SEEJPH Volume XXV S2, 2024, ISSN: 2197-5248; Posted: 05-12-2024

ENHANCEMENT OF COW BOVINE'S PERFORMANCE USING THE SOLOTRACK REGRESSION ALGORITHM

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KEYWORDS

Solo Track algorithm, Dairy cattle performance, stress, heart rate, milk production, disease identification.

ABSTRACT

A crucial aspect of the supply of goods for human use is provided by the dairy industry. In order to maximize milk production and the general health of the herd, it is crucial to improve dairy cattle performance. The Solo Track regression approach is applied in this study to enhance the performance of dairy cattle. Solo Track, a novel algorithm developed for this purpose, aims to analysis various factors influencing cattle performance and predict outcomes such as body temperature, stress, heart rate, milk production, disease identification and etc. The difficulty of early detection and handling of cows that are affected by disease is caused by monitoring the condition of cows. This IOT technology is helpful in accurately diagnosing the diseases that may occur in cows and solving those diseases. Comprehensive data gathering, including details on feed composition, normal parameters that are and health measures, is part of the scope of work. To find the primary factors influencing the performance of dairy cattle, feature selection is carried out after the data has been pre- processed to ensure its quality and

relevance. After that, the dataset is used to select and train the Solo Track regression method, which makes use of sophisticated techniques to capture complex relationships between input features and desired results. To determine how well the trained model can predict outcomes and generalize to new data, it is carefully evaluated. To maximize the performance of the algorithm, fine-tuning is applied depending on evaluation outcomes. The Solo Track regression method is used in real-world dairy farming situations after it has been verified. It provides a data-driven strategy to improve milk output, health care, and overall industry efficiency. By introducing a unique regression technique designed for dairy cattle performance enhancement, this research advances the rapidly developing field of precise agriculture. The results have importance for stakeholders, researchers, and farmers looking for creative ways to enhance dairy operations, advance animal welfare, and satisfy the growing demand for dairy products worldwide.

INTRODUCTION

Cows are known to be cattle and are the most common type of large domesticated ungulates. Worldwide, cows are employed in a variety of ways. Cows are elevated for meat, milk, and other dairy products and used as draft animals. Other products derived from cow are leather and dung. The dairy operations play a crucial role in the worldwide agricultural scene by producing goods that are necessary for human consumption. The increasing demand for dairy products makes it necessary to maximize the performance of dairy cattle in order to effectively achieve production goals. Precision agriculture is being made possible by the evolution of traditional dairy herd management techniques through the integration of sophisticated technologies. This research is focused on improving dairy cattle performance by utilizing the Solo Track regression technique. The Solo Track algorithm was created particularly for this purpose with the goal of evaluating and predicting the complex relationships between several factors impacting dairy cattle in order to improve outcomes

like milk output and general health. The composition of the feed, the immediate surroundings, and health indicators are among the primary factors affecting the performance of dairy cattle. Our goal in using Solo Track is to extract meaningful information from these heterogeneous datasets so that a greater understanding of the complex dynamics influencing the productivity and well-being of cattle is possible. The Solo Track algorithm will be developed and applied, trained on a large dataset, and its prediction power will be assessed as part of this research. The research effort aims to contribute to the progress of precision agriculture techniques by researching the practical application of Solo Track in real-world dairy farming scenarios.

The dairy industry continues to encounter sustainability, efficiency, and animal welfare challenges. One way to systematically address these issues is through the incorporation of breakthrough technology such as the Solo Track algorithm. In order to optimize dairy operations and satisfy the changing needs of a growing population, this effort seeks to offer useful insights for farmers, researchers, and stakeholders looking for data-driven solutions. Dairy farmers may now more successfully use their profitable agricultural practices thanks to the Internet of Things. Because of their plentiful milk production and the wide range of dairy products the food operations offer, cows are essential to our food culture. Dairy cows' extreme sensitivity to bodily changes may result in a decline in the quantity and quality of milk they produce. A sick cow won't produce her milk at her finest. The increasing demand for quality dairy products can only be met by intelligent dairy farming, as cows' health monitoring systems measure body temperature, humidity, heart rate, and other data. Yogurt, cheese, butter, buttermilk, ghee, and many other products are examples of dairy products. The usual range of body temperature for dairy cows is 38.6°C to 39.7°C, or 101.5°F to 103.5°F.

