

Cattle Tracing and Segregation using Long Wavelength Identification (RUBEE)

P. Dev ganesh, S. Jagadish, P. Thanu krishna, R. Karthick, A. Aruna

Abstract: *Cattle management has a vital job in domestic life. The dairy product is necessary in day to day life. Tracking and monitoring animals is becoming more complex and takes a lot of time for the owners who maintain huge amount of cattle. The segregation of cattle consumes more man power and time to complete. To overcome this, we developed a smart cattle management using long wavelength identification (RuBee). RuBee utilizes electromagnetic signals at 131 kHz and it is able to transmit and get signals efficiently of the fact that electromagnetic signals are not obstructed by steel or fluids, where the other devices like RFID cannot pass through steels or liquids efficiently. It makes the RuBee to stand alone. Collar system in cattle is used to separate the heifer in heat and sick cattle. By this segregation the extraction of milk and identification of heifer in oestrus state could be done in more efficiently manner and can be notified about the cattle state to the cattle owner for the ideal time for artificial insemination or natural mating. The temperature and PH sensor plays a vital role in identification of diseased cattle from the healthy one.*

Index Terms: RuBee, ARM7 microcontroller, AMSCST(Automatic Measurement System for Cattle's Surface Temperature), PH sensor.

I. INTRODUCTION

In the cattle farming, during grazing, the cattle are mingled with other cattle like cows, heifer and bull. In the present system, deployed LH-RFID technology that requires the cattle to move out of the truck and it should walk through the RFID gate. In that gate the RFID scans the cow and it store the information about the cow. Using this technology they segregate the cattle. When the cattle are segregated manually it takes more time and man power. In the RFID technology they used high frequency around 13.56MHz. The RFID tag is hooked on cow's ears and it offers to identify the animal for a period of many years. In that tag, cow's information are stored and it is checked when a cow enter in to the gate. During this process the cows are segregated and we can trace the cattle easily. But in the RFID they scan multiple cattle at a time. It

does not work well when it work for large warehouses. And also the RFID are affected by metals and it also affected by liquid products. It is not suitable for change in temperature. To overcome the above defects we use Long Wavelength Identification (RUBEE). The RUBEE uses electromagnetic signals and it is possible to transmit and receive signals. RUBEE is not affected by metals and liquid products. It also work efficiently in high noise immunity and in harsh environments. RUBEE has a range from 2" to 100' depends on tag and antenna design. It is low power consumption and it has long battery life with a thin coin

small battery. In the cattle farming, when the cows are moved from one place to another, the cattle are mingle with other cattle like cows, heifer and bull. In the present Korean government, deployed LH-RFID technology that requires the cattle to move out of the truck and it should walk through the RFID gate. In that gate the RFID scans the cow and it store the information about the cow. Using this technology they segregate the cattle. When the cattle are segregated manually it takes more time and man power. In the RFID technology they used high frequency around 13.56MHz. The RFID tag is hooked on cow's ears and it offers to identify the animal for a period of many years. In that tag, cow's information are stored and it is checked when a cow enter in to the gate. During this process the cows are segregated and we can trace the cattle easily. But in the RFID they scan multiple cattle at a time. It does not work well when it work for large warehouses. And also the RFID are affected by metals and it also affected by liquid products. It is not suitable for change in temperature. To overcome the above defects we use Long Wavelength Identification (RUBEE). The RUBEE uses electromagnetic signals and it is possible to transmit and receive signals. RUBEE is not affected by metals and liquid products. It also work efficiently in high noise immunity and in harsh environments. RUBEE has a range from 2" to 100' depends on tag and antenna design. It is low power consumption and it has long battery life with a thin coin small battery.

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* Correspondence Author

P. Dev ganesh, Student, Department of Computer Science and Engineering, SRM Institute of Science and Technology, Chennai, India.

S. Jagadish, Student, Department of Computer Science and Engineering, SRM Institute of Science and Technology, Chennai, India.

P. Thanu krishna, Student, Department of Computer Science and Engineering, SRM Institute of Science and Technology, Chennai, India.

