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# Recent Advances in IOT based Wireless sensors for Cattle Health Management -A review

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***Abstract*** **- Human can't imagine their life without technology in this modern era. Various kinds of technologies help people to live their life with luxury. The cattle industry is an integral part of the world economy. Additional benefits can be realized from this class of technology, such as the ability to identify the presence of disease early and thereby prevent its spread. The IOT based cattle health and environment monitoring system monitors various cattle health parameters such as body temperature, heartbeat, location of animals and environmental parameters such as temperature, humidity. This also explains how the primary sensors identified by the research can be used to forecast cattle health in a simple, basic manner. Monitoring the activities and health of the cattle continuously and taking corrective measures help in increasing the milk productivity. This helps in preventing the cattle from diseases at early stage and also increases the milk yield**

***Keywords—monitoring; Parameters; forecast; productivity***

## 1. Introduction

The farming industry is an important sector of the Indian economy.The Indian dairy sector produced 134.5 million tonnes of milk last year. Over the past decades production increased from 53.9 million tonnes in '90-'91 to 127 million tonnes in 2011-2012. The Asian country represents 17% of the world's total dairy production. This makes India the largest dairy producing country in the world. The Indian government is aiming for an intensive expansion of milk production to 180 million tonnes in 2021-22. The use of wireless sensors and wearable technologies is becoming increasingly important for animal health management. These devices, if built precisely and used correctly, can provide timely diagnosis of diseases in animals, eventually decreasing economic losses. Such devices are particularly useful for dairy cattle farms. Advanced tracking and monitoring technologies have already been used for pets and wild animals. Under Article 4 of 1987 European Convention for the Protection of Pet Animals, pet owners must provide their pets with sufficient food, water, and exercise; today, the latter can be easily monitored by GPSand cellular network-based animal trackers. Furthermore, a new branch of computer science, called Animal-Computer Interface (ACI) has evolved focusing on improving the humananimal communications and enabling the so-called animal welfare science. For wild animals, on the other hand, emphasis has been on systems that non-intrusively monitor their behavior, on monitoring environmental changes that lead to behavioral and species-specific issues, as well as co-existence of humans and wild animals, be it through prevention of road-side accidents, or preventing illegal hunting of endangered species. To record, share and analyze biomedical data of animals globally, the large volume of data produced can only be handled by systems deeply rooted in today's notion of clouds, high-end computing and real-time data transmission. As it is, there is a high synergetic momentum to revisit smart computing and sensing systems for domestic and wild animals, foster their further advances, and pioneer the developments in the area of smart systems for farm animal welfare, all under a joint framework.

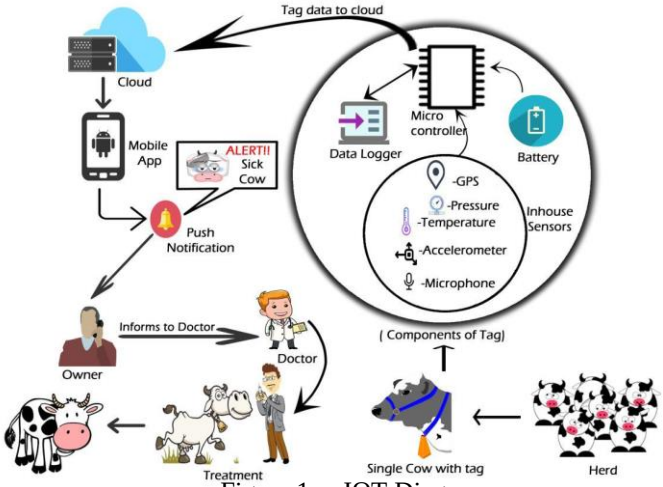


Figure 1 IOT Diagram

## 2. Types of sensors

(Awasthi and etal) described their research for the development of a sensor system for dairy cattle health monitoring. The sensor systems development may be described in four levels: 1. Sensor technique: Measurement of raw data for a cow (e.g., activity, temperature); 2. Data Interpretation: Interpretation that condenses change in the sensor data (e.g., increased activity) to fabricate information about the status of the cow (e.g., Oestrus); 3. Information Integration: Information can be integrated from other sensors (e.g., data from milking parlour or load cells) as an add-on for decision making; and 4. Decision-making: The decision-making depends on the farmer, or the sensor system may do it autonomously (e.g., to call doctor or farmer depending on the situation) [1,42].

