**ARTIFICIAL INTELLIGENCE IN LIVESTOCK DISEASE DETECTION**

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**ABSTRACT**

As of now, domesticated animals in stable yard are observed for sickness through a manual, work escalated process. Physical inspects are managed around once every week, and pen riders are contracted to look out for the crowd, searching for practices that demonstrate an animal is infected. Infectious maladies in this way have impressive opportunity to spread before they are first identified, prompting expanded horribleness and mortality in the group. We propose the utilization of cameras powered by artificial intelligence mounted in feedlots, combined with an insightful reconnaissance framework, to naturally and ceaselessly screen the animal; basically, this is a contextual analysis of structuring a savvy condition-observing framework condition-checking framework, as an inferential sensor.

**Keywords:**

Livestock disease surveillance, machine learning, artificial intelligence

**INTRODUCTION**

In livestock farming, pests and diseases lessens both the quality and production of animals. So, livestock disease detection at early stage is important for cure and control to reduce production costs, reduce damage on animal health and rise income. The farmer’s eye alone is not much effective when it comes to identifying the correct disease more so when he/she has a large hard of livestock. Some animals can be investigated as well others can be left out. This possess more threat to this animals’ health. In the past the farmers used to follow their naked eyes to assess the whole body of the animal to see the possible signs of diseases on the skins of the livestock. Some of them may be able to know the signs and the respective disease, that is when the farmer has prior information about livestock diseases. With this ignorance since they have no knowledge about livestock disease they may think the patch on the skin is may be some dirt yet ideally it’s a disease. The animal will end up deteriorating and posing a risk to its health and even infecting other animals if the disease is contagious. Other farmers even have no knowledge when one of their animals is sick. The reduced production of the animal is not tracked, all this helps to know when an animal is sick or not. The rate of feeding needs to be monitored, when a certain animal’s feeding rate reduces this means that this animal has a problem. This should be a concern to a farmer, but what if this farmer has more than fifty animals in the stable yard? How can each animal be monitored? Use of bare eyes will automatically be difficult. Solution yield cannot satisfy the needs of all the animals. So, we need fast, accurate and automatic methods to detect the animal behaviors, eating habits, pests on the body of the animal, injuries and detection of the diseases. Which method is most suitable? Since everything is all including observation, cameras powered by AI needs to be installed in feedlots, dens, and even stable yards to keep monitoring the animals. The camera will be taking pictures and videos of this animals. Machine learning and image processing technology would then be employed to analyze and assess the animal. Classify the disease detected on each animal. How can a specific animal be identified? Each animal should have animal tags with a unique identification that can help a farmer to sample out the infected animal. The stages of disease detection and identification are image acquisition, pre-processing, segmentation and feature extraction and classification.

Image Acquisition

Image Segmentation

Image pre-processing

Feature extraction

Classification

Disease classification

Steps to detect and classify disease from an animal.

**Methodology**

**Dataset collection**

Each animal disease needs to be represented in a dataset so that the computer can be able to learn after trained by the dataset. The images of various diseases are taken from different species of animals. This should range from all types of livestock animals (domestic animals), example, cattle, pigs, sheep, goats, camels, horses, rabbits, chicken, turkeys, mules, assess, geese, ducks, pigeons and other birds. Even other animals termed as pets, example, dogs, cats disease variation pictures need to be taken and stored in a central database, ready for the computer to learn through machine learning. Instead of developing a dataset from scratch, you can opt for the already created datasets. Example Kaggle dataset: EMPRES Global Animal Disease Surveillance, Data.GOV has, etc. Since other animal diseases cannot be physically displayed on the animal skin, others cannot be seen by naked eyes. Such disease symptoms are always depicted by the behaviors of the animal and even the eating habits. this includes; discomfort, difficulty in jumping, cries when moved diarrhea reduced and rate of eating. This also needs to be focused. In the dataset, classify similar images with the same disease pattern. This can now make it easy for the computer to learn those different patterns.

