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A Real Time Agricultural Crop Maintenance Model Using RWSA Technique For Iot Networks

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Abstract

Agriculture is the main emerging subject at everywhere, automation is compulsory. Population is growing rapidly at fast rate so food is necessary for peoples. Conventional agriculture method serves intensified results. Because of this food increasing rate is decreased, this problematic system can be change with the help of traditional methods like IOT, Machine Learning and Artificial Intelligence. Until we covers edge computing,inter quartile correlation and static threshold, etc methods. These all methods gives the sufficient results but improvement is needed. Proposed Sensor Calibration and Feed Back Method (SCFM) could be use full for better agriculture crop maintenance and automation. In this research we are finding the leaf colour, leaf size, fertilizer requirements are analysed. In this context better Agritech-Agriculture gives the solution for current problems. The data collected from local sensors and remote station sensors gives to control system in SCFM. Using this scenario exactlyregulator the dispensing of water as well as chemicals, fertilizers for prevention of diseases.

Keywords: Runway Scheduling Algorithm (RWSA), SCFM- SENSOR CALIBRATION AND FEED BACK METHOD,IoT.

1. INTRODUCTION

IoT can affect the world we live in; all components of the IoT condition are created ventures, connected vehicles just as more astute urban communities. Additionally, the greatest effect could be the utilization of innovation, for example, IoT to the farming business. By 2050, the overall populace will arrive at 9.6 billion. The cultivating business should, thusly, grasp IoT so as to sustain this extraordinary populace. The interest for further nourishment must be met toward troubles, for example, climatic conditions additionally rising environmental change, just as the ecological results of serious cultivating rehearses. Savvy IoT-based cultivating can enable ranchers to diminish waste and increment profitability from the measure of compost used to the number of excursions that homestead vehicles have made.

Things being what they are, what's shrewd horticulture? Savvy horticulture is a capital-serious, cutting edge framework for the majority to deliver sustenance neatly just as economically. It is the usage in agribusiness of contemporary ICT (Information and

Communication Technologies). In IoT-based keen cultivating, sensors (light, stickiness, temperature, soil dampness, and so on.) are utilized to screen the harvest field just as robotize the water system framework. From wherever the ranchers may screen the conditions of the field. Contrasted with the standard procedure, IoT-based canny cultivating is amazingly powerful. Notwithstanding focusing on standard, enormous scale cultivating exercises, IoT-based shrewd cultivating applications could be new switches to improve other expanding or normal horticultural patterns, for example, natural cultivating, family cultivating (entangled or little spaces, explicit domesticated animals as well as yields, protection of explicit or top-notch assortments, and so forth.) and improve incredibly straightforward cultivating. IoT-based wise cultivating may give astounding points of interest regarding ecological issues, alongside progressively powerful utilization of water, or improvement of sources of info and techniques. Presently, we should discuss the critical IoT-based clever cultivating applications that are upsetting horticulture.

Associated gadgets have infiltrated every part of our lives with the expanding usage of the Internet of Things (IoT), from wellbeing and wellness, remote checking, car, and coordination’s to brilliant urban areas and modern IoT. Subsequently, it is just consistent that IoT, gadgets, just as mechanization, discover its application in horticulture and, in that capacity, upgrade pretty much every aspect of it immensely. How might despite everything one rely upon steeds and furrows when self-driving vehicles and augmented reality are never again a dream of sci-fi, yet a day by day occasion? In ongoing decades, cultivating has seen various mechanical changes, ending up increasingly industrialized and innovation-driven.

Figure: 1 General IoT Network

Growers have acquired greater regulatorconcluded the system of raising livestock likewise increasing plants through the use of multiple intelligent agricultural gadgets, creation it additional reliable also enhancing its effectiveness. In this article, we resolve explore and examine the benefits of IoT use belongings in agriculture. So, if you're preparing to spend in intelligent farming or create an IoT solution for agriculture, dive straight into it. What is smart farming? There are several ways of referring to modern farming in terms of definition and market size.

AgriTech, for instance, relates to the overall use of innovation in agriculture. On the other side, smart agriculture is frequently used to indicate the use of IoT alternatives in agriculture. The identical refers to the definition of intelligent farming.

IoT technologies also have the ability to transform several agricultural aspects. In other phrases, there are five methods in which IoT can improve farming: data, tons of details, collected by smart farming sensors, e.g. weather conditions, soil quality, the advancement of crop growth or cattle health. This information could be used to monitor your business ' specific status as well as personnel appearance, machinery effectiveness, etc. Increased inner process control, resulting in reduced manufacturing danger. The capacity to predict your output from manufacturing allows you to plan for improved product distribution.If you have an accurate understanding of how many crops you should grow, you can make sure that your item is not around unsold. In agriculture, there are a few types of IoT sensors as well as IoT applications in specific: weather stations, combining various smart farming sensors, are probably the most popular climate surveillance gadgets for smart farming. Various information from the setting are gathered and sent to the cloud located around the field.The measurements provided can be used to map climatic conditions, select the appropriate crops and take the required measures to improve their capacity (i.e. precision farming). Some examples of such farming IoT systems are all METEO, Smart Elements, and Pycno.

