MACHINE LEARNING BASED ANIMAL HEALTH MONITORING SYSTEM

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***Abstract*— Good health and wellbeing of animals are essential to dairy cow farms and sustainable production of milk. Unfortunately, day-to-day monitoring of animals condition is difficult, especially in large farms where employees do not have enough time to observe animals and detect first symptoms of diseases. This paper presents an automated, IoT-based monitoring system designed to monitor the health of dairy cows. The system is composed of hardware devices, a cloud system, an end-user application, and innovative techniques of data measurements and analysis algorithms. The system was tested in a real-life scenario and has proved it can effectively monitor animal welfare and the estrus cycle.**

For earlier year, dairy farm and farmers used the special technique for detection of animal health related diseases and it require the continuous or daily to daily base observation which again require the excessive labor if we consider the dairy farm cattle's health monitoring. sometime such technique gives the wrong result which was different from the actual health status of cattle's. The sensors base device must be moderate in size and weight. However the sensors use in such device must able to detect body temperature which is play important role in medical treatment and diagnosis. And environmental parameters will play major role in productivity of milk Another constraint is such device shall be controller and access remotely.

1. INTRODUCTION

Clinical techniques for monitoring live stock health are insufficient, as they provide only sporadic information and require too much resource investment in terms of time and veterinary expertise. A sophisticated system capable of continuously assessing the health of individual animals, aggregating these data, and reporting the results to owners and regional authorities could provide tremendous benefit to the livestock industry. Such a system would not only improve individual animal health, but it would help to identify and pre vent widespread disease, whether it originated from natural causes or from biological attacks. This project presents results from a prototype tele monitoring System that utilizes wearable technology to provide continuous animal health data. The infrastructure, hardware, software, and representative physiological measurements are presented. Livestock are domesticated animals raised in an agricultural setting to produce commodities such as food, fiber and labor. In the industrial model of livestock production, animals are housed in close quarters inside massive climate-controlled buildings or on feedlots. Each confined animal feeding operation, may house tens or even hundreds of thousands of animals. There has always been a need for livestock producers to "observe" their animals as often as possible.

The incorporation of Data Mining (DM) and Machine Learning (ML) techniques, that can be used for extracting additional and relevant information for whom manages vineyards and/or shepherds. In the scope of this paper it is explored the Cattle it cloud platform that receives animal sensor streamed data, performs data analysis (e.g. rule management), allows farm managers to access animal information and trigger alarms in real-time when certain situations are detected (e.g. panic attacks, attacks from predators, abnormal number of infractions, etc.). The paper also describes some preliminary results of an animal posture monitoring use case, for which several machine learning algorithms were tested.

2. EXISTING SYSTEM

This cattle health monitoring system uses an ECG, a Thermistor and a Gyro sensor to measure the bio-signals of each individual cattle. This data is then transmitted to an integrated management system that stores the vital cattle information using a ZigBee WSN module after the signals are amplified using processing amplifier. Finally the cattle health monitoring system graphically presents the vital information to help understand the symptoms of each individual through a clinical decision support system. It is extremely hard to gauge the substance material of the division. Presently a days there is no framework like this to quantify.

a) Drawback

1. In this process only limited will be alerted and there is no image capture of the cattle to trace them later.
2. The implementation and Complexity is high.
3. The accuracy of the exact result is less.

3. PROPOSED SYSTEM

Nowadays Cattle field is facing lot of problems due to lack of food resources. The proposed design is an automatic system that helps the cattle farmer in maintaining cattle health process. This project concentrates on the detection of health issues of animals by using Sensors near the border of the farm and also to save them by turning on the buzzer, based on health content of the cattle through the information from temperature, pressure, humidity sensors. The microcontroller collect the data from sensors and process the data based on that data it sends the signals to the speakers through APR96000 Voice Module according to which it produce the sound mainly we can produce buzzer sound in order to detect the animals while entering to the field and also sends mail to the mobiles of the cattle farmers, by using Thing Speak server, to take the safety precautions. Also farmer can see the animal status like humidity, temperature by using DHT11 Sensor in Thing Speak server at any time. Here we are interfacing Raspberry pi camera through which we can monitor cattle all the time.