It is obvious that when it comes to keeping an eye on the well-being of a huge herd of cows on a large farm, manual monitoring is ineffective. A system to continuously monitor livestock wellness in real-time is in place, but it is not very effective. Farmers should be concerned about the sudden illness or death of their livestock, even though milk production is a useful measure of a cow's health and can help farmers expand their enterprises. Let's examine the most effective and logical methods for protecting and caring for cows. Real-time sensors are used by the smart dairy farming system to gather data from the cows. A cow's body temperature, heart rate, amount of milk produced, and activity level are all regularly monitored.

AN EFFECTIVE DAIRY TRACKING SYSTEM BASED ON SOLO TRACK PREDICTION:

A. Body Temperature

The typical range of body temperatures for dairy cows is 101.5°F to 103.5°F (38.6°C to 39.7°C). Monitoring body temperature is essential to detecting health issues in cows. When a cow's temperature falls outside of the typical range of approximately 101.5°F to 103.5°F (38.6°C to 39.7°C), it is indicative of an abnormal body temperature. A sudden drop in temperature may suggest major health issues, but a high fever may indicate a condition that is often associated with an illnesses or sickness. Maintaining the health and well-being of cattle requires routinely measuring their body temperature. The body temperature data of cows, both at maximum and minimum indications, may vary slightly depending on the breed, age, and environment. However, the normal range of a cow's body temperature is 38.6°C to 39.7°C, or 101.5°F to 103.5°F. If the temperature of a cow significantly drops within this

range, it may indicate health issues that require attention.

B. Rate of Heartbeat

The typical heart rate of a cow is between 48 and 84 beats per minute. Heart rate monitoring is an essential part to evaluate the health and well-being of cows. Significant departures from this range could be a sign of serious health issues that require attention. While 48 to 84 beats per minute are thought to be the common range, cows may have a different or irregular pulse rate. Regularly elevated or lowered heart rate can be a sign of several health issues, such as infections, dehydration, stress, or cardiovascular disease.

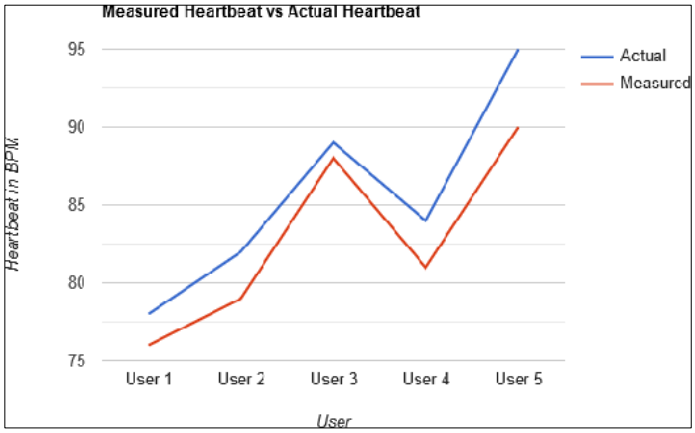

Fig 1.1: Measured Heartbeat vs Actual Heartbeat

C. **Most Prevalent Anomalies in Cow**

Bloat is a disease where the stomach swells as a result of gas buildup in the rumen. It could be caused by a number of factors, including food and specific age groups. mastitis This disorder causes inflammation of the breast gland and is typically caused by a bacterial infection. It could make the udder ache, swell, and get heated. infections, dehydration, stress, or cardiovascular problems. Foot abscesses, lameness, and hoof rot are among the issues that cattle may face. In order to prevent and manage these problems, good foot hygiene is essential. Problems with Reproduction: Infertility, labor- intensive calving work, and placenta storage are a few reproductive anomalies that may impact cows. Pneumonia and other respiratory diseases can strike cattle, especially in cramped or poorly ventilated quarters. The digestive tracts of cows can be affected by disorders such as acidosis, rumen impaction, and misplaced abomasum.