1.2 Greenhouse automation:

Besides providing ecological data, climate stations can naturally alter the circumstances for coordinating the parameters provided. In specific, a comparative guideline is used by nursery mechanization frameworks. Farm implementation and grow link, for instance, are equally IoT agribusiness products that offer such capabilities among others. Green IQ is also a intriguing item that uses shrewd sensors for horticulture. It is a clever controller for sprinklers that allows you to remotely handle your water system and lighting frameworks.

1.3 Crop management:

Another type of IoT product in agribusiness and another element of cultivating accuracy is croping the gadgets of managers. Like climate stations, they should be set up on the ground to collect data explicitly for harvesting; from temperature and precipitation to leaf water potential and crop well-being in particular. In this manner, you can screen the growth of your harvest and any peculiarities to effectively anticipate any diseases or invasions that may harm your output. Arable and Semios can in fact fill out as excellent portrayals of how to connect this use case.

2. LITERATURE REVIEW

This innovation relates as a rule to a framework for computerized control and all the more explicitly to a framework for checking and overseeing crop development. Farming has been a significant part of human presence for a long time. Upgrades in thinking about yields, quickening crop development, guaranteeing the nature of harvests and accommodating a copious and productive collect have kept on adding to the pleasure and improvement of our populace's personal satisfaction. Significant zones for robotization of farming incorporate water system, security against climate, creepy crawlies, and infection, and accommodating plant nourishment. Likewise, it is critical to have the option to conjecture crop development and collects with the goal that the financial aspects of reaping and appropriation can be increasingly productive. One case of a sort of yield that has profited incredibly from late drifts in computerized agribusiness is the grape which proves to be fruitful used to make wine. The present vineyards incorporate distinctive administering frameworks for giving water to yields to water system. Instances of such frameworks are "trickle" or "sprinkler" frameworks where water is steered among lines of vines by a cylinder having emanating gaps dispersed at ordinary interims. The water stream can be turned on or off physically or can be mechanized with clock control, PC, and so on. The cylinders can be raised over the ground, or at or subterranean level.

The situation of diminishing water tables, evaporating of streams and tanks, the capricious condition introduces an earnest requirement for legitimate use of water. To adapt up to this utilization of temperature and dampness sensors at appropriate areas for checking of yields is actualized in [8]. A schemingformedthrough edge estimations of temperature also soil dampness can be modified hooked on a microcontroller-based door to regulator water quantity. The outline can be organised by Photovoltaic sheetsalso can have a duplex correspondence connection dependent on cell – Internet interface that permits data review and water system planning to be personalisedover a web page.[9].The mechanical improvement in open source programming and equipment make it simple to build up the gadget which can improve observing and remote sensor system made it conceivable to use in checking and control of nursery parameter in accuracy agriculture.[7].

In papers [2][3][4] projected a rural utilization of remote sensor organize for yield field checking. These frameworks completely furnished with two sort sensor hubs to quantify dampness, temperature, also a picture detecting hub to think about data by taking pictures of yields. Parameters assume a significant job in settling on a decent basic leadership for solid yield inside a period. The limitations are temperature, mugginess, and pictures. By subsequent these techniques can accomplish great soundness of sensors throughshort utilization of intensity. With it's an extensive stretch of checking the agribusiness field region. Paper [5] anticipated a nursery Monitoring System dependent on agribusiness IoT among a cloud. In a nursery, the board can screen diverse ecological parameters viably utilizing sensor gadgets, for example, light sensor, temperature sensor, relative mugginess sensor, and soil dampness sensor. Occasionally (30 seconds) the sensors are gathering data of agribusiness field zone and are actuality logged then put away web based utilizing distributed calculatingalso Internet of Things. [6] Documents clarify an IOT Based Crop-Field Monitoring also Irrigation Automation framework.

In their effort, to screen crop-field a framework is created through utilizing sensors as well as indicated by the choice starting a server dependent on detected information, the water scheme framework computerized. By utilizing remote broadcast the detected information sent in the direction ofweb server database. On the off chance that water system is mechanized, at that point that implies if the dampness also temperature fields drop beneath of the probable territory. The client container screen alsoregulator the framework remotely through the assistance of an submission which gives a web interface to the client. In [7] planned a keen dribble water organization framework. In this, an Android versatile application is utilized to decrease the inclusion of human also it used to regulator, screen the yield region remotely. Water depletionbe able to decrease through Drip Irrigation framework also it workings dependent on data commencing water level sensors. Selected progressively various sensors be situated utilized to screen the earth. The field climate information gathered and sensed together with weather information from internet repositories can be used to make several efficient choices to increase crop output. If the environmental condition is warm, dry, sunny, windy then plants require a large quantity of water and if these variables are like cold, wet, cloudy, low wind then the crop needs less water. Previous research model abstracted a scheme consisting of six components that are monitoring, managing, planning, distributing information, supporting decision and tracking action[22].

