Journal of Science, Computing and Engineering Research (JSCER)
Volume-6, Issue- 5, June 2023.
DOI: *https://doi.org/10.46379/jscer.2023.060505*
ISSN: 2708-1079

SMART AGRICULTURE USING AUTOMATION AND IOT TECHNOLOGY

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Article Information

Received : 06 May 2023
Revised : 21 May 2023
Accepted : 17 June 2023
Published : 25 June 2023

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Abstract— Agriculture represents one of India's key industries. A variety of factors, including temperature, humidity, rain, and other factors, affect the rate at which crops are produced in agriculture. Those are external variables beyond the control of farmers. In order to regulate factors like pests, fertilizers, etc. in the field of agriculture, crops must be treated properly. Fertilizers may boost crop yield, but they also have an impact on people's health. Therefore, the primary goal of this study is to construct an automated car for spraying pesticide and to use an AI image recognition model based on computer vision to identify weeds and pests. The moisture level of the field is detected and the amount of water needed for the land is also detected and appropriate water is irrigated. Smart irrigation system is integrated with IoT-based technology. We implement a technique automated cars to spray fertilizers, pesticides to cover major parts of the field.

Keywords: ***IOT, SMART, Agriculture, analytic, algorithm***

Citation: Dharshini S, Preetha Lakshmi E, Joshna B S, Surya A, Jayachandiran U. "Smart Agriculture Using Automation And Iot Technology", Journal of Science, Computing and Engineering Research, 6(5), 24-27, June 2023.

I. INTRODUCTION

Agriculture is a significant sphere of the Indian economy. But India is much suppressed by the fact that this agricultural field is facing a downfall due to a lot of criteria. Some of these include financial problems, low crop yield, water scarcity, lack of labors and bio-magnification. With the increasing population growth and high demand for food and low manpower availability, this field needs extended support like automation technology and other artificial intelligence inputs for its betterment.

IoT technology has become a part of our daily life in many dimensions and is related with a wide range of industries, like scientific, commercial, health, and transportation. In the era of e-knowledge, the most notable technological domains are artificial intelligence, the Internet of Things, data science, big data and Machine learning which are becoming more eminent in many aspects of our lives.

The primary goal of this paper is to furnish the construction of an automated car for spraying pesticides and fertilizers at specified levels without going into the toxicity limit. Smart irrigation systems are integrated with IoT-based technology to regulate the water flow and supply only the required amount to the field.

The moisture level of the field is detected and the amount of water needed for the land is also detected, which makes resource conservation more effective and contributes to a better living for future generations. We implement automated cars to spray fertilizers to the roots and pesticides to the vulnerable parts of the crops. We specially designed a car model to accomplish this task and help for better results in the quality of crops.

Furthermore, we concentrate on creating an app that will allow users to manually regulate this irrigation system with a single click in the event of some abnormalities. So our main objective is to develop a budget friendly model for helping farmers to increase the production and stabilize their financial status.

It also sources out to contribute to a healthy lifestyle for the future generation. The regulated amount of all these inputs may gradually reduce the final impact on human health due to its accurate prediction of the chemical contents in soil. Bio-magnification, a very important yet unnoticeable threat to mankind has always been neglected. The impact it would cause, has serious consequences and will adversely affect our health.

II. SOCIAL RELEVANCE

This paper is completely related to agriculture which is a major sector in our Indian economy. This idea can be efficacious for the economic and financial upliftment of farmers. There aren't many technological improvements in Indian agriculture but this concept can change the scenario and boost the country's economic growth. With the help of Smart agriculture, better results can be achieved in a shorter span of time.

III. CONTRIBUTION TOWARDS SOCIETY

A. Bio-magnification

Bio-magnification is also known as Bio-amplification or Biological magnification. The rise or expansion of tainted

chemicals brought on by the intoxicated environment is known as bio-magnification. Heavy metals like mercury and arsenic as well as pesticides like polychlorinated biphenyls are examples of possible contamination.

The creatures absorb these chemicals through the food they eat. When higher food chain species consume lower food chain organisms that possess these toxins, the toxins build up in the higher organisms.. Humans are more susceptible to cancer, kidney, liver, and birth abnormalities as well as respiratory and cardiovascular ailments as a result of biomagnification.

The primary aspect ensuring a high and consistent grain output is pesticide use. However, the increased overuse of pesticides, which results in environmental contamination, releases a large amount of harmful compounds into the environment. DDTs are a type of persistent organic pollutants (POPs) that have attracted particular attention in environmental science because of their high residual levels, strong bio-magnification potential, and propensity to enter the food chain and affect the entire ecological ecosystem.[1]

B. Affordable material

Since Polymer hard plastic will be used instead of steel and other elements to construct this automated vehicle, farmers will be able to afford it much more easily. In addition to lowering costs, it also has a number of other

advantages, including resistance to corrosion and chemical reactions. Plastic is also weightless and can be more portable than other metals. We have planned to use 5mm plastic sheets that are strong enough to carry our load.

