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Smart Animal Farm

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Abstract: Farming is not just a hobby; it's a way of life. Proper care of animal farm can be addressed through monitoring the environmental parameters and feeding system in order to maintain the healthy lifestyle of animals.
In this paper we propose an efficient smart system which places the environmental and diet care of animals above every other factor, it includes automated measurements to analyse the feed and water as required, exhaust the biogas waste produced, detect fire in the farm by simply making use of sensors, automatic analysis and observation of the entire farm and sending alert messages to the mobile app if there is a problem .Our primary motive is to reduce the time, energy and labor costs by integrating smart technology in to their facilities.
Keywords: Internet of things, Animal, Smart, Animal Farm, behaviour analysis.

I. INTRODUCTION

In India, number of farmers depend on the animals for their livelihood. Animals are not resources , they are living, breathing, hurting members of our global family. As we are witnessing, the forces of innovation currently in all the domains, we can introduce the same evolutionary technologies in the area of animal farming for animal welfare. Switching from a traditional farmer to a modern farmer is really a hard task, but change is to humans what sunlight is to plants, there is no growth, without it.
Internet of things (IoT) term used in our everyday's life has ability to collect, sense, analyse data from the connected devices and then share the data through internet facility, so that the collected data can be used utilized to facilitate our living. No innovation/technology is ever a waste of time. If it didn't bring you what you want, it taught you what you don't want.
Our smart system addresses almost all requirements of animal farming such as Provide feed and water as required, Exhaust the biogas produced, Detect fire in the farm, real time monitoring of farm. Manual analysis and observation in a continuous fashion is a total waste of time. All it does steal your time and energy. Keep busy doing nothing. In our system, there is automatic surveillance of the entire farm by using mobile app which has many advantages like it is cost efficient, accurate, increases flexibility. Animals can be feed remotely from anywhere either using mobile app or dashboard.

II. RELATED WORK

"Research on Animal Feed and Animal Waste Detection based on Computer Vision".
[Authors : Bin Hu, Qiuchang Tian, Zizhang Chen , Gang Xiong.]
In this paper, author presents the algorithm (animal feed detection algorithm and animal waste detection algorithm). In animal feed detection algorithm, author has used color features and canny's edge detection techniques to detect the animal feed. In waste detection algorithm, author has used the technique called median filter together with hough's straight line transformation to find out the contaminated area for the waste detection.
"Automating Monitoring of Cat Feeding Behaviour".
[Authors : Donald Bailey, David Thomas, Michelle Cho, Said Al-Souti.]
In this paper, author has proposed an economic way of monitoring the behaviour of cats while feeding during palatability trails. Palatability is used in food selection as it depends on various factors includes taste, temperature, texture choice of food. Here author has used food bowls with load cells to measure the quantity of food eaten by cats. Another feature used in this paper is video monitoring, it records the activity of animals and also eliminates period of animal inactivity by using adaptive background subtraction technique.
"Automated Analysis of Feeding Behaviour in Small Animals".
[Authors :J. P. Stittl, R. P. Gaumond1, J. L. Frazierl, and F. E. Hanson]
In this paper author has described the implementation and operation of an apparatus that is designed to record and analyze the feeding behaviour of a small animal such as a caterpillar. The behaviour studied here is driven by input from taste receptors; changes in peripheral sensory input will induce observable behavioural changes. Author has implemented a system capable of modeling the chemosensory induced behavioural changes of a plant-feeding caterpillar, the larval Muncu sextu. Eight taste neurons

provide primary input to the feeding decision center of the CNS which produces the observable behaviour response. A mathematical model encodes the relationship between the activity levels of peripheral taste receptors and the observable feeding behaviour.

"Smart Farm Computing Systems for Animal Welfare Moni-toring".

[Authors : Marcel Caria, Jasmin Schudrowitz, Admela Jukan and Nicole.]

In this paper, author has designed the open and low cost computing system for animal welfare by making use of the techniques like fog computing and low cost edge devices (Raspberry Pi). This smart system creates the fog computing layer connected with cloud computing system and a mobile app and Raspberry Pi is used to monitor the animals and the farm. Author mainly focuses on two parameters i.e. stable temperature and animal movements

III.PROPOSED SYSTEM

We in this paper proposed an efficient smart system which can be designed by deploying sensors (water level sensor, temperature sensor, motion sensor, biogas sensor) and microcontroller (ESP8266) in the animal farm, all the sensors are connected to the microcontroller.

