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Automatic Farming Kit (AFK) for Automation in Agriculture Sector using Advanced Sensors and Equipment

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ABSTRACT

In this paper, we delve into the unrelated parallel machines static scheduling problem, considering both renewable and non-renewable resource conditions, and accounting for the deterioration effect. The primary challenge lies in determining the optimal assignment of tasks to machines and the efficient allocation of resources, aiming to minimize both the makespan and the cost of non-renewable resources. To address these goals, we develop a mathematical programming model and apply a multi-objective simulated annealing algorithm to our problem. Our computational experiments encompass a range of instances, including small, medium, and large scenarios. The mathematical model proves effective for small instances with 8N2M, 10N3M, and 15N3M, providing solutions to the problem. Remarkably, for these instances, the MOSA approach achieves optimal solutions similar to those obtained by the solver but does so within a shorter computational timeframe.

Keywords*:* Metaheuristic, Linear Programing, Resources Cost, Unrelated Parallel Machine.

I. INTRODUCTION

This The Automatic Farming Kit is designed to operate amultiple functions and works in agriculture industry withApplication like automatic drip irrigation system, automaticfertilizing system, weather detection system, fertilizersuggestion software based application, soil moisture andnutrient observers, Raindrop alerts and alarm, water leveldetector and UV light insect killer system with many moreadvantages.The agriculture sector plays a crucial role inensuring global food security. As the world's populationcontinues to grow, the need for efficient and sustainablefarming practices becomes increasingly important. In recentyears, there has been a significant focus on leveragingtechnology to improve farming methods, resulting in thedevelopment of innovative solutions such as AutomaticFarming Kits. This report explores the future scope ofAutomatic Farming Kits, specifically their integration withadvanced sensors like soil moisture sensors, raindrop sensors,water level sensors, and others to enable automation infarming.

The Automatic Farming Kit is developed to take growth ofAutomation in Agricultural sector with the help of Electroniccomponents and sensors like moisture sensor, raindrop sensor,temperature sensor, vibration sensor, water level detectionsensor, weather forecasting device, wind flow detector andsound sensor. also it take part

in in software and IT industrysby using programming languages like JAVA, Python, CPPetc. Agriculture is a perfect niche for innovations in the sphereof robotics: farmers usually have to deal with repetitive tasksin the field, and this work is primarily labor- intensive. Nowagricultural robots ("agrobots") cope with a wide range oftasks: harvesting, watering, seeding, etc. Ease of Use.

II. NEED OF AFK

Automatic Farming Kits are comprehensive systems thatincorporate various technological components to optimizeagricultural processes. These kits combine hardware andsoftware elements to automate tasks such as irrigation,fertilization, pest control, and monitoring of environmentalconditions. By integrating advanced sensors, these kits cancollect real-time data and make informed decisions, leading toincreased crop yields, reduced resource consumption, andimproved overall efficiency.

The world population is growing steadily, and now it hasreached 7.7 billion people. One question that comes to mindis, what are all these people going to eat? First and foremost,this question is addressed to the agriculture industry. Thegrowing population is hardly the only challenge facingmodern farmers. What about labor shortages and consumersasking for ecofriendly sustenance? The answer to all thesequestions is Automatic Farming Kit and smart farming.

The most important things of Automatic farming areenvironmental measurements and water management. Thecombination of traditional methods with latest technology asInternet of Things and wireless Sensor Networks can lead toagricultural modernization. The wireless Sensor Networkwhich collects the data from different types of sensors andsends it to the main server using wireless protocol. Our

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Automatic farming system reduces the manual work andautomates the agricultural activities.

III.USE OF AFK

The main idea of this system is to automate the activitiesof farming by using the principle of mechanics;communication and electronics. There are two modules,namely a smart farm sensing system and movable smartirrigator that moves on mechanical bridge sliderarrangement. This system consists of moisture sensor,optocouplers, spectroscopy sensor which measures lightintensity and measured chlorophyll content whichevaluates the nutrient content in the crops. A crane consistsof the two main sensors and the Smart irrigator is mountedon the overhead crane through which crop growth can beanalyzed. Sensors triggers the optocoupler connected togreen manure, seeds, compost and water container.