(Aswini and etal) designed "Arduino" an open source computer hardware that is used to sense and control objects in the physical world. The Arduino UNO is a microcontroller board is based on ATmega328.It has 14 digital input/output pins, 6 analog inputs, USB connection, power jack and a reset button. The Arduino UNO is used because of their flexibility, simple programming,

 

and low cost, huge collection of application data and large availability of open source developer tool.

Kae Hsiang Kwong and etal explained about cattle monitoring. This research provides an alterative solution for animal monitoring system by using low-cost, low power consumption sensor nodes. To facilitate real-time reporting while overcoming mobility caused by animal movement, an Implicit Routing Protocol (IRP) is particularly designed. The experimental results indicated that the proposed IRP can significantly diminish the impact of mobility under varying "off" probability, different quantity of sensor node and the occurrence of network reconfiguration. In the near future, the designed routing protocol is expected to be used in the farm trial in order to study its operation and implication in the field.

(Admela Jukan and etal) has systematically reviewed smart technologies used in animal welfare, in three main categories of animals: domestic, farm and wild animals. A smart system, as we define it, assumes sensing and computing capabilities that are interconnected, not only with various networking technologies but also computing systems that can collect, process, and evaluate data related to the animal welfare. He suggested few recommendations for further research include a few salient features of the systems reviewed and their potential to improving animal welfare, i.e.,

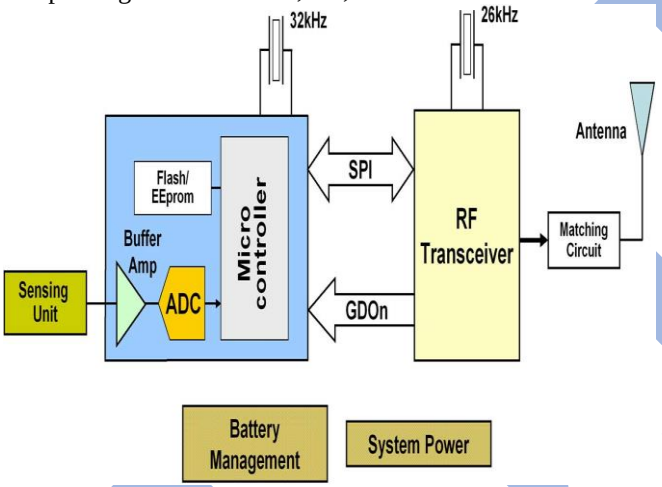


Figure 2 Block Diagram of sensor

1. **Develop integrated and open cloud based systems, applications and services.** Even though research has been reported on smart farming and agriculture, much work is to be done in integrating the specialized sensor network system with the current cloud services and infrastructure and opening the data and systems for sharing, programmability and further innovation.

**2. Integrate cross-species and cross-sectorial research.** We have found a lot of common features in how the animal based sensor network systems are built and used, but little or no evidence that the systems can be reused across species or animal applications. For instance, farming system can much benefit from the knowledge in low cost, and low power wild animal tracking, as well as from wearable systems for dogs. **3.Include animal centered research in smart agriculture**. Even though the smart agriculture concepts do not exclude animals, much of the focus today is on plant-based agriculture, and comparably less on livestock agriculture.

**4.Integrate topics of animal welfare conceptually into smart "X" systems and the IoT world.** Smart and connected cities and communities are now becoming a reality. This is a perfect opportunity to add animal welfare to the agenda. For little or no extra cost, these technologies can be also be used to track bird and other wildlife migration pattern, track and find missing pets and livestock, predict natural disasters, and a host of other possible applications. Smart transportation can be used to monitor the welfare of transported animals, smart energy can be used to track animals outdoors, smart cities can monitor wild animals in cities, and domestic animal applications can be integrated in smart homes.

