CBSE SCIENCE EXHIBITION - CATEGORY 2

AIR FORCE SCHOOL, ASTE

THEME- FOOD, HEALTH AND HYGIENE

TITLE OF OUR PROJECT- **CATTLE HEALTH CARE AND WELFARE**

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Introduction: Cattle Health Monitoring System

Ensuring the health and well-being of cattle is a critical aspect of livestock management. With advancements in technology, modern cattle health and care systems have evolved significantly, offering precise and continuous monitoring of vital parameters. This report explores the use of a comprehensive, technology-driven monitoring system designed to address various aspects of cattle health, safety, and environmental conditions.

The system utilizes wearable devices, such as belts equipped with temperature sensors and pulse oximeters, to monitor vital signs like body temperature and oxygen levels in real-time. These wearable devices provide early warnings of health issues, allowing for timely interventions.

In addition to health monitoring, the system integrates environmental sensors, including temperature and humidity sensors, to ensure that the cattle's living conditions remain within optimal ranges. Water feed management is another key feature, regulating water supply and ensuring hydration levels are maintained.

Introducing "Cellufenu" which is a natural temperature and humidity regulating material used in the cowshed to provide the cattle with favorable conditions.

Security and safety are critical in managing large herds, and the system addresses these through advanced features such as security alerts, fire alarms, rain detection and flood alerts.

This integration of sensors and real-time data analytics helps enhance cattle health management, ensuring both the well-being of the animals and the efficiency of farm operations.

Overview

The primary goal of this report is to present a detailed account of an integrated system designed for monitoring the health and safety of cattle using advanced sensors and technology. This system focuses on providing real-time data for early detection of health issues, ensuring optimal environmental conditions, and enhancing security on cattle farms. By utilizing wearable devices for health monitoring, environmental sensors for tracking external factors, and various security mechanisms for theft and hazard prevention, this system aims to streamline farm management while ensuring the well-being of the animals.

This report delves into the components of the system, describing how each sensor plays a critical role in maintaining cattle health and care. From health diagnostics to environmental safety, the system is built to offer comprehensive monitoring and management, reducing manual intervention and improving response time to issues that arise.

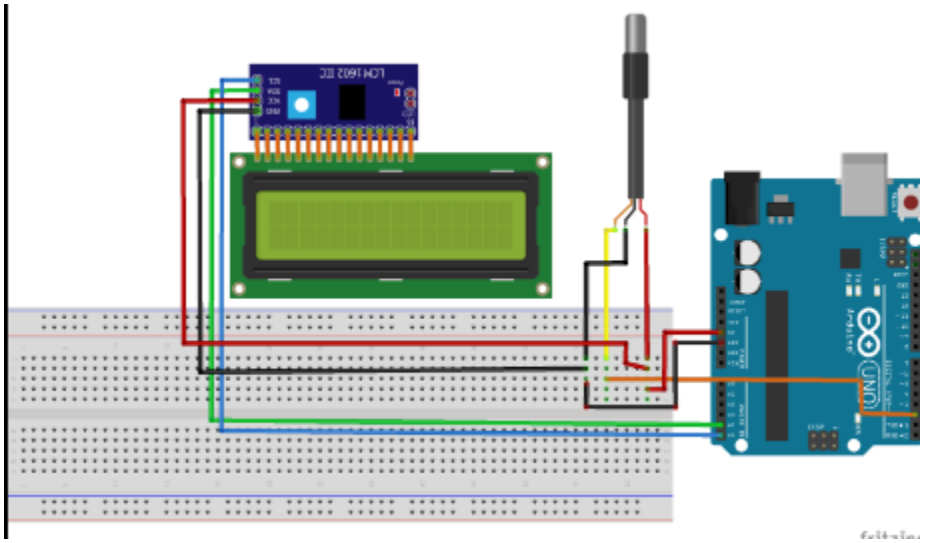
I) Sensors and Components Used:

1) Health Monitoring

a) Wearable Belt

The wearable belt is an essential part of the system designed for continuous health monitoring of cattle. It is equipped with the following sensors:

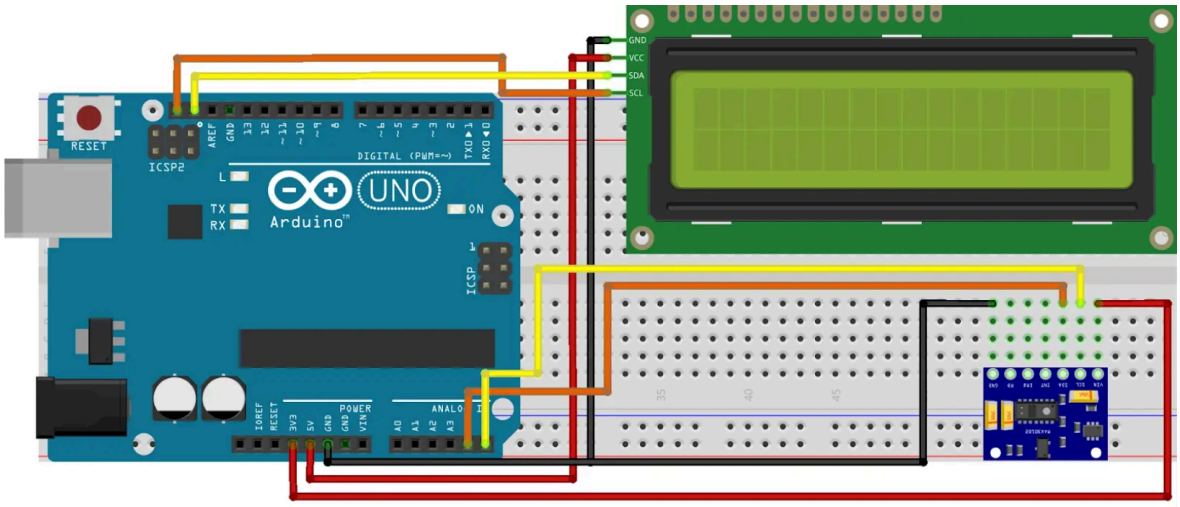
1. **Temperature Sensor (DS18B20)**



Purpose: Measures the body temperature of the cattle in real-time.

- **How it Works**: The DS18B20 is a digital thermometer that provides accurate temperature readings in a wide range of environments. It uses a 1-wire interface, meaning it requires only one wire for communication, making it efficient and easy to integrate into a wearable system. It offers a temperature measurement accuracy of ±0.5°C within the range of -10°C to +85°C, making it highly suitable for livestock health monitoring.
- **Benefits**:
  - **Early Disease Detection**: Cattle often show early signs of illness through a change in body temperature. The DS18B20 sensor helps detect these changes in real-time, allowing for prompt veterinary attention.
  - **Accurate Readings**: Its high accuracy helps detect even slight deviations in body temperature, providing precise health diagnostics.
  - **Durability**: The sensor is waterproof and can withstand the rugged outdoor environments typically found in farms.

2. **Pulse Oximeter (MAX30100)**



Purpose: Measures the oxygen saturation (SpO2) and heart rate of the cattle.

- **How it Works**: The MAX30100 is an integrated pulse oximetry and heart rate monitor module. It operates by emitting infrared and red light through the skin and detecting how much light is absorbed by the blood. Changes in light absorption are used to calculate the heart rate and blood oxygen levels.
- **Benefits**:
  - **Oxygen Level Monitoring**: Continuous monitoring of oxygen saturation helps identify respiratory issues early, such as pneumonia or hypoxia, which are common in cattle.
  - **Heart Rate Monitoring**: The MAX30100 tracks the heart rate, helping detect stress, illness, or other health conditions that may affect the heart.
  - **Compact and Energy Efficient**: The sensor is small, energy-efficient, and can easily be incorporated into wearable devices, allowing for continuous, non-invasive monitoring.

Benefits and Advantages of the Wearable Belt:

- **Continuous Monitoring**: Real-time health data ensures that any health issue, such as fever or respiratory problems, is detected early, enabling swift action.
- **Non-Invasive**: The belt is comfortable for the cattle and does not require invasive procedures to monitor vital signs, reducing stress on the animals.

- **Prevents Major Health Issues**: By catching health issues early, it reduces the risk of disease outbreaks and improves the overall well-being of the herd.
- **Reduces Veterinary Costs**: Early diagnosis and treatment often mean lower medical expenses, as conditions are treated before they become severe.

CONCLUSION

This project integrates sensor technology and chemical analysis to develop a comprehensive health and welfare kit for cattle, aimed at supporting farmers in early illness detection and proactive animal care. The wearable device, part of the kit, continuously monitors vital parameters like temperature and pulse rate, indicators of cattle health that are often overlooked in routine checks. By providing real-time data on these factors, farmers gain insights into their cattle's well-being, enabling prompt interventions when abnormalities are detected.

Alongside the wearable, the kit includes a chemical testing component, designed using microchemistry techniques for simplicity and efficiency. This chemical kit allows for the detection of disease indicators, providing a unique approach to cattle health monitoring. It empowers farmers to identify early symptoms of common illnesses, implement preventive measures, and administer remedies as needed. This can be especially valuable in rural or resource-limited settings, where quick and accessible diagnostics are critical.

The core objective of the project is to facilitate early illness detection in cattle, which not only promotes animal welfare but also plays a vital role in maximizing milk productivity. Healthier cattle are naturally more productive, so by addressing health issues early, farmers can ensure both animal comfort and economic benefits. Through this all-in-one approach, the project offers an efficient, cost-effective solution that leverages modern technology and chemical methods to elevate cattle care standards, ultimately leading to improved outcomes for both livestock and farmers.