Create images(take photos)

Create labels of each image

Clean the images/edit

Final data

Classify each image

Store in database

**Training and learning models**

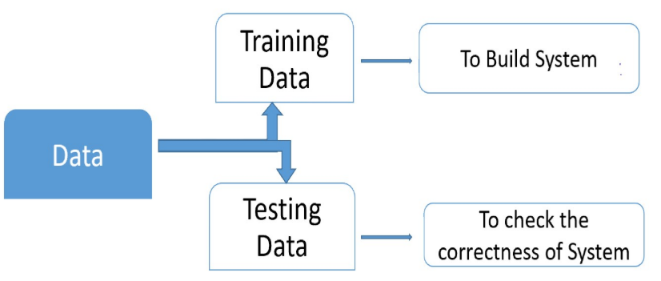
Learning is a process through which a framework gets prepared and winds up versatile to give result in a precise way. Learning is the most significant stage as how well the framework performs on the information gave to the framework relies upon which calculations utilized on the information. The model needs to experience from two stages and dataset is isolated into two classes, one which is utilized in preparing the model and called as Training set and the other is utilized in testing the model subsequent to preparing called as Testing set.

Training set

Training set is used to create a model. It comprises of the arrangement of pictures which are used to prepare the framework. Training principles and calculations utilized give applicable data on the most proficient method to partner input information with yield choice. The framework is prepared by applying these calculations on the dataset, all the important data is extricated from the information and results are gotten.

Testing set

Testing information is utilized to test the framework. It is the arrangement of information which is utilized to confirm whether the framework is delivering the right yield in the wake of being prepared or not. For the most part, 20% of the information of the dataset is utilized for testing. Testing information is utilized to gauge the precision of the framework.



**Image processing**

This is a process through which an image undergoes in order to get an enhanced image to extract important information from it. The following processes are employed:

Acquisition

Involves scaling and color conversion (RGB to Gray and vice-versa).

The techniques used includes.

1. Moiré fringe patterns
2. Shape from shading method
3. Passive stereoscopic methods
4. Active stereoscopic methods

This is part of image preprocessing and image enhancement. Removal of noise and unwanted features from the image.

Segmentation

This is the identification of the area of interest from the image. The different segmentation techniques include.

1. Thresholding Method

It is the least difficult technique approach of picture division by isolating the picture pixels dependent on their power level. The edge esteem can be figured relying upon the pinnacle of the picture histogram.

1. Region Based Method

In this strategy development of division area depends on affiliation and separating neighbor pixels. It takes a shot at the rule of homogeneity, with the reality the adjoining pixels inside explicit area rushes related attributes and disconnected to the pixel in the other locale.

1. Clustering Method

In this technique pixels having comparable qualities in picture are sectioned into same bunches. Bunch a picture into various parts dependent on the highlights of the picture. The k-implies calculation is regularly utilized for this technique.

1. Edge based Method

In this strategy all edges are recognized first and after that to fragment the required locale, edges are associated with structure the article limits. It depends on brokenness discovery in edges.

1. Partial Differential Equation Based Segmentation Method

These are quick and proper for time basic applications. It depends on the differential condition working.

**Feature Extraction**

When input information is very big to an algorithm and should be redundant, it can be transmitted to a tiny number of characteristics. The choice of characteristics is called finding the subset of the original characteristics. Selected characteristics are anticipated to contain the data needed so that the desired task can be accomplished by using decreased representation.

The following techniques will be used in feature extraction

L\*a\*b

This color space comprises of one channel for Luminance and two other channels are known as chromaticity layers.

 Space comprises of dimensions L for lightness and a and b for adverse aspects of color.

RGB

Its color space based on the RGB model. Consists of three autonomous picture planes, one of each primary color red, green and blue. Is an addictive model.

The texture feature extraction techniques include.

Wavelet transformation

This is best for frequency domain rather than spatial domain.

Grey level Co-occurrence matrices

Involves examination of spatial relationship of pixels is the grey level co-occurrence matrices.

Gabor filter

This technique is used to analyze particular frequency content in the picture in particular directions in a localized region around the region of interest.

Classification

This involves predicting the class of particular data points, always based on the features extracted and putting them in same groups regarding the features.

Various techniques can be employed to do the classification. This include,

Naïve Bayes classifier

K-nearest Neighbor – weight can be assigned to the contributions of the neighbors, so nearest neighbor donates extra in the average than the distance neighbor.

Distance metric has been calculated for samples and classify based totally on this distance  
It uses Euclidean distance to calculate distance.

Artificial neurol network.

Derived from the concept of human biological neural system.

Consists two datasets, one for training and another for testing.

**Camera installation and sensors mounting**

Cameras powered by AI needs to be strategically mounted in all corners of the stable yard of the animals. Smart ear tags embedded with sensors to keep track of the motion and improve the traceability of the animal.