D. **Detecting Diagnosing Diseases**

The diseases that can affect cows are included in the list above. Among these, anthrox illness is the term used to describe conditions in which cows' body temperature rises and they experience body vibrations. Additionally, foot and mouth illness is diagnosed if the cows have lesions on their bodies, if their milk output drops, if they shake or if their body temperature changes. Cows with milk fever have been identified with a sickness if their body temperature changes unusually, such as if it rises or falls and they feel tired. Further from that, it has been discovered that the cows have this sickness with diarrhea even if their body temperatures are raised, and they exhibit strange wounds on their bodies despite their weariness. Furthermore from this, it has been shown that cows have smallpox if they experience cow fever, exhibit physical indicators of tiredness and damage, and have a decreased milk output.

DATASET\ DISEASE	FEVER	ULCERATION	DECREASED MILK	SHIVERING	HIGH/LOW TEMPERATURE	FATIGUE
ANTHRAX				*		
FOOT & MOUTH DISEASE		*	*	*	*	
MILK FEVER					*	*
DIARRHEA		*				*
SMALLPOX		*	*			*

Fig 1.2: An Improved Performance of Dairy Farming Technique by Solo Track Regression Utilizing Enhancing IOT Technology

Anthrax:

The organism that causes anthrax is Bacillus anthracis. Anthrax comes in three main varieties, each with its own set of symptoms:

1. Perineural Anthrax
2. Thoracic Anthrax
3. Anthrax in the Stomach

Anthrax is a relatively rare disease that is usually associated with human cases through animal contact with infected animal products or infection itself. The symptoms of anthrax can vary, and not everyone who is exposed to the disease will develop it.

Foot and mouth disease

Although the disease typically affects animals, cows can contract foot and mouth disease from the virus through their skin, clothes, and respiratory secretions. To totally eliminate the disease's ability to spread, strict biosecurity measures are needed. If you detect foot and mouth disease in your cattle, you must immediately report the ailment to veterinary authorities because it is a reportable illness that can have major negative effects on the economy and the health of cows.

Diarrhea

Cow diarrhea is a common health condition that can have multiple reasons. Especially in calves, rotavirus, coronavirus, and Salmonella are among the pathogenic pathogens that might induce gastrointestinal distress. Also, there are known criminals, like Cryptosporidium, a protozoan parasite. Diarrheal symptoms and impaired digestion might result from dietary factors like abrupt dietary changes or malnutrition. Environmental stressors like crowded conditions and inadequate hygiene can help infectious germs spread. Antibiotic use, inflammatory bowel diseases including Johne's disease, stress related to calving, and the ingestion of harmful plants are some additional factors that can induce or exacerbate diarrhea in cows. Finding the exact reason is essential for effective management and treatment.

There are several symptoms of cow diarrhea that indicate digestive issues. The movement of the stool may occur more frequently and often with a looser, more fluid quality in affected cows. Dehydration is a common consequence that results in lethargy, sunken eyes, and a noticeable deterioration in overall body health. Extreme circumstances might cause cows to have stomach pain, become hesitant to eat, and give less milk. The actual excrement itself may appear odd, with a range of mucus levels from runny to thick, and in some situations, bloody. By analyzing the exact symptoms, one can determine the underlying cause of the diarrhea, which may include parasite infestations, dietary issues, or environmental stressors. Finding the exact symptoms will help determine the underlying cause of the diarrhea, which could be bacterial or viral infections, parasite infestations, nutritional issues, or environmental stressors.

