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IMPLEMENTATION OF LIVESTOCK MANAGEMENT USING IOT AND GSM

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Abstract—Animal Health Monitoring feeding system and location tracking system based on Global Positioning System (GPS), IoT and GSM is one of the effective solutions to solve problems in detecting the health level of pets and decrease the number of pet-loss cases. The system using GPS technology installed on the animal's body. The system uses the microcontroller that is connected to the GSM as a communication channel between the user and the system and as well as all parameter is update the web app using IoT.

This proposed project monitoring the feeding like food, water of the animal and also environmental conditional which updated in the user IoT pages. Automatic system used to feed food and water when it decreases specific level using motorized system. The surrounding environment is monitored using sensor to keep cool area by sensing the moisture level which automate the cool by spraying water when temperature increase in grass feed area. The system is designed to display the data and location data based on user IoT app installed in the mobile or in web page.

KEYWORD: IOT , LIVESTOCK , Animal Monitoring , ADRIUNO, DTH11 Sensor , GPS, GSM.

1. INTRODUCTION

Now a day's wild animals are becoming less in number because of industrialization and cutting of trees in the forest area. Hence it is important to save life of wild animals in the sanctuaries. Animals move freely in the area of forest without any fear. Since many years these wild animals are being tracked by using conventional methods such as using wireless transmitter and receiver pair. Here wireless transmitter is kept in the collar of animal and receiver is with forest officer. But when area of forest is large enough to not fall within the range of wireless transmitter-receiver, we can't locate animal. Usually area of sanctuaries is in the range of hundreds of kilometers in length. Hence we require a device which will work even when area of sanctuary is hundreds of kilometer.

IOT (Internet of Things) is an emerging technology. It has all together change the approach of interacting, communicating and connecting with the world. IOT can possibly interface all of us. Information from sensors, monitors and trackers can be gathered to work more proficiently. The major use of IOT is to connect together every possible infrastructure over the internet. For this purpose we must go for technologies such as GPS. This system uses this technology to locate location of animal in sanctuary. GPS modem receives string of data from the satellites and sends it to microcontroller. Low-power microcontroller extracts latitude and longitude information from string of data received from GPS modem.

Every living creature on this earth has equal importance in the ecosystem. But nowadays life of wild animals is in danger. If any accident happens to them in the zoo, physical injury or any disease may cause even death of animals in the zoo. In such situations we cannot find out exact location of animal in such a large area. To avoid such problems in the finding exact geographical location of animal in the jungle, national park or in wildlife reserves, animal tracking system is used. Talking about existing technologies in some countries, many animals have belt in their neck. This belt has a wireless transmitter.

A wildlife officer have receiver in his/her hand and will search location. However main drawback of this technique is that range of wireless transmitter is less. And in such situations these wireless transmitters are not much useful and they are time consuming. With the help of GPS technology and GSM technology, we can track an animal in the zoo or national parks of thousands of kilometers in length. This system also includes a technology such as Internet of things (IOT). In the some cases of emergency, veterinary or pet hospital staff cannot able to treat sick animals immediately as they cannot monitor animals after surgery or recuperating for 24/7. This problem is the

leading cause of death in said animals. Therefore, developers have the concept to develop a health monitoring system which keeps tracking the heart rate and temperature of sick animals in veterinary hospital.

The web application focuses on the rate of heart rate and temperature. If the heart rate and temperature are abnormal, it will alarm veterinary or pet hospital staff the animal is at risk and needs to be treated correctly. This system can be monitored by recording and analyzing the health information of sick animals, when animals have abnormal heart rate or temperature, they can be treated as soon as possible. Researches regarding animal detection have been an important field to numerous applications. Many algorithms and methods have been developed by human being in order to have a better understanding on animal behavior. Besides, these applications also can act as a warning system to human being from intrusion of dangerous wild animal for early precaution measures. These applications can be narrowed down to three main branches, namely detection, tracking and identification of animal. The animal tracking is the main topic in monitoring animal locomotive behavior and its interaction with the environment. With the technology of sensor, and global positioning system (GPS), it helps human to have a better understanding on living creatures on earth, especially on how the animal interacts with its environment

