DESIGN AND DEVELOPMENT OF PORTABLE IOT BASED ELECTRONIC MULTI-SEEDING AND SPRAYING MACHINE

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Keywords

Internet of Things, Multi-point Sprayer, Micro-controller, Precision Agriculture, Arduino sensors, Nozzle Sprayer.

Introduction:

Agriculture continues to serve as a vital pillar for economic development, particularly in developing nations, where a significant proportion of the population is directly engaged in farming activities. However, the sector is increasingly constrained by factors such as labor scarcity, limited mechanization, inefficient seed distribution systems, and suboptimal application of agrochemicals. As global food demands surge, the need for technologically advanced, scalable, and efficient agricultural solutions has become more pressing than ever. The evolution of smart agriculture, driven by the integration of technologies such as the Internet of Things (IoT), embedded systems, and automation, has shown immense potential in addressing these challenges. Precision farming—characterized by data-driven, optimized, and automated field operations—offers a pathway toward enhanced productivity, reduced input costs, and sustainable agricultural practices. Among the core field operations, seeding and spraying are critical as their accuracy significantly influences crop yield and input efficiency.

This study presents the design and development of a portable IoT-enabled electronic multi-seeding and spraying machine, aimed at automating and optimizing these two key functions. The system is engineered to perform uniform multi-seed dispensing and precise agrochemical spraying, controlled and monitored through an IoT interface. The portable nature of the device ensures adaptability for small-scale and fragmented landholdings, which are prevalent in many rural farming environments.The proposed machine integrates a suite of sensors, actuators, and microcontroller-based modules to execute field operations with high precision and consistency. Furthermore, IoT connectivity facilitates real-time data acquisition, remote operation, and system diagnostics, thereby enhancing user control and operational transparency. The research encompasses system design, component selection, hardware-software integration, and field performance assessment of the developed prototype.

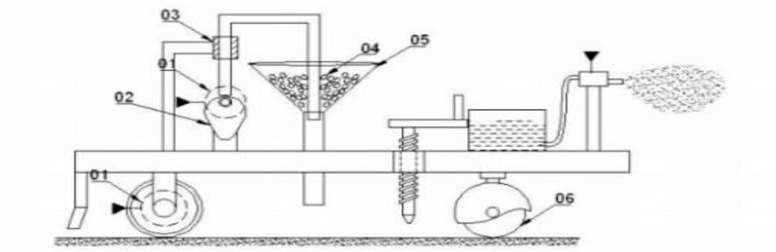
Objectives:

1. To design and develop a Agri-bot to perform automatic multi-seeding and spraying operation

2. To Embedded IoT technology to enable real-time monitoring, remote control, and data collection for enhanced operational efficiency.

Methodology:

The methodology for developing a portable IoT-based multi-seeding and spraying machine involves requirement analysis, conceptual design, component selection, and system integration. It includes prototyping, software development, testing, and validation through field trials. The process emphasizes optimization for energy efficiency, cost-effectiveness, and user-friendliness, followed by documentation, deployment, and training to deliver a reliable and efficient agricultural solution.



S.NO	PART NAME	S.NO	PART NAME	S.NO	PART NAME
01	*dc motors*	04	*seeds*		
02	*cam*	05	*hopper*		
03	*guide*	06	*rotating wheels*	►	TO CONTROL UNIT

Figure 1: CAD model of prototype

Result and Conclusion:

In this task, we have carried out a pesticide showering robot. A robot for use in horticulture An Agrobot is an idea for working on the item's presentation and cost, which, once advanced, would demonstrate to be helpful in rural showering activities. Ranchers' jobs are diminished, as are medical problems. Effectively developed a robot that can go on harsh surfaces as well as convey an adequate heap of the blower and other gear. Effective in making a robot with a sufficient design to oppose the field's difficulties. Certainly, when this thought is introduced in a way that is suitable for the Indian market, it will without doubt support bringing down the 15% molality rate found in Indian formers related with horticultural splashing activities. Projects like this move individuals to seek after farming as a full-time or part-time occupation. This is basic in created nations, especially India, where farming is the financial spine.

Figure2: Working model of prototype

Future Scope:

The future scope of this project includes:

1. **Integration of AI and Machine Learning Algorithms:**
   Implementing AI-based decision-making algorithms can enable the system to dynamically adjust seeding and spraying parameters based on real-time field conditions such as soil moisture, crop type, and pest presence, leading to improved precision and resource optimization.
2. **GPS and GIS-Based Path Planning:**
   Incorporating GPS and Geographic Information Systems (GIS) will enable automated navigation and route optimization for large field areas, reducing overlap, minimizing input wastage, and enhancing coverage efficiency.
3. **Solar Power Integration:**
   To improve energy efficiency and sustainability, future iterations of the machine can be designed to operate on solar power, making it more suitable for rural and off-grid applications.
4. **Crop and Soil Monitoring Modules:**
   Additional sensor modules for monitoring parameters such as soil pH, temperature, nutrient levels, and crop health can be integrated to transform the machine into a comprehensive precision agriculture tool.
5. **Cloud Connectivity and Data Analytics:**
   Enhancing the IoT framework with cloud-based data storage and analytics will enable long-term monitoring, data visualization, and predictive insights for better farm management decisions.
6. **Modular Design for Multi-Crop Operations:**
   A modular mechanical design can be developed to allow easy customization of seeding and spraying units based on crop type and field requirements, increasing versatility and usability across different farming scenarios.