IV.METHODOLOGY OF AFK

In the proposed system monitoring and controlling are donethrough sensors such as soil moisture sensor, PIR sensor, pHsensor, water flow sensor. To prevent tress, a microphone isused to record the sound of axe or other tools used for cuttingof trees. Here the data is transmitted through IoT. In thissystem the data is being processed by PIC16F877Amicrocontroller. The Internet of Things is regarded as the thirdway of information technology after Internet and mobilecommunication network, which is characterized more throughsense and measure.shows the block diagram of the proposedsystem model.

The working of this proposed technique is illustrated asfollows:

1) The soil moisture sensor senses and measures the moisturelevel in the soil.
2) The PIR sensor detects the animals and a high frequencysound signal is provided.
3) The ph sensor and water flow sensor is used to optimize thefertilizer usage.
4) These data are processed and the optimum water level willbe supplied to the field by automatically switching on thepower supply to the water pump.
5) These data will be transmitted to the user's mobile phonethrough Iot using a separate IP address for the givenmicrocontroller which is programmed to send the data givenby the sensor to the user through a web page showing the ivecondition of the field

V. COMPONENTS OF AFK

A) Arduino UNO Board:

Arduino Uno R3 is one kind of ATmega328P basedmicrocontroller board. It includes the whole thing required tohold up the microcontroller; just attach it to a PC with the helpof a USB cable, and give the supply using AC-DC adapter ora battery to get started. The term Uno means "one" in thelanguage of "Italian" and was selected for marking the releaseof Arduino's IDE 1.0 software. The R3 Arduino Uno is the3rd as well as most recent modification of the Arduino Uno.

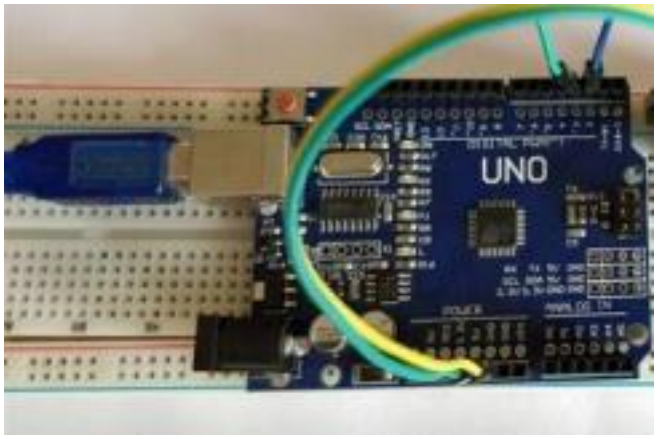

Fig. Arduino UNO Board

B) Soil Moisture Sensor:

Soil moisture plays an important role in the development ofweather patterns and agricultural applications. A soil moisturesensor measures the quantity of water contained in a material,such as soil on a volumetric basis. In this proposed researchsoil moisture sensor is used to know the exact soil moistureconditions on their fields. This helps farmers to generally useless water to grow a crop; they are able to increase yields andthe quality of the crop by improved management of soilmoisture during critical plant growth stages.

Fig. Soil Moisture Sensor

C) PIR Sensor:

In this proposed system Passive Infrared (PIR) sensors areused for the purpose of human and animal detection in thefield. This is a type most commonly encountered in motionsensing They are commonly used in automatic door openingsystem, security alarm systems .PIR sensors are used asmotion detectors in many applications such as Hospitals,grocery stores and libraries.