The effectiveness and quality of agricultural manufacturing, storage and transportation can be greatly enhanced by using IoT and cloud services and precision farming techniques. In this article, we present the architecture of a multilayered enabling platform for the agricultural sector to incorporate IoT technologies. This research contributes significantly by suggesting a viable human-centered IoT model for agriculture with particular emphasis on developing nations [23].

3. RELATED METHODS

3.1 IoT Cloud Integrated Load Balancing Algorithm:

Energy sensitive load balancing algorithm can solves limited problems. But, current technology needs improvement and all solutions for any IoT-Agritech problems. Edge computing network is one of the best method for agriculture monitoring. In this computing Sensor Array1(SA1) and Sensor Array2(SA2) place key role. In SA1 data aggregation module is major functional block, SA2 consist of power manager module and packet filtering module. SA1 and SA2 are attached with connectivity module. At bottom bacon module and neighbour management module are performs agritech monitoring. The above discussions are related to energy sensitive load balancing and Agro-IoT techniques. But, not explains deep agriculture monitoring. Eg.. leaf color, leaf size, requirements of fertilizers seeding rate and hybrid genetics.

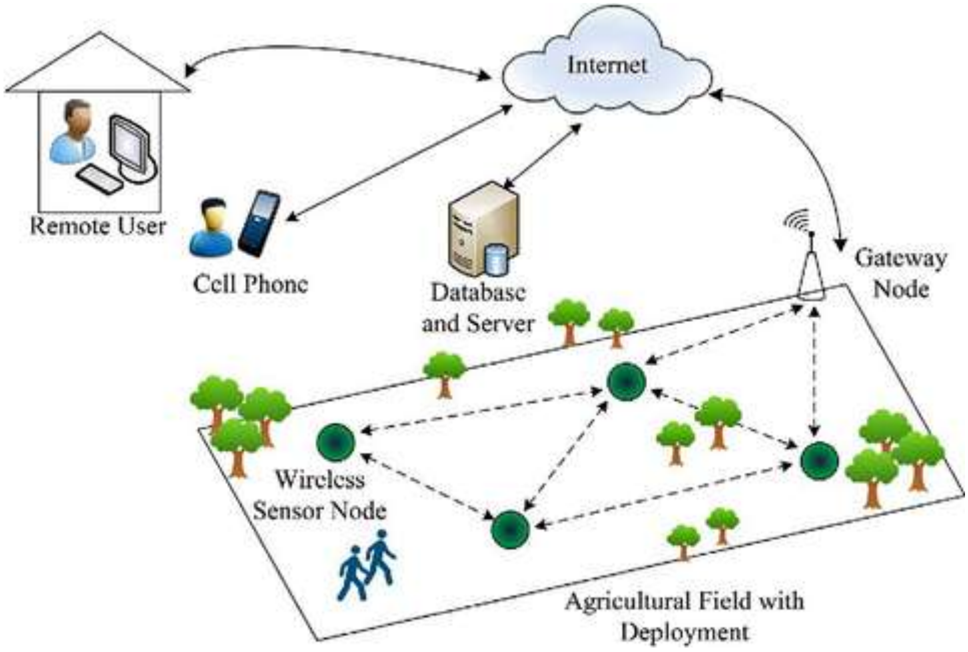

Figure:2 IoT based sensor network

Data acquisition must important for any networks like communication, sensor, IoT, etc. Fig2 shows that present Agro-IoT model. In this model of basic step sensors monitors the crop status like greenery, age, water requirements and all. After first step data is fetched from sensors and analysed with healthy crop data. At every step end user receives technical data from IoT network. In between IoT load and end user data filtering, noise reduction, prediction analysis had been done.

3.2 Different IoT Network Strategies-Rooting:

This framework is a blend of equipment and programming parts. The equipment part comprises of various sensors like soil dampness sensor, photocell sensor, and so on through the product part comprises of an android based application associated with the Arduino board and other equipment segments utilizing the Internet of Things (IoT). The android based application comprises of sign and a database in which readings are shown from sensors and are embedded utilizing the equipment. The improvement in water system framework utilizing a remote system is an answer to accomplishing water preservation just as progress in the water system process. This examination attempts to robotize the procedure of water system on the farmland by checking the dirt water level of the dirt in respect to the plant being developed and the adaptively sprinkling water to recreate the impact of precipitation.