Figure 1: Livestock monitoring System in Cattle

1.2 RELATED WORK

1. Qazi Mudassar Ilyas ,The system will include soil moisture senThe farmers of agricultural farms manage and monitor different types of livestock. The manual inspection and monitoring of livestock are tedious since the cattle do not stay at fixed locations. Fencing many cattle requires a considerable cost and involves farmers' physical intervention to keep an eye to stop them from crossing beyond the access points. Visual tracking of livestock and fencing is a time-consuming and challenging job. This research proposes a smart solution for livestock tracking and geofencing using state-of-the-art IoT technology. The study creates a geographical safe zone for cattle based on IoT and GPRS, where the cattle are assigned dedicated IoT sensors. The cattle can be easily remotely monitored and controlled without having any need for farmers to intervene for livestock management physically. The smart system collects the data regarding the location, well-being, and health of the livestock. This kind of livestock management may help prevent the spread of COVID-19, lower the farming costs, and enable remote monitoring.. IEEE 2022.

2. Sneha. R This research is meant for the design of wildlife animal tracking system using GPS and GSM. This explains the methodology to overcome the problem of animal injury and mortality due to straying of wild animals out of national parks and wildlife sanctuaries by the use of wildlife tracking system. Automatic tracking system. Automatic tracking system has been implemented by incorporating GSM and GPS technology in the form of a device that would be attached to the body of an animal and would be continuously monitoring the position of the animal with respect to the GPS defined boundaries setup inside a wildlife sanctuary or national park. In case an animal strays out of the GPS defined zone, the coordinates specifying both the latitude and longitude information of an animal informing the concerned officer about the approaching danger. This system is flexible, cost efficient and easy to implement and can be beneficial for monitoring wildlife related complexities like poaching, railway and roadway accidents, destruction of vegetation and threat to human life on the occasion of straying of wild animals out of their habitation zone.2020

3. L Kamelia. Animal temperature monitoring system and location tracking system based on Global Positioning System (GPS) and Short Messages Services (SMS) gateway is one of the effective solutions to solve problems in detecting the health level of pets and decrease the amount of petloss cases. The system using

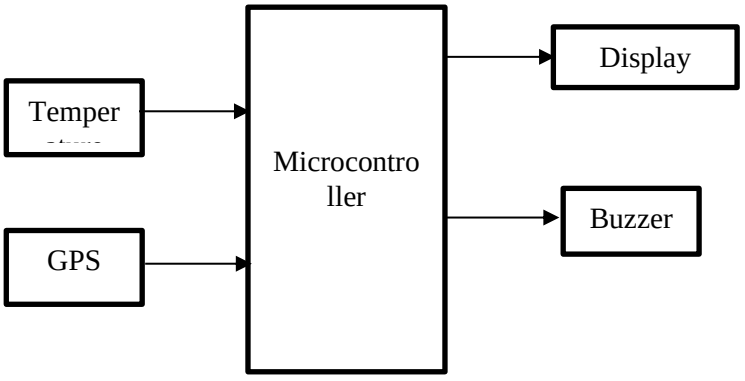
GPS technology installed on the animal's body. The system uses the Arduino Pro Mini microcontroller that is connected to the GSM module as a communication channel between the user and the system. The system is designed to display the temperature and location data based on user requests sent via SMS. Tests show the system can work according to the initial scenario using the MLX 90614 sensor, Arduino Pro Mini AT Mega 328, GSM Module, and GPS module. The system has an accuracy of 99.62% compared to conventional thermometers. The system also has accuracy at 98.7% compared to the location accuracy on Google Maps.

4. P.Keertana , There is an increasing number of issues regarding various animal health condition and movements. And in recent era, animals have become an integral part of a human life. And hence, an animal health monitoring and tracking system using ZigBee module is developed. ZigBee Technology is more and more adopted in a wide range of applicative scenarios. To track the health of an animal, sensors such as the temperature sensor, heart rate sensor, pulse rate sensor and the respiratory sensor are used. The ZigBee module would be connected to a Graphical User Interface (GUI) to show the digital data. With the advancement in technology and existence of internet, we practically can connect any device to internet and implement the concept of IOT.

