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Emergency Detection and Monitoring Daily Routine of a Cattle using IOT

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Abstract

The main aim of this system is to smarten the infrastructure of cattle farming and to track the biological and physiological activities of cattle by implementing a noninvasive wearable by using IOT. In these, we come into picture the lightning sensor depend upon the climate it will turn on and off, temperature sensor will depend upon room temperature of cattle farm; methane sensor is used to check methane level in the farm; fire sensor depend upon any fire emergency and is responsible for smart lighting and also smart ventilation, it is also responsible for sprinkler actuation to make the infrastructure safer and smarter. We are also implementing automatic food releasing mechanism. We can identify the single cattle count with the help of the IR sensor.

Keywords: *Arduino Mega, cattle, GSM, IOT, sensors, wearable device*

INTRODUCTION

In India, around 66% of rural people completely depends on agriculture and animal husbandry. They rely on livelihoods like cows, buffaloes, sheep, goat, horse, camel and donkey. In addition to supplying milk, wool, egg, meat and dung, animals mainly bullocks are used as source of power for farmers during farming. Thus, in Indian economy animal husbandry plays an important role. According to economic survey conducted during 2016−2017, India ranked number one in milk production. About 18% of world milk production is from India. The major problems in cattle farming are unable to detect diseases at early stage. If the illness is not treated properly during the initial stages itself, then it will develop as diseases like lung congestion, pneumonia, laminitis etc. When the severity of the diseases reaches high then it will lead to the entire cattle death by spreading easily to all the cattle. Cattle farm infrastructure during different seasons and various environmental conditions plays a vital role in cattle health. Cattle can be affected by irregular feeding, fire accidents, rise of temperature in the farm etc. So, it requires a lot of human power for continuous monitoring. To overcome all these problems, we are implementing this project.

LITERATURE SURVEY

Miguel A. Perez et al. [1] published a paper on “Pocket ELISA: A Low-Cost Portable ELISA Reader Based on Image Analysis over PDA Platform for Clinical Diagnose in Medical Veterinary”, which described about the use of instrument to ubiquitously reading out plates by the use of digital analysis. In this system, main challenge is designing a versatile platform using standard, low-cost elements, such as PDAs or embedded PCs, open libraries, and consumer-grade digital cameras. All these alternative solutions can provide similar results with small.

Toufiqul Islam et al. [3] proposed enhanced wireless control system for

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smoke and fire detection. This system describes the design and engineering of a wireless control system for smoke and fire detection with alarming provision, and also SMS sending and fire extinguishing by a vehicle. It makes use of PIC (peripheral interface controller) microcontroller for the controlling of the system.

Ateef Agarwal et al. [4] proposed WPAN (wireless personal area network) based cattle health monitoring with Lab VIEW as a data logger. This WPAN based cattle health monitoring system to measure health and psychological parameters of the cattle. It has been developed for measuring environmental temperature, humidity, body temperature, rumination, heartbeat, and sweat. And also, this system is capable to analyze stress level of cattle using THI (Thermal Humidity Index). The ATmega16 controller and ZigBee has been used to develop the wireless sensor and receiver nodes. Lab VIEW is used for real time data logger to monitoring the output of various sensors over the PC.

METHODOLOGY

The following Fig. 1 represents the interfacing of various sensors to the Arduino Mega 2560 controller.