R. Karthick, Student, Department of Computer Science and Engineering, SRM Institute of Science and Technology, Chennai, India.

A. Aruna, Assistant Professor, Department of Computer Science and Engineering, SRM Institute of Science and Technology, Chennai, India.

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II. RELATED WORKS

A. A Proposed Prototype for Cattle Monitoring System

Chokri Jebali and Ammar Kouki, they proposed the system, The RFID framework is utilized to screen the dairy cattle entering and escaping the trailer. This presents a few difficulties as far as impedance brought about by steers development inside a metallic casing. They proposed a model to imitate the genuine framework in lab condition, so impedance issues can be precisely contemplated and relieved. Additionally, utilizing the model guarantees speedy experimentation with least cost, sparing time, and taking out creature fatigue.



A profound investigation with the model demonstrates that the orientation of the tag stoundingly corrupted the recognition, and ends up being surprisingly more dreadful in the earness of vibration. It gives a measurement of three advances, each with six label entries with various edges to evaluate the proficiency of the RFID per user, and to uncover the significance of the model in term of execution to complete practically every one of the parameters influencing the location rate in the trailer. The RFID is depends on the orientation of the RFID tag and also the moisture level at the RFID tag to overcome the drawbacks of the RFID. We using long wavelength identification (rubees) the rubees produce electromagnetic signals those electromagnetic signals are not affected by the orientation and moisture level of the tag[1].

B. RFID for cattle traceability system at animal checkpoint

U.Ketprom, C.Mitrapant, P.Makhapun, S.Makwimanloy and S.laokok they proposed the system, They expects to contemplate the attainability of recognizability framework at the administration creature checkpoint and how UHF-radio recurrence ID (RFID) innovation can be sent for empowering such framework. UHF-RFID specialized methodology faces numerous ramifications on powerful conditions at creature checkpoint along the street. they furnish professionals with knowledge on how RFID innovation can meet detectability prerequisites. RFID empowers the programmed framework; consequently, it is conceivable to offer administrations, for example, programmed information obtaining and check administration through RFID and entry time estimation administration. These administrations are given dependent on RFID framework, information procurement program called e-Note, and creature checkpoint focus (ACC) site. To produce recognizability data, clients distinguish the key parameters, for example, the quantity of development grant on the ACC site and look into data on creatures, development courses, starting point and goal, and so forth. Such RFID incorporated framework guarantees that the detectability data can be effectively gotten to and is more fully informed regarding the present circumstance. The RFID uses radio waves it cannot pass through steels or liquids efficiently where the rubees uses electromagnetic signals it is possible to transmit and receive signals more efficiently because those electromagnetic signals are not blocked by steel or liquids. The RFID is affected by the open air environmental change but the Rubees is not affect by the open air environmental changes and it works efficiently. Rubees is more secure. The RFID is affected by the mechanical disturbance where the rubees can work efficiently in the mechanical disturbance. [2]

C. Continuous Health Surveillance System for Cattle

AftabAhmed Isak Mulla, Anup Pravin Mulik, Abhishek Prashant Jadhav and Dipakkumar D. Gawai they proposed the system, in their project, they proposed a wireless sensor network system(WSN) settling of Radio Frequency Identification (RFID), Zig-bee module and assistant sensor's to screen the creature's bolstering conduct, drinking conduct, weakness, heart beat and body temperature. This will guarantee persistent checking of cows and help in aversion of wellbeing related maladies of the cows' and builds adequacy of different characteristics of creature farming like milk production, decreases treatment cost, diminish work cost and so forth. The efficiency of the system is low and the power consumption is comparable high. In our paper we use automatic measurement system for cattle surface temperature

it use rectal temperature so the temperature is accurate and it is easy to separate the cattle in the reproductive cycle and the diseased one.[3]