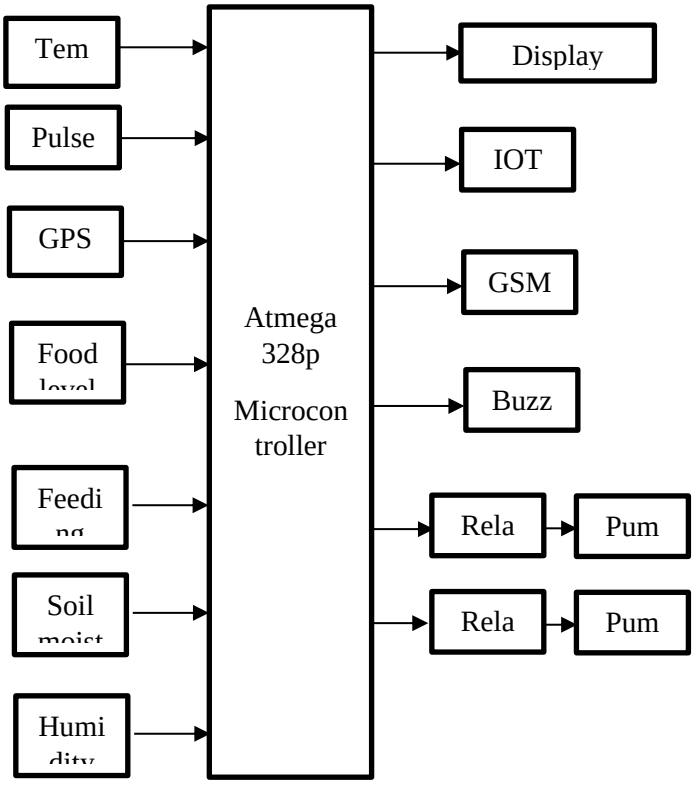
II. WORKING

This project is designed to monitoring the livestock from the farms. It easy to feed , monitoring and observed the livestock through the IoT machine. This is helpful to the user observed from far end of the place without presence in that area.

BLOCK DIAGRAM FOR EXISTING SYSTEM



BLOCK DIAGRAM FOR PROPOSED SYSTEM



Health monitoring of animal with help of temperature sensor and pulse sensor. GPS system used for tracking the location of the animal and send the data to the user through IoT. It monitor the environment like surrounding temperature , air moisture and soil moisture in order to provide comfort environment for animal. It also monitor the feeding of animal like food and water . When it decrease set level it automatic feed the water and food in container. If any abnormal found in health of animal , GSM alert is given to user and also updated in IoT.

.IV. THE HARDWARE DESIGN

SENSORS

DS18B20

Temperature Sensor Module is a digital temperature sensor. The connection of this sensor to the microcontroller via the 1-wire protocol is established. Therefore, several sensors can be connected only through one common wire to microcontroller . The output is digitally accurate to 12 bits. Therefore, the temperature can be measured with a precision of 0.0625 ° C.

PULSE SENSOR

Pulse sensor is designed to give analog output of heart beat when a finger is placed on sensor. It starts working; LED on top side will starts blinking with each heart beat. To see the sensor output, output pin of sensor is connected to controller .The working principle of sensor is based on light modulation by blood flow through nerves at each heart pulse. The sensor consists of an Infrared transmitter and Receiver. The Infrared ray emits from the transmitter and received in the receiver. When the blood is pumped in between the fingers correspondingly to the beats of the heart, the infrared rays are blocked in between and released accordingly. With each heart pulse the detector signal varies. This variation is converted into the electrical signals and given as output voltage as 0 or 5 Volts DC. The output signal is indicated in LED which blinks on each heartbeat.

MOISTURE SENSOR

This sensor can be used to test the moisture of soil, when the soil is having water shortage, the module output is at high level, and else the output is at low level. By using this sensor one can automatically water the flower plant, or any other plants requiring automatic watering technique. Module triple output mode, digital output is simple, analog output more accurate, serial output with exact readings.

Soil moisture sensors measure the water content in soil. A soil moisture probe is made up of multiple soil moisture sensors. One common type of soil moisture sensors in commercial use is a Frequency domain sensor such as a capacitance sensor. Another sensor, the neutron moisture gauge, utilize the moderator properties of water for neutrons. Soil moisture content may be determined via its effect on dielectric constant by measuring the capacitance between two electrodes implanted in the soil. Where soil moisture is predominantly in the form of free water (e.g., in sandy soils), the dielectric constant is directly proportional to the moisture content. The probe is normally given a frequency excitation to permit measurement of the dielectric constant

ULTRASONIC SENSOR

An Ultrasonic sensor is a device that can measure the distance to an object by using sound waves. It measures distance by sending out a sound wave at a specific frequency and listening for that sound wave to bounce back. By recording the elapsed time between the sound wave being generated and the sound wave bouncing back, it is possible to calculate the distance between the sonar sensor and the object.