**5.Create smart emergency and disaster response for animal welfare.** All animals, be it pets, farm, zoo or wildlife, are arguably the biggest casualties in emergencies and disasters like fires, earthquakes, floods and other natural disasters. In such situations, when first responders are stretched to the limit, smart technologies can play a significant role from detection to prevention to recovery. Smart systems can detect the emergency, the number and kinds of animals in need, and take predetermined rescue and recovery measures. **6. Make animal welfare economically sustainable.** As this review shows, animal welfare can be economically sustainable, when supported through low cost smart systems, or when integrated into systems already in place. The data provided by technologies can inform consumers of animal products of the provenance of the livestock, and provide strong economic incentive and aid adoption.

**7.Use smart technologies to learn from the animal world.** As part of the ACI, there are untapped opportunities to use smart technologies learn from the animal world. There is documented evidence that animals can provide early warnings for impending natural disasters like earthquakes, floods and hurricanes, and diseases like heart attacks, cancer or diverse types of seizures. But smart technologies present the possibility to scale this from isolated and often unrelated cases into an actionable methodology that could have enormous benefits.

**8.Promote Education and Awareness.** The key challenge in adoption of any of these smart technologies is lack of awareness of the existence, effectiveness and economic benefits within the farming community, among consumers, and even technologists. Educating the veterinary and wildlife conservation communities about smart technologies could also make great strides in increasing deployment. Computer science and engineering curriculam need to include syllabi on smart technologies and systems for animal welfare. There are undoubtedly hard technical and economic challenges to overcome, but these are minor in comparison to changing the existing mindset. As this review demonstrates, there are many smart technologies in use today, and a sea of promising innovations in the future, making it possible for smart computing and sensing technology to co-exist with the animals in a sustainable, humane and mutually beneficial manner.


 

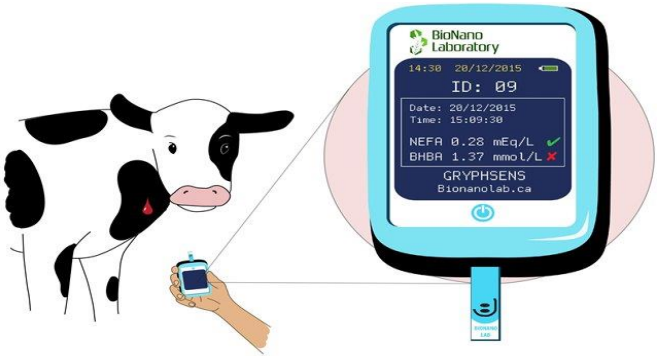


Figure-3 Different Types of Sensors

**Advantages**

Network setups can be done without fixed infrastructure.
Ideal for the non-reachable places such as across the sea, mountains, rural areas or deep forests.
Flexible if there is ad hoc situation when additional workstation is required.
Implementation cost is cheap.

**Disadvantages**

It is not affordable for small farmers.
Less secured because network hackers can enter the access point and get all the information.
Lower speed compared to a wired network.
More complex to configure than a wired network.
Easily affected by surroundings (walls, microwave, and large distances due to signal attenuation).

## 3. Result

This review sets the goal to systematically survey the existing literature in smart computing and sensing technologies for domestic, farm and wild animal welfare. We use the notion of animal welfare in broad terms, to review the technologies for assessing whether animals are healthy, free of pain and suffering, and also positively stimulated in their environment. Also the notion of smart computing and sensing is used in broad terms, to refer to computing and sensing systems that are not isolated but interconnected with communication networks, and capable of remote data collection, processing, exchange and analysis. We review smart technologies for domestic animals, indoor and outdoor animal farming, as well as animals in the wild and zoos. The findings of this review are expected to motivate future research and contribute to data, information and communication management as well as policy for animal welfare.

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