Smallpox

There are several symptoms of cow diarrhea that indicate digestive issues. The movement of the stool may occur more frequently and often with a looser, more fluid quality in affected cows. Dehydration is a common consequence that results in lethargy, sunken eyes, and a noticeable deterioration in overall body health. Extreme circumstances might cause cows to have stomach pain, become hesitant to eat, and give less milk. The actual excrement itself may appear odd, with a range of mucus levels from runny to thick, and in some situations, bloody. By analyzing the exact symptoms, one can determine the underlying cause of the diarrhea, which may include parasite infestations, dietary issues, or environmental stressors. The smallpox virus does not infect cows, as is often said, and it primarily affects humans. That being said, "cowpox," a disease exclusive to cows, is distinct from smallpox. The "cowpox" virus primarily infects cows, causing skin lesions and, in rare cases, mild clinical symptoms. It is interesting to note that cowpox has historically contributed to the development of the smallpox vaccine. The discovery that cowpox patients seemed to be immune to smallpox led Edward Jenner to create the first effective smallpox vaccination in the late 1700s. Smallpox has been eradicated from the human population as a result of vaccine initiatives, while cowpox remains a rare but serious disease in cattle.

The variola virus causes smallpox, a human disease that is not known to infect cows. But since you mentioned smallpox symptoms in a fictitious cow-related context, it's crucial to understand that these symptoms also include fatigue, a high temperature, and a particular rash that begins as elevated bumps and progresses to blisters packed with fluid in humans. These blisters leave behind scars when they eventually scab over and fall off.The condition can be quite dangerous, leading to complications and, in extreme cases, death. If you're referring to a disease that sounds similar and affects cows, it can be cowpox, which is characterized by moderate systemic symptoms, fever, and skin lesions. For accurate information and a suitable diagnosis, however, consulting a veterinarian is crucial.

Milk fever

Milk fever, a metabolic disease also known as hypocalcemia or parturient paresis, commonly affects dairy cows in the early stages of lactation. One characteristic that distinguishes the condition is the sudden drop in blood calcium levels that occurs when milk production begins. In the first 24 to 48 hours after giving birth, cows typically get milk fever. Symptoms include muscle weakness, lost coordination, and difficulty standing. Additionally, afflicted cows could exhibit reduced milk production and appetite. A cow with acute milk fever may become recumbent, meaning it is unable to stand. As part of the urgent treatment, intravenous calcium is given to increase blood calcium levels. One popular preventative technique is to enhance calcium intake by making dietary adjustments before calving. Effective management and careful monitoring are essential during the calving period to ensure the health of dairy cows during this critical phase of their reproductive cycle and to lower the risk of milk fever.

ACTIVITY KEEPING AN EYE ON THE COWS TO INCREASE MILK PRODUCTION

Milk is a vital part of our lives. Milk and milk products have been vital to human nutrition from infancy to adulthood. Cow or buffalo milk is generally added to other foods because it is a full food in and of itself. It can be kept constant for the heart rates of cows. Make sure the bedding for your animals is constantly fresh, clean, and devoid of manure. Bacteria from soiled bedding can spread to the udder and cause mastitis, or an infection of the udder in cows. Try to milk your cows at the same two times of day whenever you can. For cows, daily routines are enjoyable. Maintaining a regular feeding and milking schedule is one strategy to reduce a cow's environmental stress. It is possible to milk cows more fully in a stress-free atmosphere. In stressful conditions, this diminishes and increases milk production. Wash your hands well both before and after milking. Feeding cows after milking can help keep harmful bacteria out of the udder while the teat canal is open since cows stand while eating.

Monitoring the behavior of dairy cows can improve their health, well-being, and productivity. In order to assess these behaviors, it is useful to attach sensors to certain body parts, like the neck, leg, and back.

A huge farm needs to keep an eye on the health of a large number of cows. It's obviously ineffective to continue using human labor for monitoring in the current manner. Furthermore, due to a continued lack of suitable protocol, cattle farmers are unable to use the microchip nick band Tag that is put in the cattle nick productively.

MANIPULATION OF AN EFFECTIVE DAIRY TRACKING SYSTEM THROUGH SOLO TRACK PREDICTION:

A Pedometer sensor placed in a particular location on the cow farm to keep an eye on the cows and track their behavior such as feeding, lying down, standing, walking and Physical activities. The entire physical data of the cows has been pre-entered by the sensors that were installed at the cow farm. In the past RFID tag placed around cows' necks. Since the cows were disturbed by a tag in their neck region. Each cow now has a sensor in its ears that stores all of the information about its body. To keep track of all the cows' movements, an Ear Bud will be installed in each of their ears. The cows' functions

Fig 1.3: Activity: Keep an eye on the cows

are set to compute with 99% accuracy, and this sensor is mounted in the ear area instead of the previous cow neck area sensor. It is also lighter in weight and placed without causing any disturbance to the cows.

