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AgriMitra - An Autonomous Smart Robo Farmer

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Nature of Work: Novel Solution, Indigenous Design to a Problem/Challenge

Abstract: ***This paper presents the development of AGRIMITRA, an autonomous smart agricultural robot designed to address the pressing challenges faced by Indian farmers, including labor shortages, lack of soil testing knowledge, increasing wages, seed wastage, and excessive water usage. In the backdrop of these issues and the alarming rate of farmer suicides, Agrimitra emerges as a technological beacon, aiming to revolutionize traditional farming practices. The robot is equipped with advanced features such as soil moisture sensing, temperature and humidity sensors, an MQ2 smoke detection sensor, and rainwater sensors, enabling efficient resource utilization and informed decision - making. Additionally, it performs labor - intensive tasks like ploughing, seed sowing, and weed cutting. This innovation not only promises to enhance productivity but also aims to alleviate the hardships of farmers, potentially mitigating the tragic trend of farmer suicides in India.***

Keywords: Agricultural Robot, Smart Farming Technology, Farmer Suicide Prevention, Autonomous Farming, Soil Moisture Sensing

1. Rationale

Agriculture has been the cornerstone of our nation's prosperity. Most of the livelihood in India depends on agriculture. As the knowledge - based farm labours are less, the requirement for them is high and their wages are increasing. The main problem in agricultural field include lack of labour availability, lack of knowledge regarding soil testing, increase in labour wages, wastage of seeds and more wastage in water. To add to this, behind the vibrant fields and picturesque landscapes lies a sad reality – the tragic saga of farmer suicides.

In recent years, the plight of Indian farmers has come under the harsh spotlight due to increasing number of suicides. The farming community, often burdened by debts, unpredictable weather patterns, and crop failures, faces immense mental and financial pressures. In agriculture, the opportunity for robot - enhanced productivity is more and the robots are appearing on farms in various guises and in increasing numbers. To overcome all these challenges of the modern era. the robot for agriculture has been developed. The main aim of agricultural robot is applying robotic technology in agricultural field. The agriculture robot efficiently performs ploughing, seeding and mud levelling automatically, along with various other features.

2. Scientific Principle/ Concept:

In the sector of agriculture, to overcome the challenges faced by farmers, technological advancements offer a glimmer of hope. The integration of agricultural robots into farming practices presents a transformative solution. AGRIMITRA – An autonomous smart robot farmer has various technological advancements incorporated in it. The soil moisture sensing ability of Agrimitra can efficiently utilize water by watering the crops only when necessary, based on real - time soil moisture data. Proper irrigation based on soil moisture levels will ensure that crops receive adequate water at the right times, leading to healthier plants and potentially increased yield.

The temperature and humidity sensors will collect data on temperature and humidity, and help the farmers to make informed decisions about crop selection, planting times, and the best practices for different types of crops. Also, certain pests and diseases thrive in specific temperature and humidity conditions. With this data, farmers can implement preventive measures or treatments to protect crops from diseases.

Agrimitra also has an MQ2 smoke detection sensor using which it can swiftly identify smoke particles, triggering immediate alerts to farmers. With prompt detection of smoke or fire, farmers can take rapid action to contain and extinguish the fire before it spreads, potentially saving vast areas of crops from destruction. Rain water sensors in our It can detect precipitation levels, allowing farmers to adjust irrigation schedules accordingly.

Additionally, Agrimitra can carry out various labour - intensive tasks such as ploughing, seed sowing, weed cutting, and thereby farmers can reduce the physical strain on themselves. It has also has the ability to act as a scarecrow with the hands operated by power screw mechanism. Besides these features, the robot can also interact with the farmer using Alexa software as an interface. All of these automations will allow for precise and consistent operations, leading to improved efficiency and potentially higher crop yields.

3. Material Used

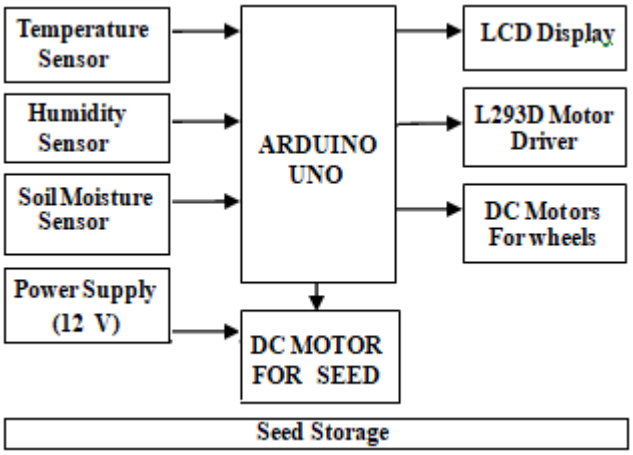
DC motors, Arduino Uno, Temperature & Humidity sensor, Soil moisture sensor, MQ2 gas sensor, Rain water sensor, LCD display 16x2 I2C, TG113 Bluetooth Speaker circuit board, LEDs, 4ohm Speaker, Servo Motors, 9 V submersible water pump etc.

4. Procedure / Descriptions

The methodological procedure, circuit diagram and the block diagram are included in this section. The figure shows the block diagram of agricultural robot. Arduino Uno microcontroller is the master controller of the developed robot. . The robot for agricultural purpose is an autonomous robot which can be controlled remotely through a wireless Bluetooth connectivity between the Smartphone and the

robot. The microcontroller is powered by a 12V DC battery. The microcontroller gives a 5V supply to the driver circuit. The driver circuit amplifies 5V current into 12V current and drives the motors connected to it.

The L293D motor driver circuit controls two DC motors. One DC motor is used for line marker and another one is used for seed dispenser. The seed storage device is a cone like structure or a hopper in which seeds are stored for seeding purpose. The hopper has a tube extension in its lower part and this hopper tube will allow seed to flow to the lower part of the robot. After the seeding operation, a leveller is used to close the soil and to level it. All of these put together, this is our effort to make the Amrutkaal of my country, really an Amrutkaal for our farmers. Let us stand together, for the integration of technology in agriculture, not only to enhance productivity but, more importantly, to ensure that the "anndaatta" of this country no more commit suicides and my India becomes in real sense "The Superpower".



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