The data collected by the sensors is transmitted to the cloud via wi-fi. System uses these automated measurements and takes appropriate actions like if water level sensor senses the level of water goes down to the minimum value then the water pump turns on to fill the water container, if the level of feed decreases then the motor gets on so that the feed can be filled up, if there is excess of biogas emission then the cleanup activity is performed, if fire sensor module detects fire in the farm, it turns on fire alarm. Data available on the cloud can be easily accessed by using mobile app or dashboard.

Animals can be feed remotely from anywhere in the world by using mobile app or dashboard. An important feature of the mobile app is it can send the alert messages to the application , if problem exists. Even though our smart system is applicable to every animal species, our main focus is on cattle.

IV. ALGORITHM

The Apriori Algorithm is an influential algorithm for mining frequent itemsets for boolean association rules.

A. Key Concepts

1) The Frequent Itemsets: The sets of item which has minimum support (denoted by Li for ith-Itemset).
2) Apriori Property: Any subset of frequent itemset must be frequent.
3) Join Operation: To find L k, a set of candidate k-itemsets is generated by joining Lk-1 with itself.

B. STEP 1

1) Generate the candidate itemsets in C1
2) Save the frequent itemsets in L1

C. STEP K

1) Generate the candidate itemsets in Ck from the frequent itemsets in Lk-1
a) Join Lk-1 p with Lk-1q, as follows: insert into Ck

```
select p.item1, p.item2, . . . , p.itemk-1, q.itemk-1
from Lk-1 p, Lk-1q
where p.item1 = q.item1, . . . p.itemk-2 = q.itemk-2, p.itemk-1 < q.itemk-1
```

b) Generate all (k-1)-subsets from the candidate itemsets in Ck
c) Prune all candidate itemsets from Ck where some (k-1)-subset of the candidate itemset is not in the frequent itemset Lk-1
2) Scan the transaction database to determine the support for each candidate itemset in Ck
3) Save the frequent itemsets in Lk

D. System Architecture

The following is the diagram for system architecture.

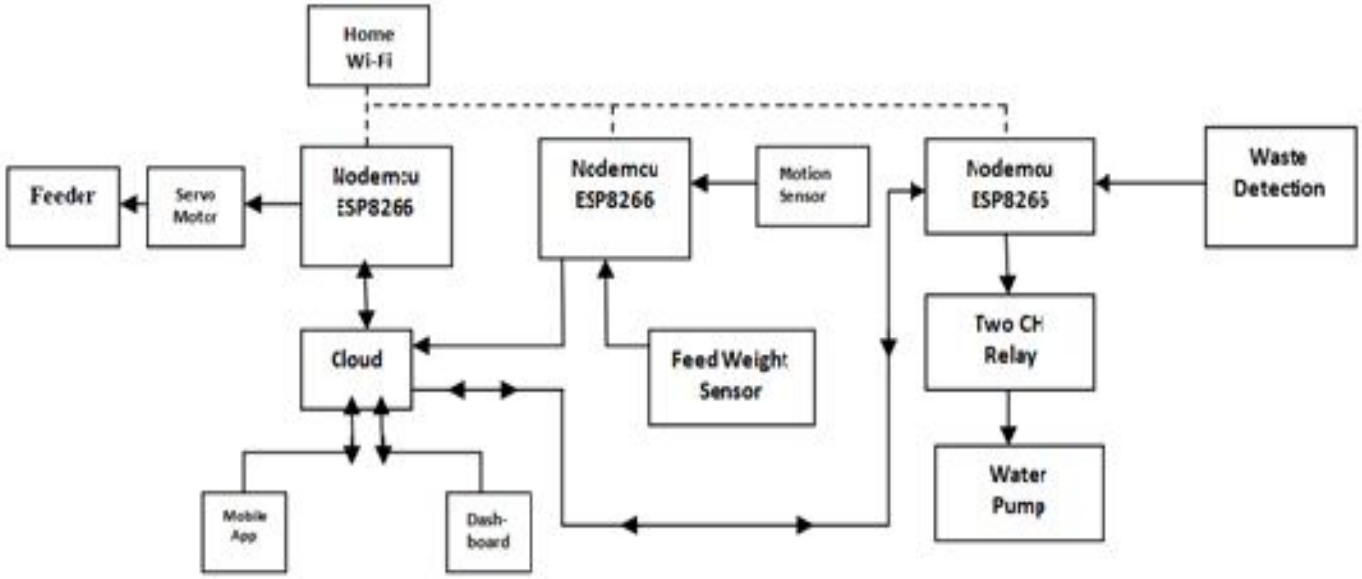

Fig. 1 System architecture

IV. SIMULATION RESULT

A. The objectives of system Are

1) To Provide feed and water as required.
2) To Exhaust the excess of biogas produced.
3) To Detect fire in the farm.
4) This intelligent system should also do surveillance of the entire farm.
5) Real time monitoring.