The Solo Track regression algorithm that is now utilized in cow health monitoring systems is constructed with cow ears and is capable of measuring a variety of parameters, including heart rate, humidity, and body temperature. A cow's activity level and other physiological indicators, such as heart rate and temperature, are continuously monitored using the Solo Track Regression approach. The detectors measure a number of health-related variables automatically. Cattle with GPS ear tags can be tracked individually, and they will give progressive beef farmers a lot of useful information. The current location of every cow may be tracked remotely with the use of a solar-powered GPS ear tag. These sensors would be affixed to the bodies of cattle so that they may be tracked throughout time for any physical problems. The process consists of heart rate sensors, temperature and moisture sensors, and reflection detectors. We've set up a notice to let you know as soon as something changes from this. The Internet of Things device can notify the farmer via a computer or smartphone if the data indicates that the cow needs care or is in distress. After that, the farmer can take the necessary steps to guarantee the cow's wellbeing. This tactic is quite profitable for farmers since it protects the cows.

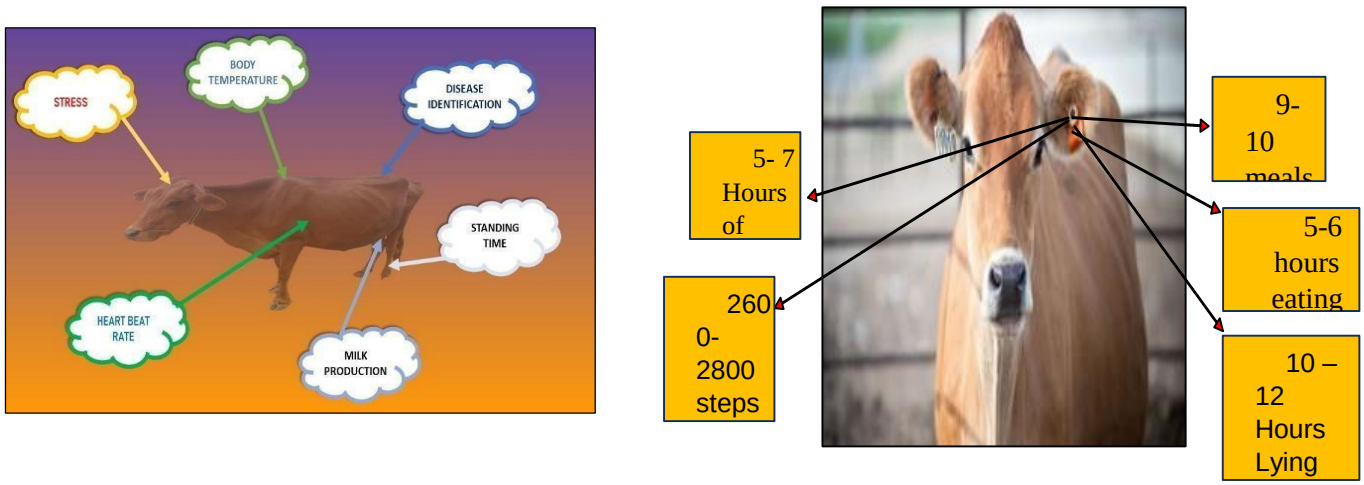

Fig 1.4: Enhancing Dairy Farm Efficiency: Solo Track Prediction

CONCLUSION

Using the method described in this research, a cow's health markers can be monitored minute by minute. This allows for the detection of unexpected changes in milk production as well as anomalies in the vital indicators of body temperature, relative humidity, heart rate, and rumination rate and disease identification. Because of this, the device can basically keep an eye on a cow's health and quickly assess any minor problems. Continuous user surveillance is not necessary because incorrect parameter changes will be automatically recognized and the user will essentially be alerted via a mobile device or system.

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