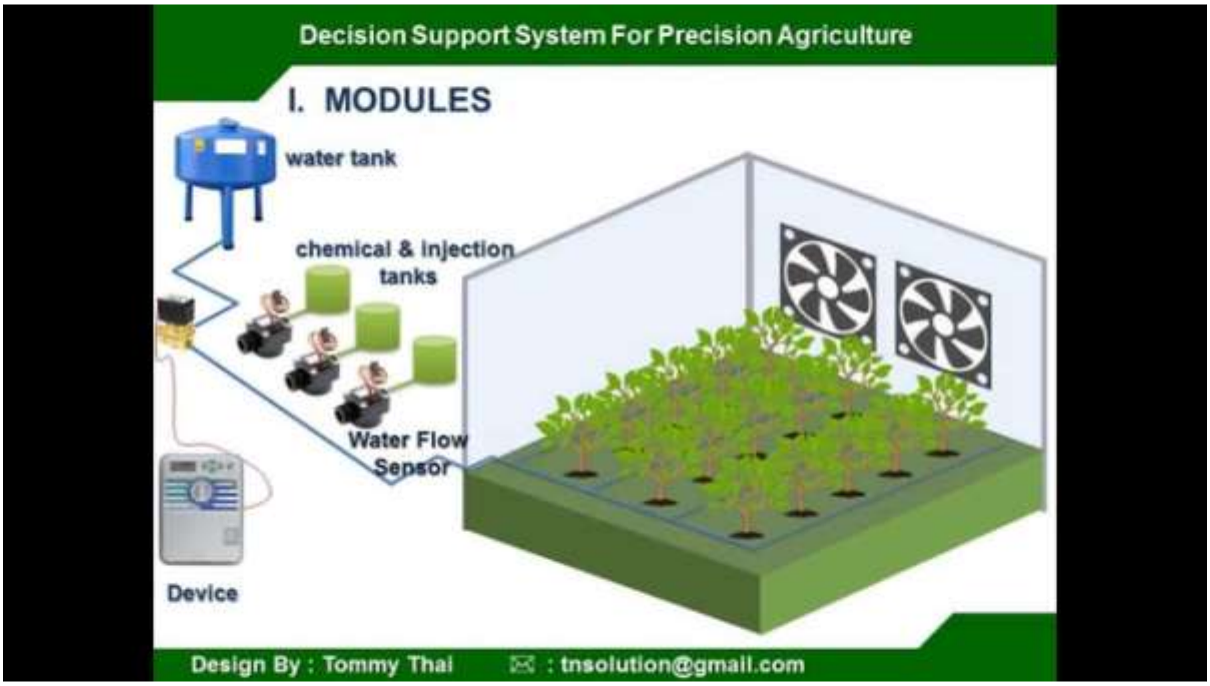

Figure:3 Architecture for interfacing IoT network.

In above fig3. Explains agriculture monitoring with respective WSN(Wireless Sensor Networks) and IoT. In this method the network is connected with all sensing input and output modules. Mobius(IN-CSE) is the main block hear registration, data management, communication management, security, location, service management are done with load balancing protocol

```
// TAS code example for iThing
// Create two TAS functions
get_smart_plug(int index) {
// TAS function 1 for retrieving electricity consumption data from the smart plugs
// (index 0: fan, 1: light bulb, 2: humidifier)
...
}
set_smart_plug(int index, Boolean state) {
// TAS function 2 for controlling the smart plugs
// (index 0: fan, 1: light bulb, 2: humidifier)
// (state true: on, false: off)
...
```

```
}
// TAS code example for iThing
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// TAS function 2 for controlling the smart plugs
// (index 0: fan, 1: light bulb, 2: humidifier) // (state true: on, false: off)
...
 }
```

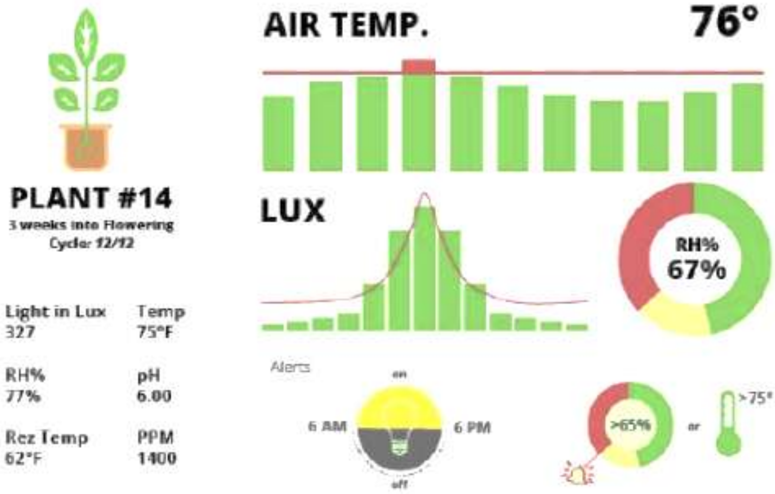

Figure: 4. Plant monitoring system

Fig.5 shows that monitoring of plant at every time sensing the temperature, humidity, water level monitoring. Here this system will helpful for only single plant monitoring but not for crops so advancements are needed.

