Poultry Bot: Autonomous Movement

Syed Sohaib Shere, Zain Ali, Muhammad Farhan Ur Rehman Malik, and Syed Musab Ullah Hussaini

Abstract—**Poultry Bot is a major technological breakthrough for the poultry industry as it provides solution for utmost problems faced in a poultry farm. The purpose of poultry bot is to completely revolutionize the century old farming practices used till now by introducing the latest technology for 1,190 billion rupees turnover generating sector. [1] The goal is to minimize the biosecurity risk to help improve the production. Further, assisting human to make more informed and better decisions. Poultry bot is an autonomous self-driven robot, monitoring several factors effecting on a poultry farm by implementing ROS and IoT along with LIDAR mapping.**

Index Terms—**Major Technical Breakthrough, ROS based Autonomous Self-Driven Robot, IoT Monitoring, LIDAR Mapping**

I. INTRODUCTION

Poultry as a farming activity already existed for ages, over the 20th century, it became a real profession. In that century, poultry farming underwent several major revolutions in which the production system was drastically changed. In today's poultry farming a significant part of the daily animal care is mechanized or automated like manure removal, climate control, automated medication, and litter racking. As these tasks contained limited complexity and variation, that are fulfilled using stepper motors and simple control logic. The properly running poultry shed still requires good stockman ship with intensive monitoring and awareness of animal of behavior and interactions as well as proper management and conscientiously performing of the daily task. This poultry bot comprises of implementation of IoT for monitoring important factors such as temperature, humidity, and air quality that can easily be detected by electronic discrete sensors that are particularly developed for single dedicated task. Another, innovative feature that is integrated with this robot is its autonomous movement which is to be done using a minicomputer which is specifically used to make this bot unique, efficient, and remarkable. Along with this, the technology of LIDAR is adopted to make the bot move precisely in the field area. Pesticide, that cannot be ignored when it comes to poultry care, is also integrated that will follow the defined scheduled spraying with controlled concentration according to the requirements of the shed.

II. PROBLEM STATEMENT

There are almost 15000 poultry farms in Pakistan despite of having such a huge industry not a single poultry robot is present due to restrictions on self-import, uneconomical cost, and lack of after sales services. [1]

By notifying real-time alerts and being cost-effective by lowering operational costs. Poultry Bot will enable the farmer to enhance productivity while eliminating the need for physical vigilance. The goal of poultry bot is to fully automate the process of monitoring and maintaining a poultry farm by providing tech-based solution for daily faced problems.

III. LITERATURE REVIEW

As for the poultry robots available worldwide, different robots are introduced with capabilities of various problem solving. Some of the available poultry robots are discussed as follows:

A. Poultry Patrol
By using thermal imaging, it enables the robot to detect disease and fatalities. The movement of birds is monitored to analyze their health. [2]

B. Octopus Robots
The bots continuously measure environmental factors, such as temperatures, humidity, carbon dioxide and ammonia levels, alerting farmers in real-time of deviations and potential problems. [3]

C. Robot Egg Collector
Poultry farms that give chickens open space to move around face the problem of random eggs laying all over the farm. The robotic egg collectors use an array of sensors to find and collect eggs without disturbing the chickens. [4]

D. Poultry Safe
It is capable of dealing with all types of substrates, turning and ventilating litter to prevent the exertion of ammonia gas and other diseases. [5]

IV. AIMS AND OBJECTIVES

The aims and objectives of this project is:

- To optimize the working time.
- To improve animal welfare.
- To increase the ADGs (average daily gain).
- To increase food security.
- To improve litter racking quality.
- To minimize the workforce.
- To reduce the human interaction.
- To make the project cost efficient.

V.   FEATURES

The following features are included in this project:

1) LIDAR
   a) Mapping
   b) Localization
   c) Navigation
2) Driving System
   a) Remote Control
   b) Autonomous Movement
3) Power Supply Unit
4) Litter Raking

VI.   INDUSTRIAL APPLICATIONS

Poultry bot allows a poultry farm to improve the quality of poultry by improving animal well-being. This poultry bot will match the parallelism with the industrial revolutionary era 4.0 which is IoT based implementation in the industrial field. In addition to that, robotics technology in the form of ROS has been used that made the poultry bot move autonomously inside the poultry farm which will increase the efficiency and productivity. A major issue of lack in supervision of the animals that includes pest control, human concentration and inaccurate environmental factors monitoring would be countered by this single poultry bot that will boost the monthly revenue. Last but not the least, this bot would be cost efficient as it will minimize the monthly expenditures.

VII.   HARDWARE DETAILS

The hardware details are as follows:

1) Mini PC
2) Arduino Mega 2560
3) BMS HX-3S-FL25A-A
4) 12V 1000W Inverter
5) Buck Converter XL-4016
6) Battery Pack Li-Ion 3S4P
7) Bluetooth Module HC-05
8) Two Channel Relay Module
9) Incremental Rotary Encoder
10) Battery Level Indicator MH-DL 18S
11) IBT2 H-Bridge Motor Driver Module
12) DC Geared Motors DGO-7024SIA
13) DC 12V 100W 775 High Speed Long Shaft Motor
14) RP Lidar A1M8 360 Degree Laser Scanner Development Kit

VIII.   SOFTWARE DETAILS

The software details are as follows:

1) RViz
2) Linux
3) Gazebo
4) AutoCAD
5) Adobe Illustrator
6) Arduino Software
7) ROS (Robot Operating System)

IX.   TENTATIVE OUTPUT

A poultry bot performs an inspection on the chicks in the shed, from litter racking to temperature monitoring, to assist the farmer in caring for their flock. Implementing this technology, will improve the quality of poultry and aid in achieving better results. The self-driving and self-controlling robot will reduce reliance on humans, resulting in increased production.

X.   FUTURE WORK

- This project can be further improved by embracing AI and data-driven systems and enhancing disease control measures.
- Embrace AI and Data-Driven Systems: Emphasize the integration of highly adaptive artificial intelligence and data-driven systems in broiler and breeder production. These technologies can optimize operations, improve decision-making, and enhance overall efficiency.
- Enhance Disease Control Measures: Develop advanced disease detection and prevention strategies using AI-driven systems. Implement real-time monitoring and early warning systems to identify and control.

XI.   REFERENCES

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