calculated.

3) Ankit R. Bhavsar et al proposed a system in which sensors are implemented in cattle's body and deployed in a farm environment. The local storage area which provides information to the user's query, collects the data and forward it to the centralized data storage area through batch processing which provides data to the veterinary hospital.

4) David Hanson et al proposed a GPS based cattle health monitoring system which monitors the distance walked and daily activities performed by the cattle. The measurements are taken using a 3 axis accelerometer sensor. The obtained data can be helpful to improve the cattle health.

5) Mr. Kunja BihariBihari Swain et al proposed a scheme consisting of devices for monitoring the biological parameters like rumination, humidity, heartbeat and temperature of the cattle.

6) Jianze Li et.al proposed a new method which resorts to collecting cattle's body temperature and behavior characteristics for detecting the cow's estrus. According to the body temperature of dairy cattle rising 1-2° in ovulation period, and the volume of the movements of dairy cattle increasing significantly, the paper described a monitoring system which is based on Zigbee wireless transmission technology and the system can detect the body temperature and the volume of the movements of dairy cattle at the same time. The system consists of a wireless transceiver and controller module MG2455, a thermopile infrared sensor and a digital acceleration sensor ADXL20. The system uses a star topology and each signal acquisition node controlled by MG2455 is fixed in the thigh of dairy cattle.

7) Yoshie Takao et.al studied and developed a monitoring system of Vitamin A in cattle using machine vision. The chromaticity level of pupil color of cattle was calculated by taking the images of cattle's eyes.

8) Kevin smith et al proposed a telemonitoring system for the cattle with wearable sensors technology which continuously provides health information of the cattle. It is mainly used for presenting physiological measurements.

9) Ahmet Cumhur Arslan et.al. Proposed a solution that depends only on the shape information, animals with the same color are recognized successfully even in poor lighting conditions

3. Existing Method

In earlier years, earlier year, cattle health monitoring was done manually by using a number of labourers to observe the day to day activities of the cattle. By doing so they can identify health related diseases. But sometimes this system may lead to false prediction and may lead to wrong results which may differ from actual health conditions of the cattle. This causes harmful effects to cattle health. Thus the monitoring a system is proposed to monitor the health parameters of cattle automatically, fastly and accurately. Which is very useful for proper treatment of cattle. Another important constraint is that devices should be controlled and accessed remotely. Basically this is divided into three domains,

- Sensor technology
- Communication
- Wireless sensor networks technology (WSN). 4.Methodlogy

Sensor Technology

Sensors play a vital role in automatic detection of different health parameters of cattle. Monitoring the cattle's health by placing the different sensors like heartbeat sensor, temperature sensor etc., on the cattle's body and the delivered output electrical signal is then compared with standard limit of normal range.

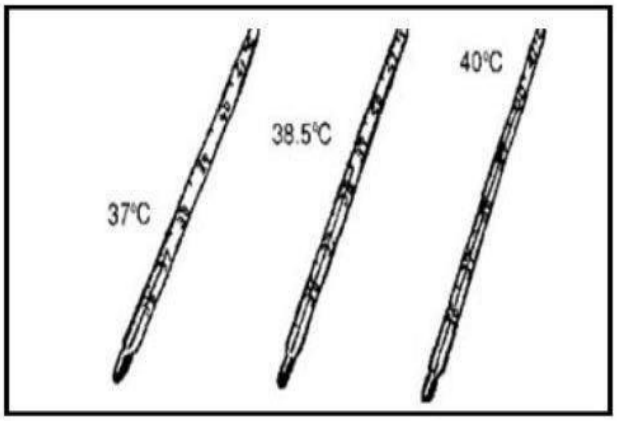


Fig.1 Body Temperature Measurement in Olden days using Thermometer

In sensor technology, detection of body temperature of the cattle can be done by various sensors, here we have used LM35. The cattle's normal body temperature is in the range 38.5-39 degree Celsius.

Fig.2 Body Temperature Sensor & Its Circuit

Heartbeat Sensor

The normal heart beat range of the adult cattle is 48-84 beats/min. The sign of the pain can be evaluated by analyzing the heart rate. This sensor is kept behind the cattle's elbow for listening the heart beat over the chest side. It can also detect the stress and anxiety of the animals.

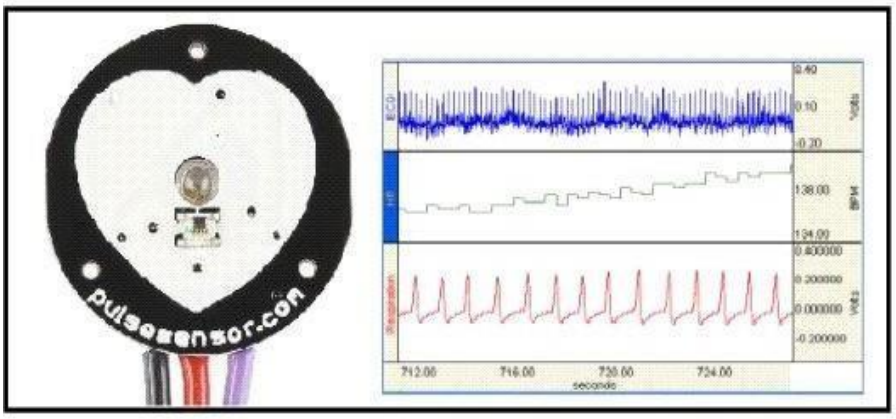


Fig.3 Heart Beat Sensors & Its Output Graphics

Piezoelectric Sensor

The principle behind piezoelectric sensors is the piezoelectric effect. It is generally used to measure the changes in the pressure, acceleration, strain.