DISVANTAGES OF EXISTING SYSTEM

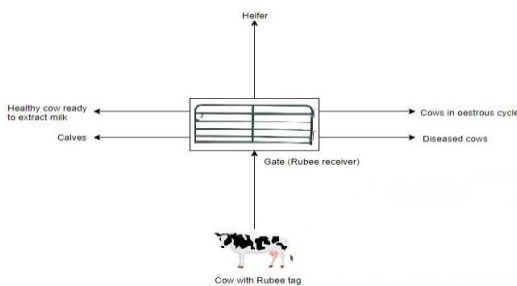
- The RFID is depends on the orientation of the RFID tag and also the moisture level at the RFID tag.
- The RFID is affected by the open air environmental change.
- The sensors efficiency of the system is low and the power consumption is comparable high.
- The RFID uses radio waves it cannot pass through steels or liquids efficiently

III. PROPOSED SYSTEM

In this system we provided a efficient way for cattle tracing and cattle segregation. For cattle tracing we used Long Wavelength Identification (RuBee). RuBee utilizes electromagnetic signals at 131 kHz and it is able to transmit and get signals efficiently of the fact that electromagnetic signals are not obstructed by steel or fluids, where the other devices like RFID cannot pass through steels or liquids efficiently. The RFID does not work efficiently in harsh surrounding conditions. The RuBee has range from 2" to 100' depends on tag and antenna design.it is low power consumption and it has long battery life with a thin coin small battery. RUBEE is low frequency inductive protocol that operates at 131kHz.It works like a barcode reader. In the RuBee tag we store the information about the cattle. The active tag sends magnetic waves to the antenna and receiver in the RuBee periodically. The active RuBee tag uses thin coil battery and its lifespan is 2 to 5 years. With the help of RuBee tag we can trace the location of cattle and we can also find how many cattle are in the range of RuBee. The RuBee receiver and antenna designed should be in a specific manner such that movement of cattle could be traced When the cattle fencing is 100 yard means the antenna should fix to that fencing size. It can be modified by the user. The RuBee receiver should connect to the personal computer. When the cattle move out of the particular range it detects the signal and send it to the computer. The antenna detects the signal at a particular time interval. It is programmed by the user. The receiver send the location of the cattle to the connected pc's. With the help of connected pc's cattle tracing can be done effectively. In the cattle segregation we categorize the cattle. In the cattle farming we divided the entire cattle shack into five categories, such as healthy cattle, diseased, heifer, cattle in oestrous state and calves . For the entry of all shacks we have only one gate. It is not a normal gate it is attached with RuBee tag reader. The reader is used to read the tag which has the information about the cattle. The cattle is allowed to pass through the gate (which has the RuBee reader attached to it) one by one. The RuBee reader collects the information about the cattle from the tag and classifies them by the acquired data. When the cattle age is less than 2 years and hasn't reach the oestrous state then it is heifer. When the cattle temperature is not in the range of 100 to 104 °F [37.8 °C to 40.0 °C] then it is diseased cattle.

When the cattle is in ideal temperature and it has one or more calves and it also not in the oestrous state then it is the cow which is ready for milk extraction. When the cattle is pregnant it is send to separate shack. To determine the fertility of cow we use AMSCST. It is used to check the fertility of the cattle. If the age around 2 or 3 and fertility condition is true then the cattle is in oestrous state. When we do segregation manually it takes more time and needs more man power. The diseased cattle cannot be identified easily when we do manually. This RuBee method gives efficient ways of segregation. The AMSCST(Automatic Measurement System for Cattle's Surface Temperature) is used to find the fertility of a cattle. It reads the surface temperature with the assist of rectal temperature. The AMSCST is fixed in the metatarsus of the hind leg and it measures the surface temperature. To find the surface temperature, rectal temperature and the calorstat are used. The PH sensor is placed at end of the cow's tail and it takes samples from the genetals of the cow and the sample is used to determine the cow's well being. The obtained ph value is not in the range of idle ph then the cow's well being is noticed and the data is send to microcontroller. The AMSCST temperature and the ph sensor value is send to the connected pc by using ARM7 microcontroller. In that pc via internet it send the data to the RuBee tag. It stores the information in that tag. Then the information about the temperature and Ph value is used for segregation by using the above method. The respective cattle are categorized and send to the specific shacks.