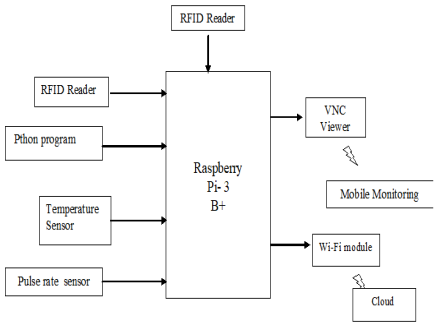

Figure-1: Block Diagram of Machine learning based animal health monitoring Using Raspberry Pi

The Design Requirements of infant incubator are to provide the infant with the bare necessities, these are: (i) An ambient temperature of 36ºC-37ºC (ii) Humidity greater than 70%RH and (iii) sterile air supply from the above diagram, temperature sensor DHT11 is used to measure the body temperature which gives the normal and abnormal values. The DHT11 is precision temperature sensor which can be easily calibrated. They operate as a 2-terminal Zener and the breakdown voltage is directly proportional to the absolute temperature at 10mV/o K. The circuit has a dynamic impedance of less than 1Ω and operates within a range of current from 450µA to 5mA without alteration of its characteristics. Unlike other sensors, DHT11 have a linear output and gait sensor is used to measure the biometric characteristics of the livestock. However, much of this information cannot be retrieved directly from sensors, being necessary more computational demanding mechanisms. One interesting possibility is the use of ML techniques, which popularity and power have been increasing.

4. HARDWARE DESCRIPTION

a) Raspberry Pi

The Raspberry Pi is manufactured in three board configurations through licensed manufacturing deals with Newark element 14(Premier Farnell), RS Components and Ego man. These companies sell the Raspberry Pi online. Ego man produces a version for distribution solely in China and Taiwan, which can be distinguished from other Pi's by their red coloring and lack of FCC/CE marks. The hardware is the same across all manufacturers.

The Raspberry Pi has a Broadcom BCM2835 system on a chip (SoC), which includes an ARM1176JZF-S 700 MHz processor, Video Core IV GPU and was originally shipped with 256 megabytes of RAM, later upgraded (Model B & Model B+) to 512 MB. It does not include a built-in hard disk or solid-state drive, but it uses an SD card for booting and persistent storage, with the Model B+ using a MicroSD.

The Foundation provides Debian and Arch Linux ARM distributions for download. Tools are available for Python as the main programming language, with support for BBC BASIC (via the RISC OS image or the Brandy Basic clone for Linux), C, Java and Perl.

Figure-2: Raspberry Pi

b) DHT11 Sensor

Humidity is the measure of water vapour present in the air. The level of humidity in air affects various physical, chemical and biological processes. In industrial applications, humidity can affect the business cost of the products, health and safety of the employees. So in semiconductor industries and

the amount of moisture present in the gas that can be a mixture of water vapour, nitrogen, argon or pure gas etc... Humidity sensors are of two types based on their measurement units. They are a relative humidity sensor and Absolute humidity sensor. DHT11 is a digital temperature and humidity sensor.

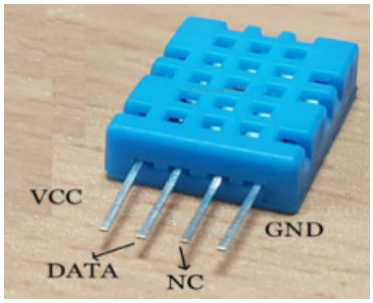

Figure-3: DHT 11 Sensor

c) Buzzer

Magnetic transducers contain a magnetic circuit consisting of a iron core with a wound coil and a yoke plate, a permanent magnet and a vibrating diaphragm with a movable iron piece. The diaphragm is slightly pulled towards the top of the core by the magnet's magnetic field. When a positive AC signal is applied, the current flowing through the excitation coil produces a fluctuating magnetic field, which causes the diaphragm to vibrate up and down, thus vibrating air. Resonance amplifies vibration through resonator consisting of sound hole(s) and cavity and produces a loud sound.