Figure: 5 layer model

A reasonable model for savvy farming is proposed by investigating the writing review. Prior to that, let us identify the general construction of IOT. Establishing numerous physical gadgets by and by IOT essentially consumes a 3-layer structure. The primary layer is the incorporated request layers which in horticulture associated applications are worked in light of the fact that it is considered as a UI layer. It is sans client and it incorporates rancher's mobile phones and individual gadgets are happens to screen the farming region.As per this layer, the ranchers can take a choice to secure their harvest as sound and improve sustenance creation yield. The subsequent layer is the data the board layer which contains a few obligations like arrangement and grouping of information, making, checking, basic leadership, and so forth. These jobs are kept up alsoaccomplished in this layer. The third layer is a system the executive's layer which speaks to the correspondence innovations like Gateway, RFID, GSM, Wifi, 3G, UMTS, as well as Bluetooth Low Energy, Zigbee and so forth. The fourth layer is a data accumulation layer which comprises a wide range of sensors, cameras and so on.These are utilized to gather data of harvest for enhancedin addition to simple field checking of horticulture zone. Figure 6 demonstrates the four layer IoT structure.But maintenance is more complex and energy consumption of IoT networks also increase's so we move to proposed SCFM.

4. PROPOSED METHOD

Main objective of SCFM-IoT is to implement the monitories tasks using different-angle of visualization. A farmer containerrelatethrough physical substances, as well as the IoT data virtually involved to them. The proposed SCFM-IoT system includes two integrated modules: IoT and SC. The first module is based on sensor technologies, which are capable of identifying physical objects and collecting data sources. Meanwhile, an SC-3D module is deployed to provide a 3D visual representing in physical world. The totaltheoretical diagram of the projectedSCFM-IoT is exposed in Figure 6.