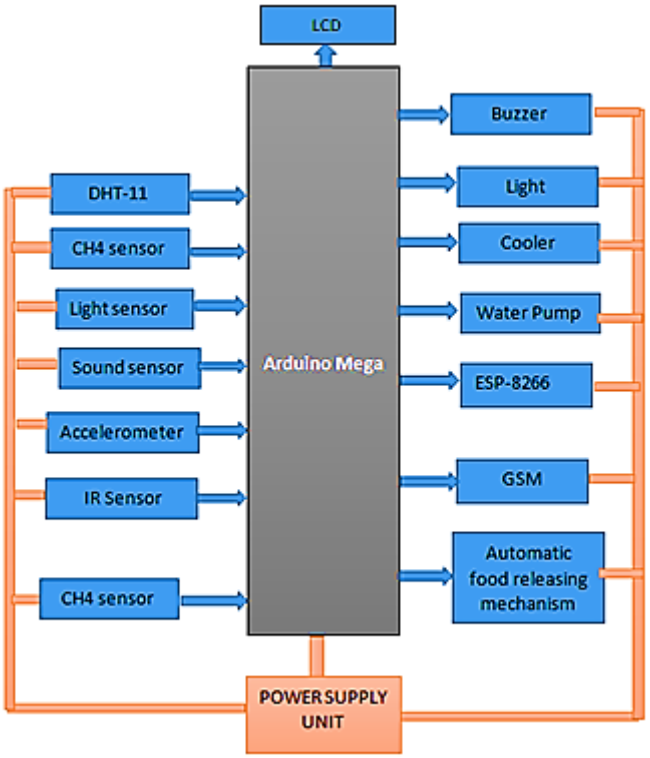

Figure 1: *Block diagram of proposed module [2].*

Different sensors are interfacing with controller unit. Sensors will convert the physical object into electrical signal, which will further processed by the controller unit. LM-35 is used as temperature sensor, which measures the body temperature of the cattle and feed the signal controller unit; controller will process the signal and send it to the cloud channel using ESP-8266 Wi-Fi module. Also, alarm will be started to alert the cattle farmer. DHT-11 is a humidity sensor, which will measure the humidity/moisture level at cattle farm and if the level is below or above the threshold value then actuators will be turned on to control the humidity level and it is used for count the occupancy level of cattle in farm

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for smart lighting and smart ventilation purpose. For illness and emergency detection sound sensor is used to measure sound intensity from cattle. To detect the smoke level in cattle farm environment, smoke sensor is used. The fire accidents are detected by fire sensor. This sensor is used for count the occupancy level of cattle in When the fire is detected controller will turn on the fire extinguisher also alarm will be turn on. All the parameters can be viewed in thing speak website. We have methane sensor, which will detect the methane gas level, if the gas level is more it will sense and turn on the automatic cleaning mechanism. We have robotic based food releasing, it is completely controlled from remote place. User can turn on/off the food releasing mechanism by using GSM. We are using GSM technology to send the alert/status message to the user instantly.

SYSTEM SPECIFICATIONS

Arduino Mega 2560

It is a microcontroller board based on the ATmega2560. It has 16 analog inputs, 54 digital input/output pins, 4 UARTs, a USB connection, a 16 MHz crystal oscillator, an ICSP header, a power jack, and a reset button. It operates at 5v DC voltage and 16MHz frequency.

DHT11 Humidity sensor

Real time humidity in cattle field is monitored through this sensor for ventilation purpose and it also measures the temperature. It operates at 3.5V to 5V DC voltage and consumes 0.3mA current. It operates between 0ºC to +60ºC temperature. The single-wire serial interface system is combined to become quick and easy. It is a 4-pin single row pin package.

Accelerometer Sensor

It is a device used to measure proper acceleration that is acceleration of a body in its own instantaneous rest frame. Two of these sensors are used in this wearable device for alerting during pregnancy and limpness detection. One will be tied to calculate rumination time under jaw of cattle and another one will be tied to calculate lying time, standing time, estrus period and distance walked with cattle collar. It operates at 3.3V to 5V DC voltage and consumes 350µA current and operates between -40ºC to +85ºC temperature. Vibration is measured in 3 different directions namely X, Y and Z.

KG181 Microphone Sensor

It is used to measure the intensity of sound from the cattle for emergency and illness detection. It operates at 5V DC voltage and consumes current greater than or up to 15mA.

Methane Gas Sensor

MQ-4 sensor is used for detection of methane gas (CH4). It can detect the methane concentration between 20-10000ppm. The conductivity of the sensor increases with the concentration of the gases. Hence by knowing the sensor conductivity gas concentration can be determined. The sensor provides high sensitivity with fast response time at low cost.

LDR Sensor

These are referred as types of photo detectors or photo sensors. It is used to monitor intensity of light in cattle farm environment for smart lighting purpose. They detect light but do not record images. It operates at 5V DC voltage and consumes current up to 75mA and operates between -60ºC to +87ºC temperature and dissipates 250mW power at 30ºC. Its output resistance is indirectly proportional to incident light.