IV. ARCHITECTURE DIAGRAM



Architecture diagram

V. MODULE DESCRIPTION

5.1 RuBee:

RuBee (IEEE standard 1902.1) is a two way, dynamic remote convention intended for unforgiving condition, high security resource perceivability applications. RuBee uses Long Wave (LW) attractive signs to send and get short (128 byte) information bundles in a neighborhood territorial system. The convention is like the IEEE 802 conventions in that RuBee is arranged by utilizing on-request, shared, dynamic emanating handsets. RuBee is distinctive in that it utilizes a low recurrence (131 kHz) bearer. One outcome is that RuBee is moderate (1,200 baud) contrasted with other parcel based system information guidelines (WiFi). 131 kHz as a working recurrence gives RuBee the benefits of ultra low power utilization (battery life estimated in numerous years), and ordinary task close steel as well as water. These highlights

make it simple to convey sensors, controls, or even actuators and markers. Since RuBee utilizes long wavelengths and works in the close field (under 50 feet) it is conceivable to all the while transmit and get from numerous contiguous radio wires, without impedence giving the signs are synchronized. That makes it conceivable to improve data transfer capacity and expel any edge affectability ordinarily observed with other RF frameworks. RuBee has no reflections and isn't hindered by steel or fluids and in this way is volumetric (not observable pathway). That makes RuBee powerful in unforgiving condition perceivability and security applications. It likewise implies RuBee has no TEMPEST target or listening in dangers in secure offices. RuBee is the main remote innovation to be endorsed for use in secure offices by the U.S. Branch of Energy (DoE). RuBee has likewise been endorsed by DoE and HERO tests by the DoD for use in high unstable territories with a Safe Separation Distance (SSD) of zero. RuBee is likewise just remote innovation to ever be affirmed by DoE with an inherent security zero SSD. RuBee tags might be recognized with high affectability through entryways, regardless of whether the advantage is covered up in steel brief case, similarly as in vehicles however doors utilizing receiving wires covered in a street.

5.2 Automatic Measurement System for Cattle's Surface Temperature

The Automatic Measurement System for Cattle's Surface Temperature (AMSCST) to evaluate the heat temperature of metatarsus by associating a one of a kind shell planned to fit the existence structures of dairy steers' back leg. Utilizing AMSCST, the surface temperature (ST) on the metatarsus of the rear leg was progressively estimated amid 24 hours every day with an interim of one hour in three tried seasons. In perspective on ST and rectal temperature (RT) recognized by AMSCST and thermometer, independently, a direct blended model was set up, with respect to both the time point and occasional factors as the fixed impacts. Unary direct relationship and Bland-Altman examination results showed that the temperatures estimated by AMSCST were solidly related to those conscious by mercury thermometer ($R^2 = 0.998$), suggesting that the AMSCST is an exact and trustworthy way to deal with distinguish dairy cows' body temperature. Measurable examination demonstrated that the distinctions of STs among the three seasons, or among the diverse time focuses were huge ($P < 0.05$), and the distinctions of RTs among the distinctive time focuses were correspondingly critical ($P < 0.05$). The expectation precision of the blended model was confirmed by 10-overlap cross approval. The normal contrast between estimated RT and anticipated RT was about $0.10 \pm 0.10^\circ\text{C}$ with the affiliation coefficient of 0.644, showing the achievability of this model in estimating cow body temperature.

The ST was estimated utilizing our AMSCST from the metatarsus of the rear leg with inadequate hair. Inside the metatarsus the temperature sensor is mounted where veins and muscle are rich. A shell shape was intended to fix the temperature sensor fitting to the steer life structures.

The temperature sensor was put in close contact with the muscle through the shell and mounted on a curved home situated midway in favor of the shell. This structure limits the impact of condition factors, for example, wind, prompting progressively precise temperature estimation.