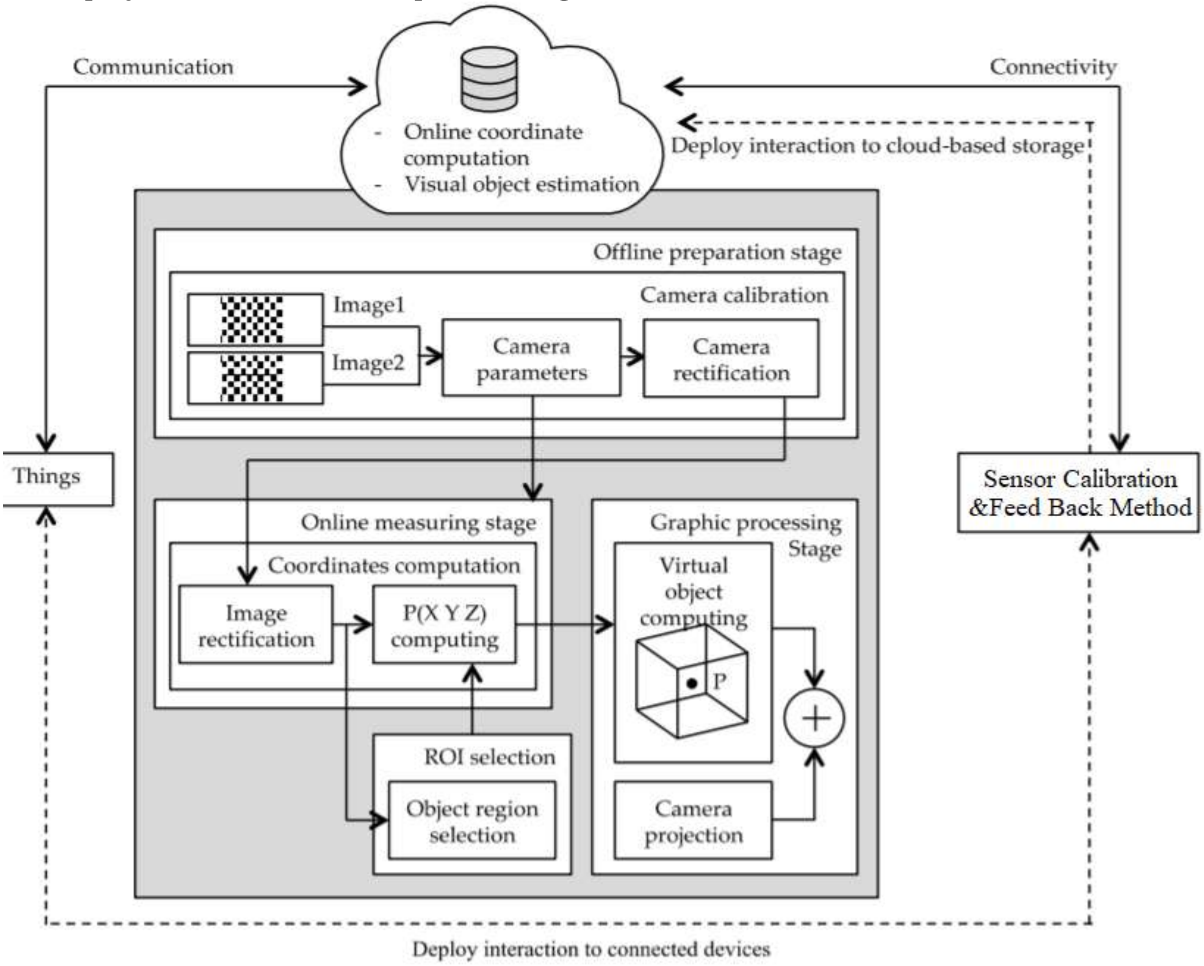

Figure: 6 proposed SCFM

To begin with, the left side of the diagram illustrates the connected devices, "things", which live at the edge of the network, whereas, the middle of the diagram represents the storage where data from things are aggregated in real time. Besides the storage, the system contains three stages, called the offline preparation stage, online measuring stage, and graphic processing stage. First, the offline preparation stage is used to estimate the camera parameters and to ensure that the relativity among the cameras is respected for all of them[10]. For example, the position as well as orientation of camera 2 are comparative to camera 1, the position also orientation of camera 3 are comparative to camera 2, and so on. Next, the online measuring stage provides data relating to the objects (e.g., coordinates). Then, the graphic processing stage elaborates IoT information and imposes them on 3D virtual objects (e.g., 3D virtual cube, virtual text). Lastly, the right side of the diagram depicts SC development associated with IoT information. Here, a farmer enters the information associated with physical objects and tries to gain IoT virtual contents through device display based on SC-IoT interaction. In this case, a farmer may execute on the storage or on the thing itself. Each of the parts of the diagram will be discussed below

4.1 Parameters and Communication

In order to use IoT paradigms to communicate and create information structures, connected devices, or things such as sensors/actuators, control devices should be defined. Furthermore, agricultural subsystems (crop, soil, climate, water, nutrients, also energy) should be associated with them to determine development requirements [6]. Meanwhile, sensors enable acquisition of various sensor data, such as coordinates of crops, soil moisture content, temperature, water level, nutrients, and luminance.

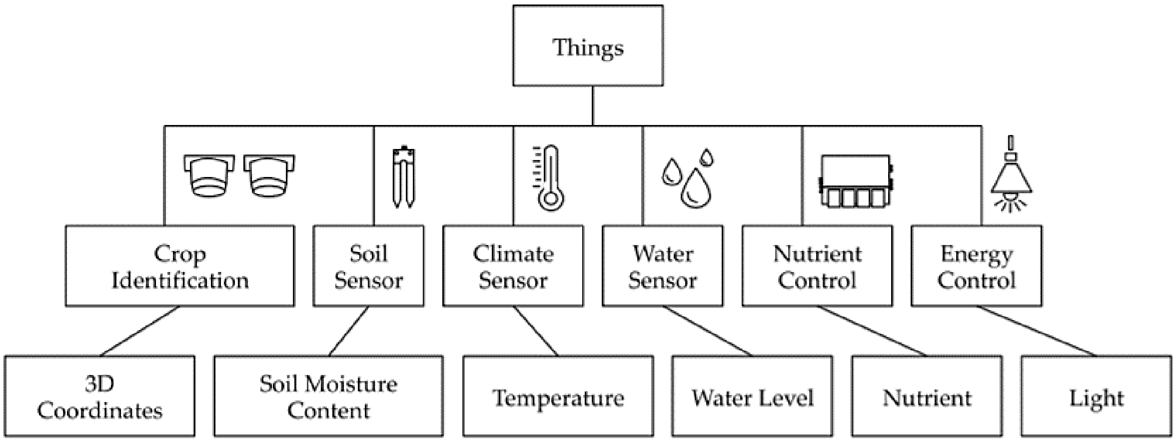

Figure: 7 3D parameters

In our AR-IoT system, a hierarchy of crop production is composed of regions of the farm (FARM_REGION_VO), the farmer manager (FARMER), sensor devices (SENSOR), and crops (PLANT). The farm is divided into several lots (FARM_LOT_VO). The farm manager is assigned names that can be used to access several lots (FARMER_LOT_VO). Things (SENSOR) are composed of control and sensor devices. Each crop (PLANT) is listed by crop type (e.g., PLANT1), as shown in Figure 7.

For example, in Figure 7, various devices, such as multi-cameras, are positioned around the farm, which a farmer manager can use to visualize the same object from different angles. Thus, the coordinates of crops will be identified to provide virtual visualization. In our case study, an IoT-based multi-camera was deployed to measure coordinates due to their stability and accuracy. Accordingly, a WSN (Wireless Sensor Network) was established to visualize the virtual contents[11].