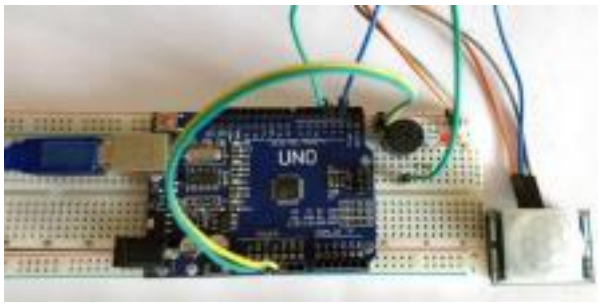

Fig. PIR Sensor

D) pH Sensor:

A pH sensor measures the hydrogen-ion activity in water based solutions, indicating its acidity or alkalinity expressedas pH. The pH meter is used in many applications rangingfrom laboratory experimentation to quality control. In thisproposed system pH sensors are used for soil, crop, and watertesting in agriculture to achieve high quality produce fromfarming operation. The output can be digital or analog, and thedevice can be battery-powered or rely on line power. With pHsensor we can measure the growing conditions and improveboth the health and yield from our crops.

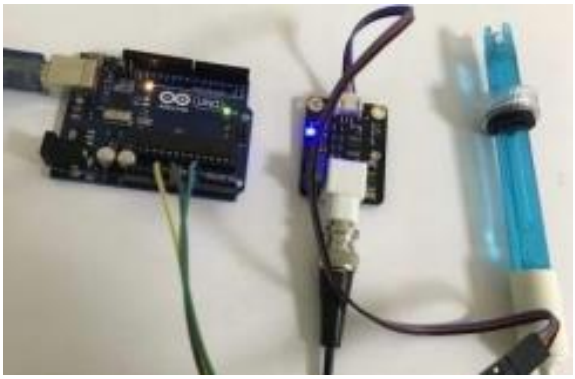

Fig. pH Sensor

E) Water Flow Sensor:

A water flow sensor consists of a plastic valve body, a waterrotor,and a hall-effect sensor. When water flows through therotor, rotor rolls. The speed of the flow sensor changes withdifferent rate of flow. The hall-effect sensor outputs thecorresponding pulse signal. In the proposed system the waterflow sensor is used to measure the amount of fertilizer mixedwith water. Through this the farmers can get the exact scenarioof fertilizers mixed with water and the usage of fertilizers canbe optimized. There are different types of applications such asgas meter, chemicals, process auto-control, medical, food andbeverages.

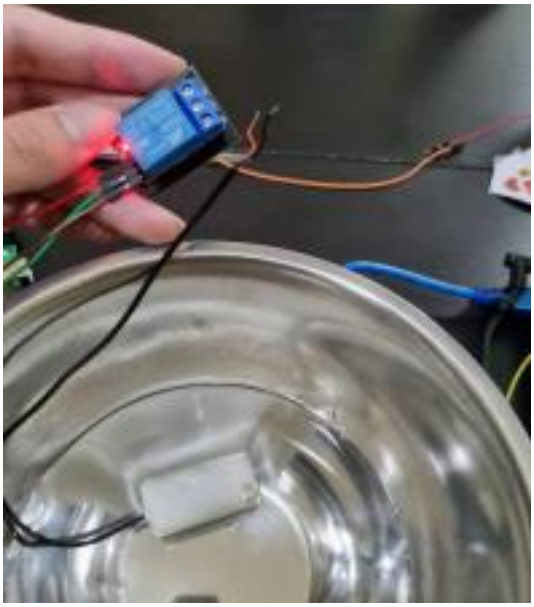

Fig. Water Flow Sensor

F) Raindrop Sensor:

Raindrop sensors detect the presence and intensity of rainfall.When integrated into Automatic Farming Kits, these sensorsprovide valuable information about natural watering events.By combining data from raindrop sensors with soil moisturedata, farmers can adjust irrigation schedules accordingly. Thisintegration helps prevent unnecessary watering during rainyperiods and reduces water wastage.

