**IoT with Animal Ecology- Next Smart Farming Evaluation**

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***Abstract: Internet of things for animals refer to the many such devices like biochips transponders on farm animals, heart monitoring implants, cameras streaming live feeds of wild animals in coastal waters, DNA analysis devices for environmental or pathogen monitoring. The speedy expansion for IOT for animals has helped in generating large amount of useful data needed to collect and analysing from the behaviour of these animals. The current theoretical limits of IoT in animal ecology are also discussed. Although IoT offers a new direction in animal ecological research, it still needs to be further explored and developed as a theoretical system and applied to the appropriate scientific frameworks for understanding animal ecology.***

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1. **INTRODUCTION**

Recently, the Internet of Things has become the most major technology in all over the world, which is not only used by the people to contact with each other but also utilized by the business organizations to become international.

IoT can create a whole world of magic for the healthcare sector, including medical and consumer wearables, data aggregation and analytics, and predictive systems that help entire nations avoid lifestyle-related illness and other diseases.

Wildlife is at a tipping point. In the 20th century, for example, we lost more than 500 land vertebrate species. However, it is estimated that the world will lose the same amount of species over the next 20 years alone. Through deforestation, overfishing, and poaching, human intervention continues to bring a multitude of species to the brink of extinction. Now, it will take human intervention, with some additional assistance, to save them.

In the dire context of rising global temperatures and increasing land clearing, next-generation technologies offer some hope to protect biodiversity now and into the future, with connected devices tracking keystone species and revealing unique behaviours.

There is little new about tracking herds of animals via tags. Previous iterations of the technology have often been large and heavy, and needed to be hung around the necks of cattle or other animals. Needless to say, this is not a cost effective solution for many use cases.

Thanks to low-cost, small cellular IoT technology, things are changing. Finnish startup company Anicare has launched a tracking device that can be attached to an animal’s ear.

Connected farming may also aid in determining the cause of animal casualties. Using the last known position allows farmers to find perished individuals and determine cause of death. This may aid in reducing fatalities and simplify reporting to the government for statistics and compensation purposes.

1. **IOT IN ANIMAL HEALTHCARE FRAMEWORK**

In practical terms, the IoT in an animal healthcare framework should consist of a wearable device, a data aggregation device and a data center. It's important to remember that connecting each sensor directly to unreliable broadband internet in an open space wouldn't be a clever idea. Connecting numerous sensor devices to the cloud is neither power nor cost efficient. Instead, users can look to build a local wireless network, integrating Bluetooth Low-Energy or LoRa for maximum efficiency and low cost-infrastructure.

The data transfer unit communicates the sensed data to the data center via a gateway of wireless communication medium. In the data center unit, data received from the gateway is used to create analysis and visualizations that allow users to view real-time conditions of animal health. The data is stored in the cloud for future use and analytics.

It's worth mentioning that today, IoT hardware is much more accessible than 10 years ago. There are more off-the-shelf products available and custom-build is also easier. Using IoT in animal healthcare is no longer a sci-fi story.

1. **IOT TECHNOLOGY IS TRANSFORMING THE AGRICULTURAL SECTOR**

The impact of Internet of Things (IoT) and connected devices in this modern day world is undeniable. Today it has reached almost everywhere, from home, to health sector, smart cities, fitness, to industrial sector. Its presence can be seen in most industries, and the domain of agriculture is no different. In fact, IoT and connected devices can have an incredible impact on farming practices, so the farmers would no longer need relying on the horses and plows. After all, in the times of self-driving cars, and augmented and virtual reality, what is the point of depending on the age-old methods? Hence, the concept of IoT is a much-welcomed in Agriculture and Farming.

Even though at the moment smart agriculture IoT is much popular as the consumer connected devices, the market is yet very dynamic. IoT solutions’ adoption for agriculture purposes is growing constantly, like there is BI Intelligence that has predicted that number of agriculture IoT device installations will hit 75 million by the year 2020, and it is going to grow 20 percent annually. Also, it is expected that global smart agriculture market size will triple by 2025, and thus it will reach to $15.3 billion, which is bit over $5 billion in the year 2016.

# **IoT-Enabled Livestock Management**

Livestock management, also known as livestock monitoring or precision livestock farming, uses IoT-enabled devices to track and monitor the health of livestock, most commonly cattle.

IoT-enabled livestock management solutions take the guesswork out of herd health. Using a wearable collar or tag, battery-powered sensors monitor the location, temperature, blood pressure and heart rate of animals and wirelessly send the data in near-real-time to farmers’ devices.

This allows farmers to check in on the health and location of each individual animal in their herd from anywhere as well as receive alerts if something falls outside of the normal range. Rather than physically check the vitals of each individual animal to see if an illness has spread, they know immediately which livestock is affected and which are not.

Besides tracking health, livestock monitoring solutions can use GPS tracking to gather and store historical data on preferred grazing spots or use temperature tracking to determine the peak of mating season.

# **Smart Farming: The Future of Agriculture**

The Internet of Things (IoT) has provided ways to improve nearly every industry imaginable. In agriculture, IoT has not only provided solutions to often time-consuming and tedious tasks but is totally changing the way we think about agriculture. What exactly is a smart farm, though? Here is a rundown of what smart farming is and how it’s changing agriculture.

Traditional greenhouses control the environmental parameters through manual intervention or a proportional control mechanism, which often results in production loss, energy loss, and increased labor cost.

IoT-driven smart greenhouses can intelligently monitor as well as control the climate, eliminating the need for manual intervention. Various sensors are deployed to measure the environmental parameters according to the specific requirements of the crop. That data is stored in a cloud-based platform for further processing and control with minimal manual intervention.

Agriculture is one of the major verticals to incorporate both ground-based and aerial drones for crop health assessment, irrigation, crop monitoring, crop spraying, planting, soil and field analysis, and other spheres.

Since drones collect multispectral, thermal, and visual imagery while flying, the data they gather provide farmers with insights into a whole array of metrics: plant health indices, plant counting and yield prediction, plant height measurement, canopy cover mapping, field water pond mapping, scouting reports, stockpile measuring, chlorophyll measurement, nitrogen content in wheat, drainage mapping, weed pressure mapping, and so on.

Importantly, IoT-based smart farming doesn’t only target large-scale farming operations; it can add value to emerging trends in agriculture like organic farming, family farming, including breeding particular cattle and/or growing specific cultures, preservation of particular or high-quality varieties, and enhance highly transparent farming to consumers, society and market consciousness.

If we have the Internet of Things (IoT) and [the Internet of Medical Things (IoMT)](https://www.iotforall.com/ai-healthcare-turning-data-into-action/), why not have one for food? The European Commission project Internet of Food and [Farm 2020](https://www.iof2020.eu/about) (IoF2020), a part of [Horizon 2020 Industrial Leadership](https://ec.europa.eu/programmes/horizon2020/en/h2020-section/industrial-leadership), explores through research and regular conferences the potential of IoT technologies for the European food and farming industry.

IoT has fostered the belief that a smart network of sensors, actuators, cameras, robots, drones, and other connected devices will bring an unprecedented level of control and automated decision-making to agriculture, making possible an enduring ecosystem of innovation in this eldest of industries.

# **Conclusion**

Thus, the IoT agricultural applications are making it possible for ranchers and farmers to collect meaningful data. Large landowners and small farmers must understand the potential of IoT market for agriculture by installing smart technologies to increase competitiveness and sustainability in their productions. With the population growing rapidly, the demand can be successfully met if the ranchers, as well as small farmers, implement agricultural IoT solutions in a prosperous manner.

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