The timing diagram of HC-SR04 is shown. To start measurement, Trig of SR04 must receive a pulse of high (5V) for at least 10us, this will initiate the sensor will transmit out 8 cycle of ultrasonic burst at 40kHz and wait for the reflected ultrasonic burst. When the sensor detected ultrasonic from receiver, it will set the Echo pin to high (5V) and delay for a period (width) which proportion to distance. To obtain the distance, measure the width (Ton) of Echo pin.

ATmega-328

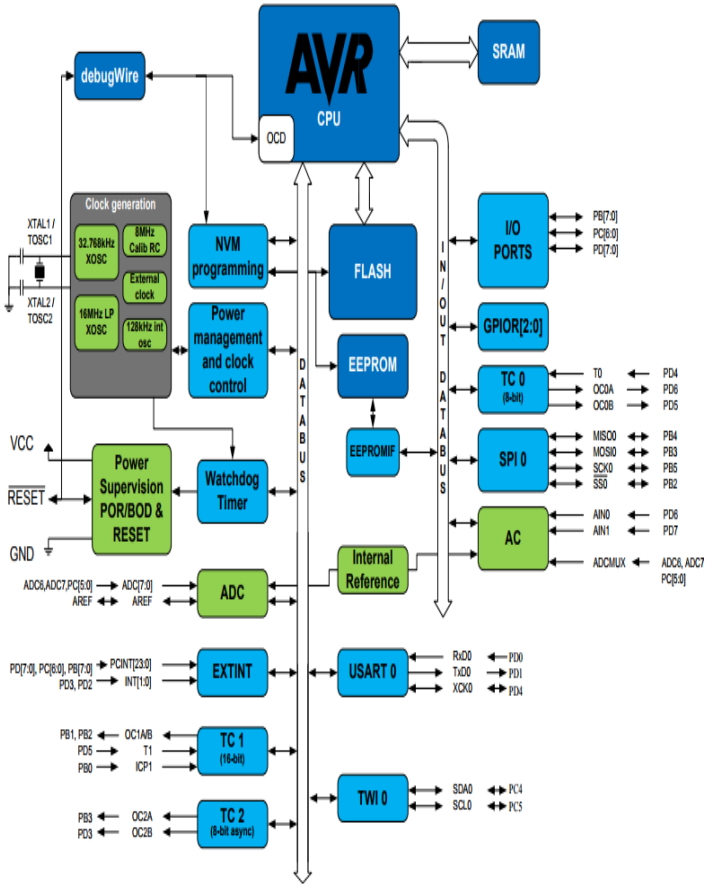
ATmega-328 is basically an Advanced Virtual RISC (AVR) micro-controller. It supports the data up to eight (8) bits. ATmega-328 has 32KB internal builtin memory. This micro-controller has a lot of other characteristics.

ATmega 328 has 1KB Electrically Erasable Programmable Read Only Memory (EEPROM). This property shows if the electric supply supplied to the micro-controller is removed, even then it can store the data and can provide results after providing it with the electric supply. Moreover, ATmega-328 has 2KB Static Random Access Memory (SRAM). Other characteristics will be explained later.

ATmega328 is an eight (8) bit micro-controller. It can handle the data sized of up to eight (8) bits. It is an AVR based micro-controller. Its builtin internal

memory is around 32KB. It operates ranging from 3.3V to 5V. It has an ability to store the data even when the electrical supply is removed from its biasing terminals. Its excellent features include the cost efficiency, low power dissipation, programming lock for security purposes, real timer counter with separate oscillator.

ATmega328 Block Diagram



An Arduino board historically consists of an Atmel 8-, 16- or 32- bit AVR microcontroller with complementary components that facilitate programming and incorporation into other circuits. An important aspect of the Arduino is its standard connectors, which let users connect the CPU board to a variety of interchangeable add-on modules termed shields. Some shields communicate with the Arduino board directly over various pins, but many shields are individually addressable via an I^2C serial bus, so many shields can be stacked and used in parallel. Official Arduinos had used the Atmel mega AVR series of chips, specifically the ATmega8, ATmega168, ATmega328, ATmega1280 and ATmega2560. These systems provide sets of digital and analog I/O pins that can interface to various expansion boards and other circuits.