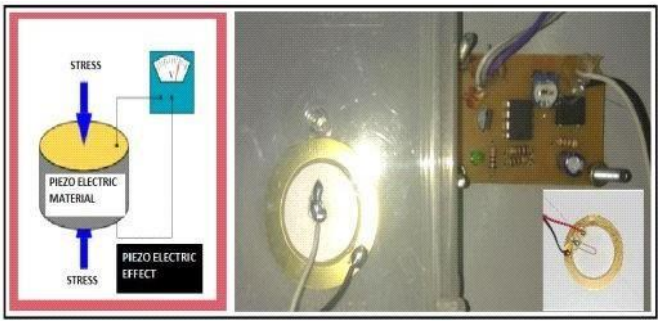


Fig.4 Piezoelectric Effect & **Fig.5** Piezo Sensor Circuit

Piezoelectric sensor is an important tool used to measure cattle.

In this, the sensor only responds when the cattle feel illness due to milk fever diseases or when it falls on the ground.

Communication

Here, the message is communicated to the doctor's mobile using a WiFi module [ESP8266]. The message contains a health graph about the cattle, on observation the doctor can easily provide suggestion by being in their place.

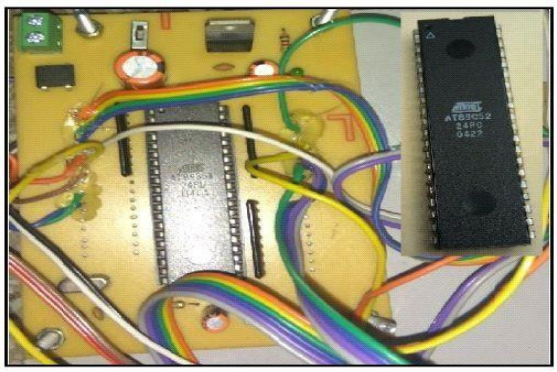


Fig.6 AT89C51 Controller & its Circuitry

AT89C51 microcontroller is responsible for transferring the data from various sensors to the Wifi module. The main idea is to diagnose the cattle which suffer from disease, directly from home without taking the cattle to the hospital. The input from the sensors are fed to the microcontroller, then the microcontroller transmits the message to the wifi module for uploading the data in a health monitoring web page app.

ESP8266 WIFI Module

The wifi module [Esp8266] is available at low cost, small in size and contains wifi connection with data encryption between client and the access point mode. Data transmission occurs serially. The receiver and the transmitter use "AT" commands for required data.

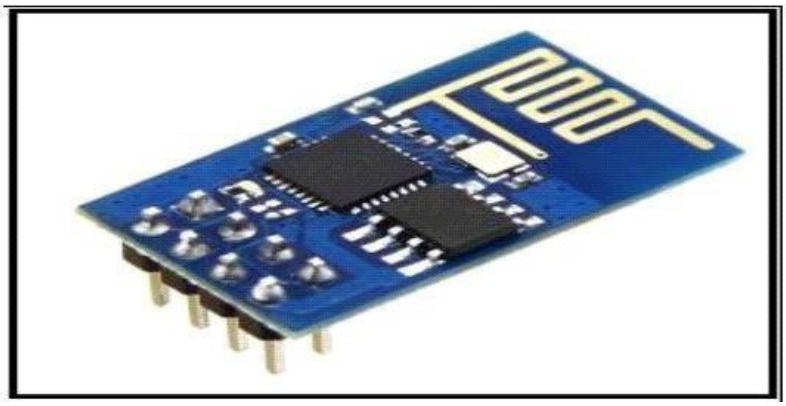


Fig.7 ESP89C66 WIFI Module

Wireless Sensor Networks

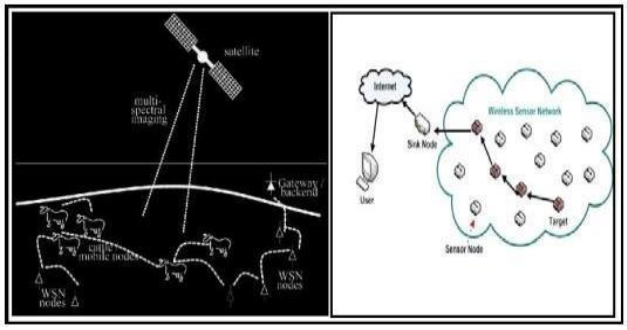


Fig.8 Typical Wireless Sensor Networks (WSNs) Architecture

Basically WSNs is a cluster of sensors used for monitoring and recording the physical pressure, temperature etc., and organizing the gathered data of the cattle at some central location(at cloud). Then the data is accessed through a web page or app.