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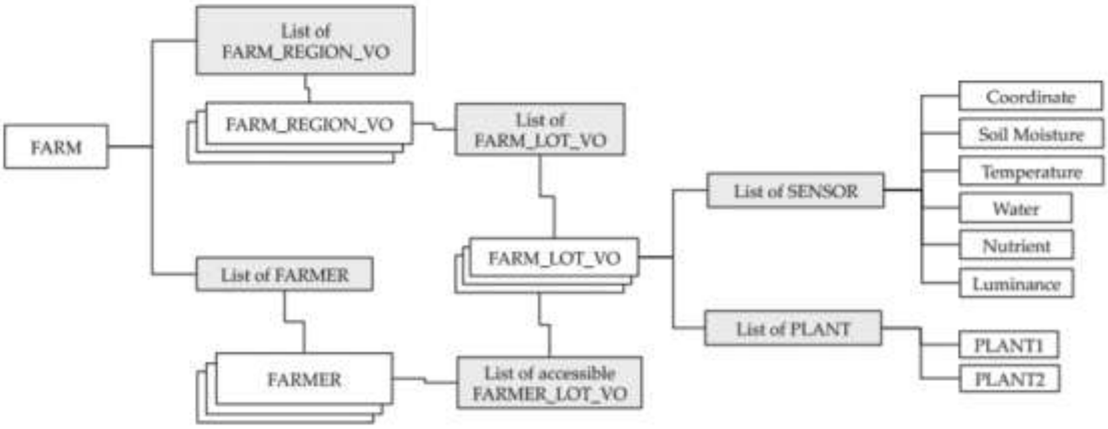

Figure: 8 step by step information structure

4.2 ALGORITHM-Runway Scheduling Algorithm(RWSA)

```
FARM {
  farm_name;
  farm_description;
  list of FARM_REGION_VO;
  list of FARMER; // Movable
}

FARM_REGION_VO {
  region_id;
  region_description;
  AR {
   (x, y, z);  // Center virtual object (VO)
   (h, w, d); // Height, width, depth
  }
  IOT {
    list of SENSOR; // Static
  }
  list of FARM_LOT_VO;
  INFO; //URL
}

PLANT {
  plant_id;
  plant_description;
  AR {
    (x, y, z); // Plant location.
    current_region_id, current_lot_id;
  }
  IOT {
    tag;
  }
  INFO; // URL
}

FARMER {
  farmer_id;
  farmer_description;
  AR {
    (x, y, z); // Farmer location.
    current_region_id, current_lot_id;
    list (region_id, lot_id, time) // List of permissible access}
  }
  IOT {
    tag;
  }
  INFO; //URL
}

SENSOR {
  sensor_id;
  sensor_description;
  AR {
    (x, y, z); // Sensor location.
  }
  IOT {
    type ; // The sensor type:  coordinate, soil,
           // temperature, water, nutrient, luminosity.
     sensor_value; // The measurement value
  }
  INFO; // URL
}

FARM_LOT_VO {
  lot_id;
  lot_description;
  AR {
   (x, y, z);  // Center virtual object (VO)
   (h, w, d); // Height, width, depth
  }
  IOT {
    list of SENSOR; // Static
    list of PLANT; // Dynamic
  }
  INFO; //URL
}
```

5. RESULTS

Using the existed method compare the proposed results, and also plant monitoring is done with day wise manner 1st day sowing the seeds 1 -45 days watering process, 7 green house and organic fertilizers adding 25 day for leaf color and leaf size analysed. 45 day observe the results. Shown in Table:l

Table: 1 day wise data analysis

Day	Planting Processes
1	Sowing the seeds
1–45	Daily watering
7	Transplanting seedlings into the greenhouse and applying organic fertilizer
10, 13, 16, 19, 22	Spraying organic hormones
25	leaf color, leaf size
45	final results

Table: 2 manual and proposed comparisons

Approach	n	Mean	S.D.	*t*	*p*
Manual	10	2.4900	0.26854		
SCFM-IoT	10	0.3470	0.04270		
Manual SCFM-IoT	10	2.14300	0.24450	27.717 *	<0.001

Note: * $p < 0.05$.

Table:2 explains that manual, SCFM, manual SCFM comparison, n is the no of point to be analysed mean function for avg the probability, S.D is the standard deviation t is time delay p is the distance using this parameters calculating the result which palnt leaf is healthy and color of leaf and all using this give the fertilizers to plants[21].