Figure-4: Buzzer

d) Pulse Sensor

This heart beat sensor is designed to give digital output of heat beat when a finger is placed inside it .When the heart detector is working, the top-most LED flashes in unison with each heart beat. This digital output can be connected to microcontroller directly to measure the Beats Per Minute (BPM) rate. It works on the principle of light modulation by blood flow through finger at each pulse.

Figure-5: Pulse Sensor

e) RFID

RFID represents ID of radio frequencies. RFID labels are little chips (more often than not as a keen card or a meeting card) that are utilized in our day by day lives to open lodgings, enter autos, and so on. These little chips structure the RFID framework together with a RFID reader. During the Second World War, RFID technology was first used to identify enemy aircraft. RFID technology has evolved since then and is now being used in many different industries Two parts of an RFID system are 1) RFID Reader and 2) RFID Tag. Data is stored electronically in the RFID tag. The reader collects this data using electromagnetic waves. Tags can only store a few kilograms of data bytes.

Figure-6: RFID reader

Figure-7: RFID Tags

f) ThingSpeak

"**ThingSpeak"** is an open-source Internet of Things (IoT) application and API to store and retrieve data from things using the HTTP and MQTT protocol

applications, location tracking applications, and a social network of things with status updates". ThingSpeak was originally launched by ioBridge in 2010 as a service in support of IoT applications.

5. SOFTWARE DESCRIPTION

a) Introduction to Python

Python is a general purpose, dynamic, high level and interpreted programming language. It supports Object Oriented programming approach to develop applications. It is simple and easy to learn and provides lots of high-level data structures. It is easy to learn yet powerful and versatile scripting language which makes it attractive for Application Development. Its syntax and dynamic typing with its interpreted nature, makes it an ideal language for scripting and rapid application development. It supports multiple programming patterns, including object oriented, imperative and functional or procedural programming styles. It is not intended to work on special area such as web programming. That is why it is known as multipurpose because it can be used with web, enterprise, 3D CAD etc. We don't need to use data types to declare variable because it is dynamically typed so we can write a=10 to assign an integer value in an integer variable. It makes the development and debugging fast because there is no compilation step included in python development and edit-test-debug cycle is very fast.

Python Version ML Algorithm

- Machine learning (ML) is a type of artificial intelligence (AI) that allows software applications to become more accurate at predicting outcomes without being explicitly programmed to do so.
- There are four basic approaches:

1. Supervised learning
2. Unsupervised learning
3. Semi-supervised learning
4. Reinforcement learning

Decision Tree Classification Algorithm

1. It is a type of supervised learning algorithm that is mostly used for classification problems
2. It works for both categorical and continuous dependent variables. In this algorithm, we split the population into two or more homogeneous sets
3. This is done based on most significant attributes/ independent variables to make as distinct group as possible.

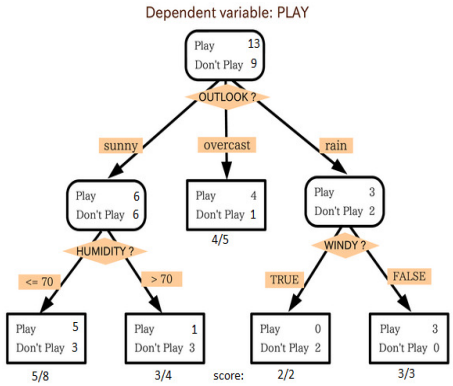

Figure-8: Tree Classification Algorithm

b) Software Development

Python is helpful for software development process. It works as a support language and can be used for build control and management, testing etc.

c) NOOBS (New Out Of Box Software)

Despite its success, there is something about the Raspberry Pi that might just put people off: until now, setting it up has not been particularly user friendly. NOOBS aims to change that! Intended for youngsters to get to grips with computing in countries where IT skills are a rarity, the Raspberry Pi has proved to be a surprisingly popular device – especially considering the relatively low specification. Setting up a Raspberry Pi isn't difficult – however it is unnecessarily involved, requiring SD card writing software. Wouldn't it be much easier if the tools for installing the Pi could be simply copied to an SD card and the computer launched? The Raspberry Pi Foundation obviously thought so as they have released NOOBS, a tool for streamlining installation, running multiple operating systems and easily configuring your OS options.

