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A ROBOTICS BASED SURVEILLANCE SYSTEM FOR LIVESTOCK WELLBEING AND EARLY DISEASE DETECTION IN POULTRY FARMS

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Abstract: This project proposes a robotics-based surveillance system designed to monitor and ensure the wellbeing of livestock. Integrating advanced sensor technologies and robotics, the system aims to provide real-time data on environmental conditions crucial for livestock health and welfare. The system employs an Arduino Mega microcontroller as the central processing unit, facilitating seamless integration and control of various sensors and actuators. The primary sensors incorporated into the system include a DHT11 sensor for monitoring temperature and humidity levels, a MQ2 sensor for assessing air quality, and an MQ137 sensor for detecting harmful gases. These sensors collectively provide essential environmental data critical for maintaining optimal conditions within livestock enclosures. Additionally, a node MCU module is enables two-way communication, allowing users to remotely access and monitor sensor readings. Furthermore, the system features a bot equipped with two motors controlled by a motor driver and another Bluetooth module. This bot serves as a mobile surveillance unit capable of navigating through livestock enclosures to collect data from different locations. The integration of motors enhances the system's versatility, enabling it to adapt to various terrain and environmental conditions. The gathered sensor data is displayed in real-time on an LCD display, providing users with immediate insights into environmental parameters such as temperature, humidity, MQ2 levels, and gas concentrations. This information enables prompt intervention in case of deviations from optimal conditions, thereby safeguarding the health and wellbeing of livestock.

Keywords: Arduino Mega, sensors, harmful gases, temperature and surveillance unit.

I. INTRODUCTION

The integration of robotics into agriculture has revolutionized traditional farming practices, leading to the development of innovative solutions for livestockmanagement. In poultry farming, the implementation of robotics-based surveillance systems holds immense potential for enhancing livestock wellbeing and early diseasedetection. These systems utilize autonomous robotic platforms equipped with sensorsand imaging technologies to monitor various aspects of poultry farms, including environmental conditions, animal behavior, and health parameters. By leveraging artificial intelligence and machine learning algorithms, robotics-based surveillance systems can analyses vast amounts of data in real-time, enabling early detection of potential health issues and proactive intervention to prevent disease outbreaks.

II. LITERATURE SURVEY

Robotics in Livestock Farming: A Review" by S. C. Mukhopadhyay et al. (2019)."Automated Poultry Disease Detection Using Machine Learning Techniques: A Review" by A. M. Salihu et al. (2020).Robotic Systems for Precision Livestock Farming: A Review by C. Kongsøre et al. (2019).Smart Farming: Including IoT, Robotics, and Cloud Computing in Livestock Production by F. L. Tavares et al. (2020).Automated Monitoring and Control Systems for Poultry Production: A Review by H. H. Aguirre et al. (2018).Robotics in Agriculture and Forestry: A Global Perspective on Research, Development, and Deployment edited by S. O. Banwell et al. (2020)

III. EXISTING METHOLOGY

Conventional methods of livestock surveillance predominantly rely on manual monitoring and periodic checks by farm personnel. This approach, while widely practiced, suffers from several drawbacks. Firstly, manual monitoring is labor- intensive and time-consuming, requiring dedicated personnel to physically inspect livestock enclosures and record environmental parameters. This can lead to delays in detecting deviations from optimal conditions, potentially compromising the health and welfare of the animals. Flowchart describing workflow of Arduino UNO dedicated to sensors. Additionally, human error and subjectivity in data collection may result in inaccuracies and inconsistencies in the recorded information. Moreover, traditional methods lack real- time monitoring capabilities, limiting the ability to promptly respond to emerging issues or environmental changes. These limitations underscore the need for more efficient and automated surveillance systems to address the shortcomings of conventional methods.

IV. DISADVANTAGES OFEXISTING METHOLOGY

Delays in detecting deviations from optimal conditions. Potentially compromising the health and welfare of the animals, human error and subjectivity in data collection may result in inaccuracies andinconsistencies in recorded information. traditional methods lack. Real-time monitoring capabilities, limiting the ability to promptly respond toemerging issues or Environmental

IV. PROPOSED METHOLOGY

The proposed robotics-based surveillance system offers a compelling solution to overcome the limitations of conventional livestock monitoring methods. By integrating advanced sensor technologies with robotics and wireless communication, the system provides real-time data on key environmental parameters crucial for livestock wellbeing. The utilization of sensors such as the DHT11 for temperature andhumidity, MQ2 sensor for air quality assessment, and MQ137 sensor for gas detectionenables comprehensive monitoring of environmental conditions within livestockenclosures. This allows for early detection of deviations from optimal conditions, facilitating timely intervention to mitigate potential risks to animal health. Additionally, the incorporation of a bot equipped with motors and IOT server(Adafruit) enhances the system's mobility and accessibility. The bot can navigate through the livestock facility, collecting data from different locations and transmittingit wirelessly to a central monitoring station. The integration of an Arduino Mega microcontroller as the central processing unit facilitates seamless control and coordination of sensors, actuators, and communication modules.

5.1. Implementation Method :

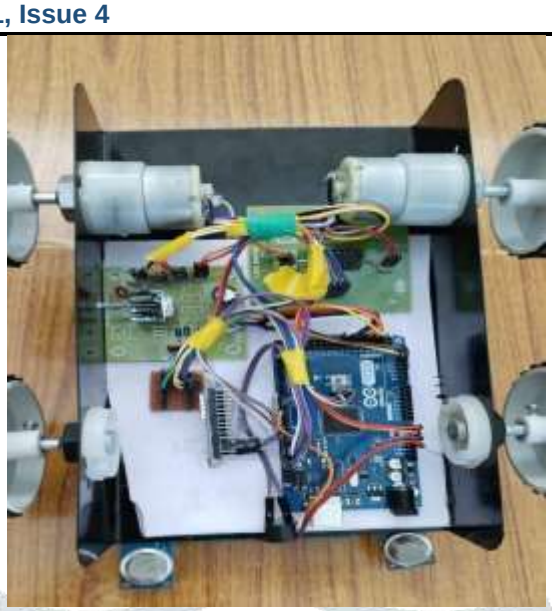
a) **Sensor Detection:** This part ensures that the to detect the harmful gases by using MQ3 and MQ13.Temperature and humidity levels monitoring bythe DHT11 sensor.

b) **LCD Display:** It displays the harmful gases and temperature levels.

c) **Buzzer indicator:** It gives the alert sound if the environmental conditions will change.

V. RESULTS AND DISCUSSION

This project aims to provide real time data on environmental conditions crucial for livestock health in poultry farms. The system will ensure that the wellbeing of livestock. The sensor detection is an important part in this project. To sense the ammonia and harmful content, an MQ3 and MQ13 sensors are used. Based on ammonia and temperature levels, sensors detect the harmful gases. To monitor the temperature DHT11 sensor is used. If everything goes right, then the receiver motor driver will be ON and then the user can start the vehicle. After this if any change of optimal conditions in poultry farms the buzzer gives alert sound.



Sample Output through one of the Sensor used in the kit.

Outputs of Proposed System By one of the Sensor

VI. REFERENCES

1) Robotics in Livestock Farming: A Review" by S. C. Mukhopadhyay et al. (2019)
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5) Automated Monitoring and Control Systems for Poultry Production: A Review" by H. H. Aguirre et al. (2018)