5.3 pH sensor

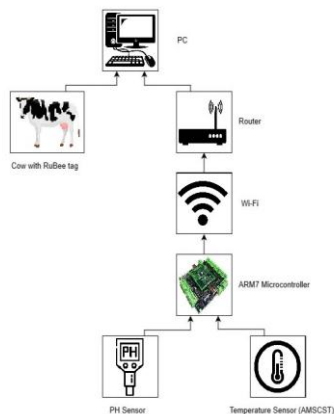
pH sensor is an intelligent instrument that appraises the hydrogen-molecule activity in water-based arrangements, demonstrating its destructiveness or alkalinity imparted as pH. The pH meter evaluates the distinction in electrical potential between a pH cathode and a reference terminal, accordingly the pH meter is some of the time alluded to as a "potentiometric pH meter". The refinement in electrical potential identifies with the corrosiveness or pH of the solution. The pH meter is utilized in different applications going from research facility for quality control. Potentiometric pH meters measure the voltage between two cathodes and demonstrate the result changed over into the relating pH regard. They include an essential electronic speaker and a few terminals, or on the other hand a blend anode, and some kind of presentation aligned in pH units. It generally has a glass anode and a reference terminal, or a mix cathode. The terminals, or tests, are embedded into the answer for be tested. The plan of the cathodes is the key part: These are bar like structures normally made of glass, with a globule containing the sensor at the base. The glass terminal for estimating the pH has a glass knob explicitly intended to be specific to hydrogen-particle focus. On submersion in the answer for be tried, hydrogen particles in the test arrangement trade for other decidedly charged particles on the glass globule, making an electrochemical potential over the knob. The electronic enhancer identifies the distinction in electrical potential between the two anodes produced in the estimation and changes over the potential contrast to pH units. The size of the electrochemical potential over the glass knob is straightly identified with the pH as indicated by the Nernst condition. The reference terminal is coldhearted to the pH of the arrangement, being made out of a metallic channel, which interfaces with the showcase. This conductor is inundated in an electrolyte arrangement, ordinarily potassium chloride, which comes into contact with the test arrangement through a permeable clay membrane. The showcase comprises of a voltmeter, which shows voltage in units of pH. On submersion of the glass terminal and the reference anode in the test arrangement, an electrical circuit is finished, in which there is a potential contrast made and identified by the voltmeter. The circuit can be thought of as going from the conductive component of the reference anode to the encompassing potassium-chloride arrangement, through the earthenware layer to the test arrangement, the hydrogen-particle specific glass of the glass terminal, to the arrangement inside the glass cathode, to the silver of the glass cathode, lastly the voltmeter of the presentation device. The voltage fluctuates from test answer for test arrangement relying upon the potential distinction made by the distinction in hydrogen-particle focuses on each side of the glass film between the test arrangement and the arrangement inside the glass anode. All other potential contrasts in the circuit don't fluctuate with pH and are revised for by methods for the calibration. For

straightforwardness, numerous pH meters utilize a mix test, developed with the glass cathode and the reference terminal contained inside a solitary test. A definite depiction of blend cathodes is given in the article on glass electrodes. The pH meter is aligned with arrangements of known pH, ordinarily before each utilization, to guarantee precision of measurement. To gauge the pH of an answer, the cathodes are utilized as tests, which are plunged into the test arrangements and held there adequately long for the hydrogen particles in the test answer for equilibrate with the particles on the outside of the knob on the glass anode. This equilibration gives a steady pH measurement.

5.4 ARM7 microcontroller

The ARM (Advanced RISC Machine) has propelled a few processors which have distinctive highlights just as the diverse centers for a wide assortment of uses. The main ARM engineering configuration has 26-bit processors, however at this point it came to 64-bit processors. The general development of ARM items can't be arranged on some specific data. However, ARM items can be comprehended dependent on its engineering. The standard ARM arrangement processors accessible in the market are beginning from ARM7 to ARM11. These processors have a few highlights like reserve, Data Tightly Coupled memory, MPU, MMU, and so forth. A portion of the generally known ARM processor arrangement are ARM926EJ-S, ARM7TDMI, and ARM11 MPCore. This article is especially expected for ARM7 based LPC2148 microcontroller engineering diagram which will give you a short data about the microcontroller design. The ARM7 is a 32-bit broadly useful chip, and it offers a portion of the highlights like little power usage, and elite. The design of an ARM is relied upon the standards of RISC. The related unravel component, just as the RISC-directions set are much simple when we contrast and microprogrammed CISC-Complex Instruction Set Computers. The Pipeline technique is utilized for handling every one of the squares in engineering. As a rule, a solitary guidance set is being performed, at that point its relative is being deciphered, and a third guidance is being acquired from the memory. A selective structural arrangement of ARM7 is called as Thumb, and it is splendidly reasonable for high volume applications where the conservativeness of code is an issue. The ARM7 additionally utilizes a restrictive design in particular Thumb. It makes it superbly appropriate for various applications by memory confinements where the thickness of code is an issue.