All of the pins in chronological order are listed in the table shown in the figure given below.

ATmega328 Pins			
Pin Number	**Pin Name**	**Pin Number**	**Pin Name**
1	PC6	15	PB1
2	PD0	16	PB2
3	PD1	17	PB3
4	PD2	18	PB4
5	PD3	19	PB5
6	PD4	20	AVCC
7	Vcc	21	AREF
8	GND	22	GND
9	PB6	23	PC0
10	PB7	24	PC1
11	PD5	25	PC2
12	PD6	26	PC3
13	PD7	27	PC4
14	PB0	28	PC5

1. VCC is a digital voltage supply.
2. AVCC is a supply voltage pin for analog to digital converter.
3. GND denotes Ground and it has a 0V.
4. Port A consists of the pins from PA0 to PA7. These pins serve as analog input to analog to digital converters. If analog to digital converter is not used, port A acts as an eight (8) bit bidirectional input/output port.
5. Port B consists of the pins from PB0 to PB7. This port is an 8 bit bidirectional port having an internal pull-up resistor.
6. Port C consists of the pins from PC0 to PC7. The output buffers of port C has symmetrical drive characteristics with source capability as well high sink.
7. Port D consists of the pins from PD0 to PD7. It is also an 8 bit input/output port having an internal pull-up resistor.

GPS MODULE

The Global Positioning System (GPS) is a burgeoning technology, which provides unequalled accuracy and flexibility of positioning for navigation, surveying and GIS data capture. The GPS NAVSTAR (Navigation Satellite timing and Ranging Global Positioning System) is a satellite-based navigation, timing and positioning system. The GPS provides continuous three-dimensional positioning 24 hrs a day throughout the world. The technology seems to be beneficiary to the GPS user community in terms of obtaining accurate data up to about100 meters for navigation, meter-level for mapping, and down to millimeter level for geodetic positioning. The GPS technology has tremendous amount of applications in GIS data collection, surveying, and mapping.

The Global Positioning System (GPS) is a U.S. space-based radio navigation system that provides reliable positioning, navigation, and timing services to civilian users on a continuous worldwide basis -- freely available to all. For anyone with a GPS receiver, the system will provide location with time. GPS provides accurate location and time information for an unlimited number of people in all weather, day and night, anywhere in the world.

The Global Positioning System (GPS) is a satellite-based navigation system made up of a network of 24 satellites placed into orbit by the U.S. Department of Defense. GPS was originally intended for military applications, but in the 1980s, the government made the system available for civilian use. GPS works in any weather conditions, anywhere in the world, 24 hours a day. There are no subscription fees or setup charges to use GPS. The GPS is made up of three parts: satellites orbiting the Earth; control and monitoring stations on Earth; and the GPS receivers owned by users. GPS satellites broadcast signals from space that are picked up and identified by GPS receivers. Each GPS receiver then provides three-dimensional location (latitude, longitude, and altitude) plus the time.

By positioning we can understand the determination of stationary or moving objects. These can be determined as follows:

1. In relation to a well-defined coordinate system, usually by three coordinate values and

2. In relation to other point, taking one point as the origin of a local coordinate system.

The first mode of positioning is known as point positioning, the second as relative positioning. If the object to be positioned is stationary, we can term it as static positioning. When the object is moving, we call it kinematics positioning. Usually, the static positioning is used in surveying and the kinematics position in navigation.

THE SOFTWARE DESIGN

The software used in this project is given below

- IDE
- PROTEUS
- IC PROG
- KEIL Development Tool

IDE

Integrated Development Environment (IDE) is a comprehensive editor, project manager and design desktop for application development of embedded designs

IDE EDITOR

The MPLAB Editor is an integrated part of the IDE Integrated Development Environment. The editor is always available when IDE is running.

IDE FEATURES

IDE provides the ability to:

1. Create and edit source code using the built-in editor
2. Assemble, compile and link source code.
3. Debug the executable logic by watching program flow with the built-in simulator or in real time with in-circuit emulators or in-circuit debuggers.
4. Make timing measurements with the simulator or emulator.
5. View variables in Watch windows.