C. Water conservation

Due to human negligence in irrigation, number of farmers practicing agriculture are decreasing in today's world. In addition, the current technology for irrigation wastes a lot of water and takes a lot of time to irri.gate the fields. India's water resources are abundant. However, as a result of population growth and overuse, there is a greater demand than there is for water[2].

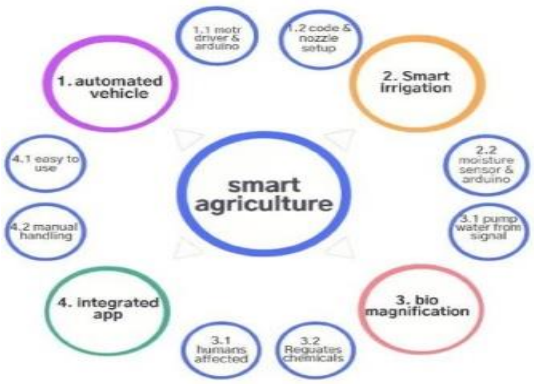

Figure1: Idea representation.

The majority of irrigation is done using old-fashioned stream flows from one end to the other. Such a source could leave fields with varying levels of moisture. The control of water usage can be improved using a computerized watering system. To meet these objectives, we have incorporated an autonomous watering network.

IV. DESIGN APPROACH

Figure2: Front view

Figure 3: Top view

Battery is attached to the motor driver, negative wire of the battery is connected to the Ground of the motor driver and positive wire is connected to a switch which in turn is attached to the motor driver.

The direction specified in the program is a practical direction on how this vehicle should be driven in the agricultural field to cover crops crossing each and every lane. We have attached a self made model of our automated car design where the red markings inside and outside the car define the nozzles. Eight nozzles are attached so that it covers three lanes of crops simultaneously.

The car is designed such that it travels straight until the end of the lane, then makes a necessary turn wither to the left or right, and finally moves to the next lane by traveling in the opposite direction. It travels along this route to cover the entire field spraying fertilizers and pesticides everywhere. In the car, the lower nozzle is made to spray fertilizers at a controlled level to the root of the crop, while the top nozzle is made to spray insecticides to the leaves and other parts of the crop. It has nozzles on each side of the vehicle so that it can simultaneously cover three lanes.

V. WORKING PRINCIPLES

A. Automated car

Polymer hard plastics are used to make the body of this automated vehicle and Spike wheels were chosen because other wheels might become stuck or stuck in the ground. Motors with 500 rpm are attached to wheels and also connected to a lead acid rechargeable battery (12 V - 1.3 amps) that makes the motors run.

We use Arduino UNO to take control of the directions and motor driver L298N model to take care of the wheels to perform in their specified .The lower body of the car is permanently fixed while the upper body is movable due to the way the car has been built. This enables the farmer to adjust the height of the car as per the obstacle's size on its path.

The model's design prioritizes compactness and portability which assures that no or little labor is required. The lead acid batteries that power the car can operate for up to three hours after a full charge. As a result, the work is done faster and more effectively. There is no risk of any non-renewable resources getting depleted because batteries are utilized as fuel.

B. Smart irrigation

We make use of Arduino UNO Microcontrollers to examine the moisture level in the crops. The Moisture sensors are placed in the definite integral, proposed as 8 sensors/ acre.

One important aspect of modern living that provides comfort, eases burdens, and allows us to save time is computerization. We intend to create a framework that enables the farmer to automatically supply water to the plant in accordance with its requirements and the current level of soil moisture. With the aid of moisture sensor and Arduino chips, a sophisticated water system is created.

We implant a moisture sensor inside the system, which will inform it of the amount of water existing in the soil. The system will check the amount of water a plant needs with the aid of a C language software, using specified values in the program [2].

The controller receives information from the moisture sensor about the amount of moisture in the soil. The controller, which regulates water, is connected to the motor in turn. Our program is executed out in terms of time. While we cannot regulate the amount of flow, we can control how long the water must flow. Until the moisture in soil reaches a predetermined limit, the motor operates in the ON state for longer when there is less water and for a shorter period of time when there is more water. In contrast, when the soil has an adequate moisture level, the motor is not activated. The app designed to regulate irrigation with a single click allows users to manually turn on and off the motors.

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