6. RESULT

Assemble the circuit on the bread board and general board. After assembling the circuits on the boards check it for proper connections before switching on the power supply. The implementation of Machine Learning Based Animal Health Monitoring System is done successfully. The communication is properly done without any interference between different modules in the design. Design is done to meet all the specifications and requirements.

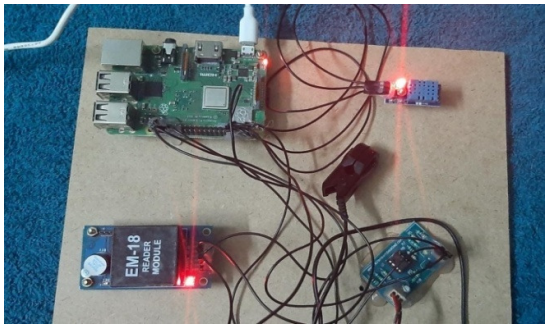

Figure-9: Hardware Prototype Image

a) Advantages

- The complexity of the project is less
- The accuracy rate is high
- The implementation is easy

b) Applications

- At home**.**
- Nurseries.
- In Factories

CONCLUSION

Advanced monitoring tools, a distributed software infrastructure, and processing algorithms will allow the livestock industry to react to and predict disease onset in cattle and its subsequent spread. This paper presented early results from a cattle-worn system capable of acquiring multiple physiological and environmental parameters: core body temperature, heart rate, GPS location, ambient temperature & humidity, and motion (via a 3-axis accelerometer). While early data have yielded previously unobtainable information about ambulatory animal activity, more work remains in the areas of heart rate detection, accelerometer data analysis, multi-parameter health assessment algorithms, and information aggregation in a collection of local/regional databases.

FUTURE SCOPE

This project proposed a cost-effective model which will monitor human as well as Cattle health. The mode will be set as per the situation and all the data will be continuously sent to thing speak account. If there is any problem, a notification will be sent to the respective persons. If there's any abnormality within the health condition of cattle remedies may be taken quickly. Hence, it's more practical and helps in the increase of production of milk.

BIBILOGRAPHY

[1] McAllister, T.A., et al. “Electronic Identification: Applications in beef production and research,” Canadian Journal of Animal Science, Vol. 80, pp. 381–392, 2000.

[2] Bernick, J. “Time for Traceability,” FARM Journal, pp. 48–49, 2001.

[3] National Farm Animal Identification and Records, 2001.

[4] Sowell, B.F., et al. “Feeding and WateringBehavior of Healthy and Morbid Steers in a Commercial Feedlot,” Journal of Animal Science, Vol. 77, pp. 1105–1112, 1999.

[5] Rodgers, A., R.S. Rempel, and K.F. Abraham. “A GPS-based telemetry system,” Wildlife Society Bulletin, Vol. 24, No. 3, pp. 559– 566, 1996.

[6] Turner, L.W., et al. “Monitoring cattle behavior and pasture use with GPS and GIS,” Canadian Journal of Animal Science, Vol. 80, pp. 405–413, 2000.

[7] Moen, R., J. Pastor, and Y. Cohen. “Interpreting behavior from activity counters in GPS collars on moose,” ALCES, Vol. 32, pp. 101–108, 1996.

[8] Gibb, D.J., et al. “Bunk attendance of feedlot cattle monitored with radio frequency technology,” Canadian Journal of Animal Science, Vol. 78, No. 4, pp. 707–710, 1998.

[9] Sowell, B.F., et al. “Radio Frequency Technology to measure feeding behavior and health of feedlot steers,” Applied Animal Behavior Science, Vol. 59, pp. 277–284, 1998.

[10] Martinez, Angel, Scott Schoenig, Daniel Andresen, and Steve Warren. “Ingestible Pill for Heart Rate and Core Temperature Measurement in Cattle,” 28th Ann Conf IEEE EMBS, Aug. 30 – Sept. 3, 2006. In press.