PROTEUS

Traditionally, circuit simulation has been a non-interactive affair. In the early days, netlists were prepared by hand, and output consisted of reams of numbers. A pseudo -graphical output plotted with asterisks to show the voltage and current waveforms.

More recently, schematic capture and on screen graphing have become the norm, but the simulation process is still non-interactive - you draw the circuit, press go, and then study the results in some kind of post processor. This is fine if the circuit you are testing is essentially static in its behavior e.g. an oscillator which sits there and oscillates at 1MHz. However, if you are designing a burglar alarm, and want to find out what happens when a would-be burglar keys the wrong PIN into the keypad, the setting up required becomes quite impractical and one must resort to a physical prototype.

Only in educational circles has an attempt been made to present circuit simulation like real life electronics where it is possible to interact with the circuit whilst it is being simulated. The problem here has been that the animated component models have been hard coded into the program. In addition, the quality of circuit simulation has often left much to be desired. For example, one major product of this type has no timing information within its digital models.

Proteus Vsm brings you the best of both worlds. It combines a superb mixed mode circuit simulator based on the industry standard SPICE3F5 with animated component models. And it provides an architecture in which additional animated models may be created by anyone, including end users. Indeed, many types of animated model can be produced without resort to coding. Consequently PROTEUS VSM allows professional engineers to run interactive simulations of real designs, and to reap the rewards of this approach to circuit simulation. And then, if that were not enough, we have created a range of simulator models for popular micro-controllers and a set of animated models for related peripheral devices such as LED and LCD displays, keypads, an RS232 terminal and more. Suddenly it is possible to simulate complete micro-controller systems and thus to develop the software for them without access to a physical prototype.

PROG

This software is used for downloading the program into PIC controller. IC programming is the process of transferring a computer program into an integrated computer circuit. The modern ICs are typically programmed in circuit through a serial protocol. Some even load the data serially from a separate flash or prom chip on every startup.

KEIL Development Tool

Keil software provides the ease of writing the code in either C or ASSEMBLY. U-VISION2, the new IDE from Keil Software combines Project management, Source Code Editing and Program debugging in one powerful environment. It acts as a CROSS-COMPILER. Keil software offers development tools for ARM.

ATMEL STUDIO 7

Atmel Studio is an Integrated Development Environment (IDE) for writing and debugging applications for AVR/ARM platforms. Currently as a code writing environment, it supports the included AVR Assembler and any external AVRGCC/ARMGCC compiler in a complete IDE environment.

Using Atmel Studio as an IDE gives you several advantages:

1. Editing and debugging in the same application window allows for a faster error tracking.

2. Breakpoints are saved and restored between sessions, even if the code was edited in the meantime. 3. Project item management is made convenient and portable.

Programming for 328p

1. Go to the ATMEL website and download ATMEL studio 7. The download link is below and it can be download and install either the web installer or the offline installer.

2. The second step to program Arduino using ATMEL Studio 7 is to add AVRdude as an external tool. To do this, open ATMEL studio and go to Tool > External Tools. There you will see a form for specifying external tool. Here we have to setup the AVRdude.exe that Arduino uses as our external tool so that ATMEL studio can use it.

3. The final step to program Arduino using ATMEL Studio 7 is to write, compile and upload the program into the Microcontroller via USB. As we said we will use C program to write the code. Start a new GCC C Executable Project, provide some name and finally select the Atmega328P as your device. This also works if you want to use C++ programming language.

4. the External Tool Arduino UNO Programmer that we created in the earlier step. But before that you have to connect the Arduino to your PC.

5. To do this, go to Tools menu in the toolbar and select/click Arduino UNO Programmer. The hex code will be burned into the microcontroller and you should see a message "avrdude.exe done. Thank you." in the output window.

VI. CONCLUSION

The following conclusions were drawn:

With increasing in interaction between humans, object and living things (Animals, plants) there is a need to build and maintain connection between them globally. IOT does this work of connect humans, object and living things with the world. In this paper, we have addressed a model for locating animals and keeping track of them. This makes it easier to feed, monitor and observe the lifestock through IoT machine.

This will interact with the user to get values in real time with their device or machine. This is helpful to the user observed from far end of the place without presence in that area. It also takes in account the caring factor. As every animal care is ought to be taken. With IOT a remote monitoring, feeding, analyzing of body temperature and other health disorders can be diagnosed.

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