VI. DATA FLOW DIAGRAM



Data Flow Diagram

VII. OBJECTIVE

To improve the cattle tracing and also to segregate the cows from calves for the extraction of milk by using long wavelength identification. Identify the diseased cows from the healthy cattle and to identify the cow in oestrous cycle by using the AMSCST temperature and Ph sensor that is used to obtain the required data and send to the connected pc by using ARM7 microcontroller and its notify the information about the cattle to the cattle owner. The system is also notify the cattle owner about the ideal time for artificial insemination of the cow in oestrous cycle.

VIII. RESULT

The designed system works in such a manner that the data obtained from the sensors are transferred to the cloud and with the help of internet provided by RuBee technology it can be monitored by the user through his /her mobile or pc. This system provides accurate values which occur from the system are observed by the user, with this intervention cattle segregation is done easily. It saves the time and segregation can be done with less man power. The AMSCST sensor detects the cattle temperature and it is send to ARM7 microcontroller along with Ph value. The data is send to computer via internet. With the help of ARM7 microcontroller and internet service the data is sent to RuBee tag. It is used for the segregation of cattle. This technology is very efficient in the cattle farming. And it is also made that the whole system is economical and setting up RuBee technology needs lower funds initially, in the long run, it will be cheap as it requires less maintenance.

IX. CONCLUSION

This paper illuminate the need and favourable circumstance of the RuBee (Long wavelength identification) for wellbeing checking of the dairy cattle. In this paper, RuBee is also used for cattle tracing which have higher efficiency in harsh environment. It likewise approves the thought and equipment that can be utilize for the cattle segregation. Which is the important work to be done before milk extraction. This method of cattle segregation increase

the efficiency of the identification of diseased cattle and oestrous state cattle and separation of cows(which is ready to be extracted for milk) from calves and heifers. This method of segregation reduces the man power and human errors.

X. FUTURE WORK

The deep research on oestrous cycle could have been predicted. The prediction of oestrous cycle for a heifer. The research on identification of disease on the cattle could be done. The preparation of artificial insemination for the cow's which has passed that the oestrous state could be initiated at right time.

REFERENCE

1. Chokri Jebali, Ammar Kouki, "A Proposed Prototype for Cattle Monitoring System using RFID", 2018.
2. U. Ketprom, C. Mitrpant, P. Makhapun, S. Makwimanloy, S. Laokok, "RFID for cattle traceability system at animal checkpoint", 2011.
3. AftabAhmed Isak Mulla ; Anup Pravin Mulik ; Abhishek Prashant ; Dipakkumar D. Gawai, "Continuous health surveillance system for cattle", June 2017.
4. S.Jegadeesan, Dr.G.K.D.Prasanna Venkatesan, "Distant Biometry In Cattle Farm Using Wireless Sensor Networks".
5. HongXiang Kou1,2, YiQiang Zhao3, Kang Ren4, XiaoLi Chen1, YongQiang Lu4,Dong Wang1," Automated measurement of cattle surface temperature and its correlation with rectal temperature",2017.
6. Stefano Dantas1, André N. Barreto1, Leonardo Aguayo1, A. Judson Bragal, Lucas S. Silva1, and Luis G. Uzeda Garcia2," Simulation of IEEE 1902.1 (RuBee) Protocol for Communication with Buried Assets", 2017.
7. R. E. Floyd, "RFID in Animal-Tracking Applications", IEEE Potentials, 2015.