V. CONCLUSIONS

In this paper, we proposed a cost efficient IoT enabled smart system which is comprised of feed filling system, water filling system, biogas exhaust system, fire detecting system. It continuously monitors the physical parameters of an animal farm. It can be controlled manually as well as automatically. This system considers almost all parameters such as diet care, cleanliness, farm surveillance which are important for an animal welfare. This kind of system is suitable for any type of animal farm with little modifications. Smart farm allows a farmer to ease his workload , save time and increase his flexibility. There is a long and prosperous future in smart farming and to sustain it each nation must become more food dependent. Automated farming means improving product quality and the job that we do, and for many is the way forward.

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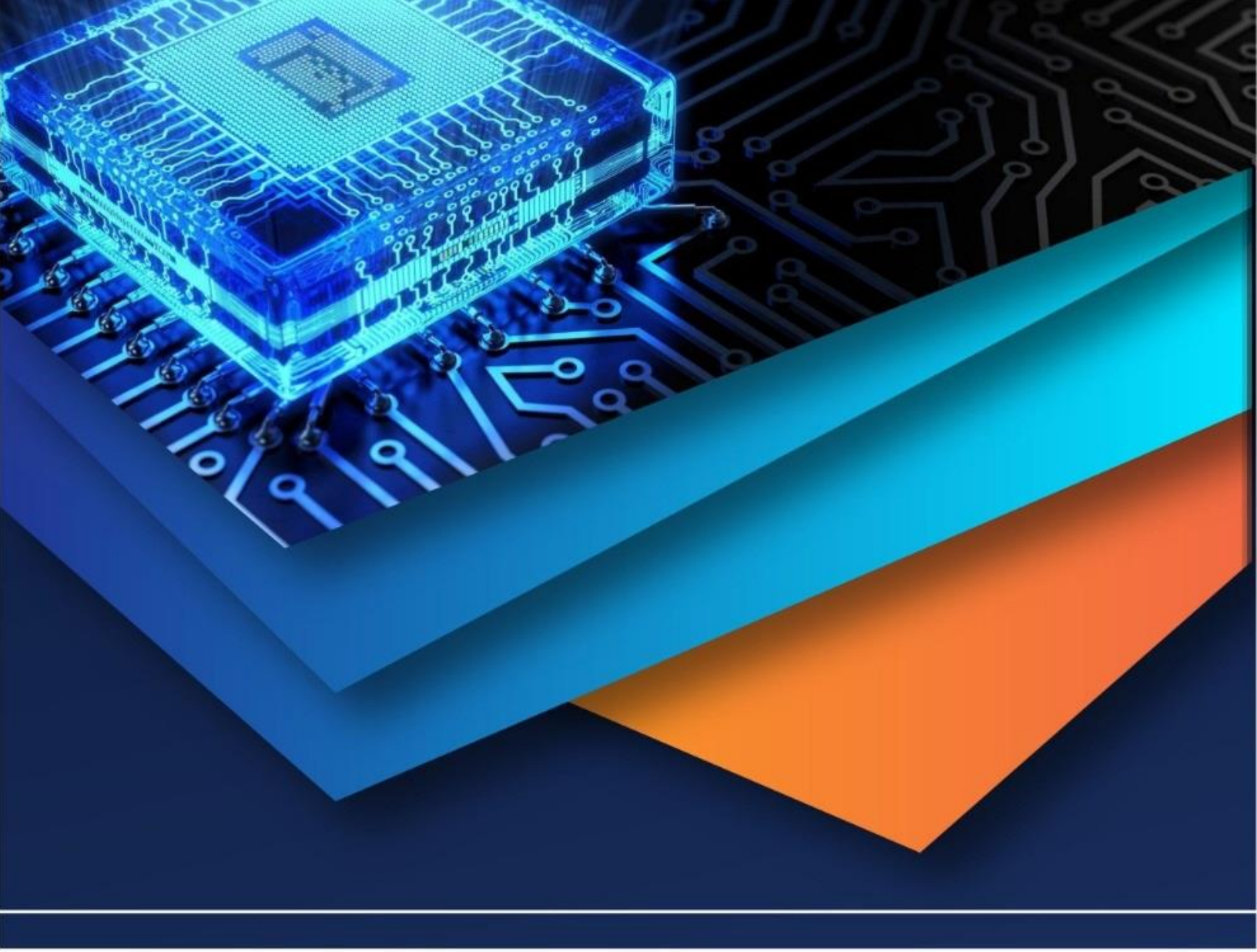

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