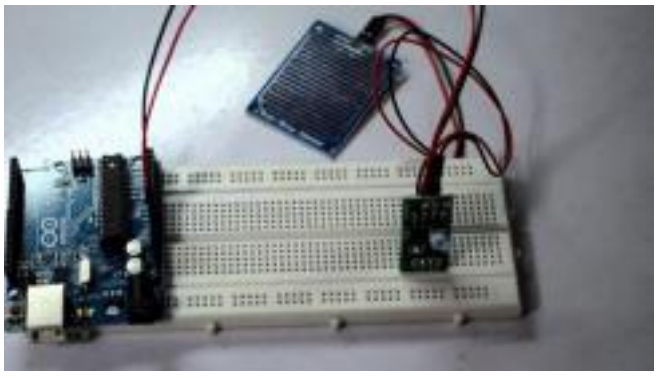

Fig. Raindrop Sensor

G) Water level sensors:

Water level sensors are essential for monitoring waterreservoirs, tanks, or irrigation channels. By incorporatingwater level sensors into Automatic Farming Kits, farmers canaccurately monitor water levels and automate the process ofrefilling or redirecting water.

Fig. Water level sensors

VI. ON FIELD SURVEY

1) On Field Survey 1 :

Name: Shitaram Pawar

Location: Gopalpur, Pandharpur-Mangalvedha Road,Gopalpur, Tal- Pandharpur-413304

Date : 06/10/2023

Time : 01:30 PM

Fig. On Field Survey 1

2) On Field Survey 2 :

Name: Ranjit Jagtap

Location: Anavali, Ranjani Road, Anavali,

Tal-Pandharpur-413304

Date : 06/10/2023

Time : 02:20 PM

Fig. On Field Survey 2

3) On Field Survey 3 :

Name: Babaso Dandage

Location: Ranjani, Sarkoli Road, Ranjani, Tal-Pandharpur-413304

Date : 06/10/2023

Time : 02:45 PM

Fig. On Field Survey 3 III. RESULTS

VII. BENEFITS

1. Increased Efficiency:

By automating critical farming processes through theintegration of advanced sensors, Automatic Farming Kits cansignificantly increase overall operational efficiency. Farmerscan optimize resource utilization, reduce manual labor, andmake data-driven decisions to enhance productivity.

2. Precision Farming:

The integration of advanced sensors enables precision farmingtechniques, where specific actions are taken based on real time data. This approach ensures that resources such as water,fertilizers, and pesticides are used efficiently, minimizingwaste and environmental impact.

3. Cost Savings:

Automated farming techniques can lead to cost savings forfarmers. By precisely controlling resource usage, optimizingirrigation schedules, and reducing manual labor, farmers canlower operational costs and achieve higher returns oninvestment.

4. Sustainable Agriculture:

Automatic Farming Kits contribute to sustainable agriculturepractices by promoting responsible resource management.Efficient water usage, reduced chemical application, andoptimized crop growth contribute to environmentalconservation and minimize ecological footprints.

Department, whose continuous advice and suggestionsshowed us the right path of doing the things in proper way. We feel indebted towards our Principal Dr. B. P. Ronge forproviding us the institutional facilities and supports.

VIII. CONCLUSION

After examining the survey papers on intelligent farming suchas IoT based monitoring system in smart agriculture, SmartFarming System using sensors for agricultural taskautomation, Sensor data collection and irrigation control onvegetable crop using smart phone and wireless sensornetworks for smart farm and Remote agriculture automationusing wireless link and IoT gateway infrastructure, a novelagricultural automation system using Internet of Things (IoT)is proposed. This system provides real time information aboutthe farmland and alerts the farmer in case of animal threats.The proposed system also prevent the trees from illegal cutdown. Some Common Mistakes.

IX. ACKNOWLEDGEMENT

Our hearts inflate with surge of glorious happiness as wepresent the research paper report on “Automation inAgriculture Sector using Advanced Sensors & Equipments”to Punyashlok Ahilyadevi Holkar Solapur University,Solapur.

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