Fig.9 Layout of Web Page

Methodology

The E-cattle health monitoring system consists of IoT with three units namely,

1.Data gaining unit 2.Data interact unit 3.Administering unit

Data gaining unit consists of sensor attached with microcontroller .These sensors are used for measuring health factors. The Administering unit observe the changes of particular cattle and give information to doctor through IoT as the form of graph. By the graph the cattle health information and proper treatment can be given when the doctor not available in that place.

4. Proposed Method

The technologies which we are using nowadays were generated and once proposed by researchers, engineers and scientists. Farm automation is one of the emerging advanced innovative technical streams. Food is essential for our living and it can be obtained only by

farm products. The productivity of farm products depends on the cattle. Thus it is necessary to take care of the health of the cattle using farm automation without causing harm to the environment. Using this method we proposed a temperature monitoring of the cattle. The main aspect of the proposed system is to reduce the minimal health inspection and long term animal health care cost by monitoring the temperature of the cattle and diagnosing the cattle if it is sick.

Arduino UNO

The Arduino UNO microcontrollers are flexible and readily available for a variety of applications. The Arduino UNO microcontroller cost is low.

Fig.10 Arduino UNO

This system observes the temperature relative to indoor spaces. The proposed system is an Arduino [atmega328] based online ambient monitoring system for cattle using a low power wireless temperature sensor [LM35] to monitor the temperature of cattle.

It contains everything in a single microcontroller board. This board can simply connect to a computer through a USB cable and power it with a battery or AC-to-DC adapter to get started. The main feature of the Uno is 16U2 programmed as an USB- to-serial converter.

Flow of Simulation

The circuit diagram described in the figure is simple and can be easily modified if needed. Whenever a circuit is designed, it is recommended to simulate and check the results according to the requirement. Since the simulation can be easily modified with a few changes, but the hardware modification is difficult due to soldering, unsoldering, troubleshooting and time consuming.

Thus simulation is created on proteus 7 and the libraries used in this simulation are easily available on the internet. First, add all the required components and connect them as shown in the circuit diagram. The connections are made carefully as one wrong connection may lead to improper results and malfunctioning.

ISIS and Simulation

Major features of PROTEUS VSM include:

Berkeley SPICE 3f5 based True mixed mode simulation with extension for digital simulation. Interactive and graph based simulations support. CPU models for PIC and 8051 series. Distortion, AC and DC sweeps, frequency noise, transient and fourier transform are included in Graph based analysis technique.

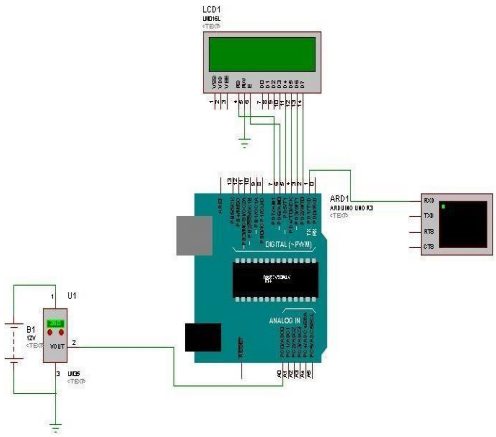
An audio graph allows playback of simulated waveforms.

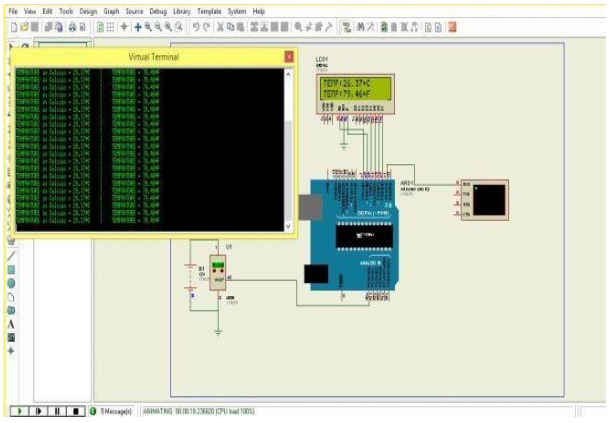
Direct support for analogue components model in SPICE format.

Open architecture for plug in components model coded in c++ or other languages. These can be electrical or graphical or combinations of both.

Simulation

Simulation of circuits is done using proteus simulation. In this project, show how to measure temperature and display it on a 16x2 LCD using Arduino, and we can use 2 buttons to choose what we want to see on LCD: Degrees Celsius or Fahrenheit. Here also add 2 LEDs into this circuit in order to warn us whenever the temperature value is lower or upper than the temperature limit we set. LEDs will blink when it happens.





5. Conclusion

This method is taken in hand to establish the idea of monitoring the cattle's health to ensure its health in fast changing conditions using the sensor technology. Monitoring the health of cattle and ensuring their fitness has become essential due to high demand on the dairy products and to provide higher yield.

Moreover, the overall economy of the dairy farming industry totally depends on the cattle's health. Using the health parameters several diseases and their symptoms can be identified and analysed in depth. Our proposed system is done using proteus software.

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