16 x 2 alphanumeric LCD Display

The 16 x 2 display has 32 characters overall i.e., 16 in one line and the other 16 in the second line. Each character is made of 50 pixels, therefore, all the pixels must work together to display the character correctly and this function is controlled by

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another controller (HD44780) in the display unit. Basically, the LCD is used to display the information obtained from the various sensors.

GSM Module

The GSM used in this system is SIM800L which is a miniature cellular module that allows GPRS transmission and other functions such as receiving and sending SMS and voice calls. The module requires a power supply of range 3.4V-4.4V. It has a quad-band frequency which makes this module perfect for projects that require long-range connectivity. The module has two antennas, one is made of wire that is useful in narrow places and the other is the PCB (Printed Circuit Board) antenna.

Infra-Red Sensor

It is an electronic device, which senses obstacle of the surroundings. Heat and motion of the object are detected by this sensor. It is used to count the occupancy level of cattle and monitors whether cattle are present or not. It operates at 3.3V to 5V DC voltage and consumes current <10mA. It detects in the range of 2 to 80 centimeters.

MQ-02 Smoke Sensor

It is used to detect the level of the smoke in cattle farm. It operates at 5V DC voltage. It consumes heat up to 900mW. Its heating resistance is 31Ω±3Ω. Its sensing resistance is 2KΩ-20KΩ. Its output voltage is directly proportional to smoke level.

ADVANTAGES

The proposed system will reduce the human effort. It will save the cattle life and improve the quality of output. It will continuously monitor the cattle health parameters. We can use this system in poultry farms, cow farms, sheep farm, and sericulture farm.

RESULTS

The Arduino mega 2560 is used to which various sensors such as IR sensor, LDR sensor, DHT11 sensor, methane sensor, accelerometer and sound sensor are interfaced successfully. The interfacing of GSM is yet to be studied and implemented. The entire circuit is yet to be designed and implemented on the printed circuit board as per its specifications and the prototype for the cattle is yet to be designed.

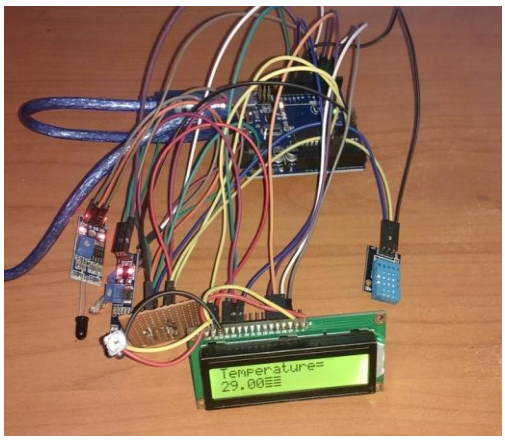

Figure 2: *Experimental setup.*

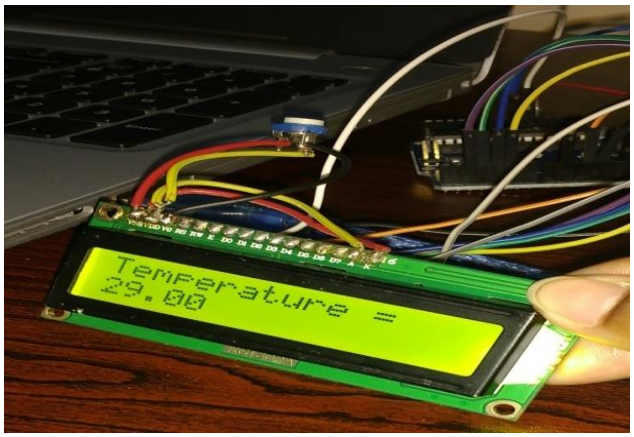

Figure 3: *Display showing readings of the sensors.*

Fig. 2 describes the interfacing of various sensors to the Arduino mega 2560 and Fig. 3 shows the result of temperature sensor. Similarly, all the results are obtained through various sensors in the same manner.

CONCLUSION

Proposed system will provide the farmers with good efficiency. The farm is fully protected. Output of the sensors will be displayed in LCD display. The

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data has been centralized to cloud using IOT concept for future analysis. The cattle's health parameters are monitor through the wearable device and it will take some necessary action in some critical conditions.

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