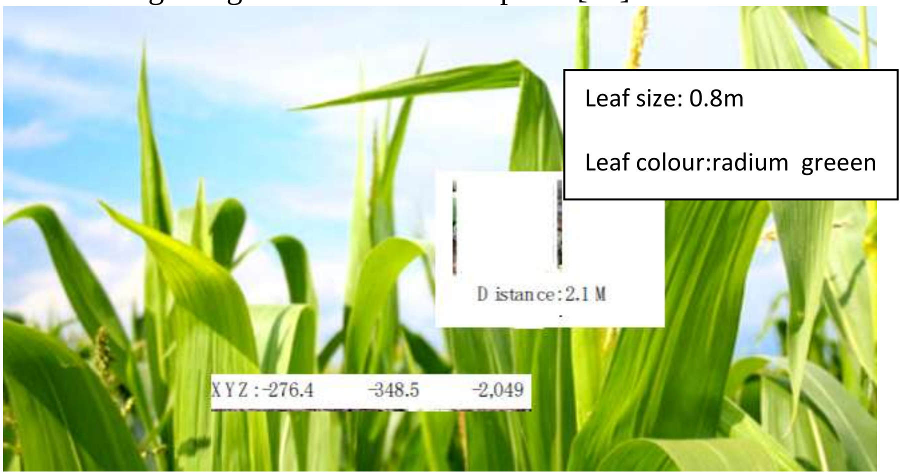

Figure: 9 final output

Fig.20 is typically a Wheat plant between 0.7 and 1.2 m tall. Wheat usually has a single main stem plus 2-3 tillers per plant. With better increasing circumstances and reduced plant density, the amount of tillers tends to raise. Tillering begins at the 3-4 point of the leaf; about when it is possible to see the first nodal roots.

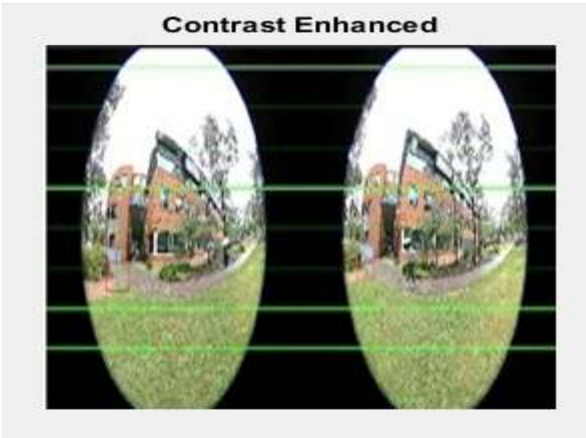

Figure :10 input of our proposed RWSA

Figure :11 b) input of our proposed RWSA Figure : 22 c) diseases finding

Table:3 Results from Analysis

Dataset	Threshold Value	CR	BPP	PSNR (db)	SSIM	ZC %
Dataset 1	5	3.94	2.22	49.78	0.9997	58.34
	10	4.65	1.81	43.05	0.9970	73.33
	15	4.96	1.23	39.14	0.9961	79.85
	20	5.87	1.14	37.51	0.9859	85.96
	25	5.74	1.12	35.52	0.9851	88.26
Dataset 2	5	4.88	1.73	49.74	0.9975	72.72
	10	5.48	1.44	43.93	0.9968	86.13
	15	5.59	1.41	40.69	0.9957	89.48
	20	5.64	1.37	38.24	0.9906	90.57
	25	5.79	1.28	38.22	0.9887	92.23
Dataset 3	5	4.79	1.85	49.91	0.9993	78.94
	10	4.89	1.71	45.12	0.9966	86.14
	15	5.25	1.46	44.18	0.9943	87.46
	20	5.78	1.42	40.27	0.9915	90.61
	25	5.89	1.37	39.99	0.9883	92.61

Table.1 explains that results from RWSA algorithm using this IoT technique finding image of plant and diseases

Table:4 Comparison Dwt Vs RWSA

Dataset	3-DWT (Th=15)				Proposed (Th=15) RWSA			
	CR	BPP	PSNR	SSIM	CR	BPP	PSNR	SSIM
Dataset 1	4.64	1.72	37.18	0.9902	4.65	1.23	39.14	0.9961
Dataset 2	5.59	1.46	40.68	0.9937	5.59	1.41	40.69	0.9957
Dataset 3	5.25	1.50	40.73	0.9946	5.25	1.46	44.18	0.9943

Table:2 is explains that the comparison table between DWT and RWSA method here all parameters are improved compared to existed method [24].

6. CONCLUSION

A case study was carried out using a crop, which was growing in nature. The relationships among the camera calibration, object coordinates, and accuracy of the visual representation and interaction were investigated. The directed learning showed that expending our SCFM-IoT technology was less mistake prone also much more promising than traditional methods. Furthermore, this study highlights an implication that could help developing decision-makers, reducing waste or lost time and advancing precision farming into the future. In this study, we calculated not individually the graphical illustration also contact of the RWSA-SCFM-IoT concept, but also employed it in a real environment setting (i.e., from replicated plantation to actual plantation). Moreover, the virtual object was represented in a comprehensive visualization, using color scale to represent the crop parameters (e.g., growth of crop or disease damage). The energy consumption of the embedded devices (e.g., multi-camera or image processing) is another issue that can be addressed though SCFM-IoT services. Moreover, RWSA-SCFM-IoT can be used for preliminary studies about the feasibility of such technologies (e.g., sensor or complex measurement devices), which are expensive and, in most cases, are not suitable for farmers. For this reason, it might be said that the use of RWSA-SCFM-IoT systems in precision agricultural is a promising target for future research. Thus, this study proposed a novel method to integrate IoT into an SC-based environment, which has the potential to be applied to monitor agricultural crops in a simple and effective manner.

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