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Smart Village: Smart Agriculture with IoT Enabled for Climatic Change and Fertilization of Soil

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ABSTRACT: In smart villages, access to sustainable energy services acts as a catalyst for development. Enabling facility of internet connection for the new possibilities of increasing agricultural cultivation with proper information and guidance, access to clean water, sanitation and nutrition, the growth of productive enterprises to boost farmer's income. The development of a country depends on the village's development. Most of the agriculture productivity suffer greatly with unforeseen change in climate. Therefore, farmers need to get appropriate information's if any sudden climatic disruption occur, it should notify on time to avoid any major damage in agricultural field. As part of the smart village concept, an intelligent system is designed that may help a farmer to get basic facilities/infrastructure by agricultural development. Here an intelligent system is proposed on the fact of farmers getting all relevant details about the improvement in fertilization of soil and agriculture by delivering climate change information's through an IoT (Internet of Things) devices. These information's could be handled through website and mobile phones. To ease for farmer understandings all the facts and information related to soil fertilization and climatic alerts are delivered as per their native language/language of their interest. This system may help its members to collaborate and take it to another level of requirement in improving their production capacity. These IoT devices are operated either through solar panel or electric supply appropriately to balance the power requirement across the field.

I.INTRODUCTION

Agriculture is the major backbone of Indian Economy. Most of the available fresh water resources are used in Agriculture. In India most of the irrigation systems are operated manually which is not automated. In the recent years automated and semi- automated technologies been deployed for irrigating the field which has replaced the traditional Agricultural mechanism. The available traditional methods of irrigation are drip irrigation, ditch irrigation, sprinkler system. This problem can be easily rectified by making use of the automated system rather than the traditional systems.. The current irrigation methodology adopted employ uniform water distribution which is not optimal.

So accordingly technologies being applied towards agricultural monitoring which is required by farmers. So as such standalone monitoring station been developed employing "MSP 430" microcontroller along with set of meteorological sensors which includes temperature and humidity.

II.RELATED WORK

The concept of image inpainting was first introduced by Bertamioetal.[1]. The method was inspiredby the real inpainting process of artists.The image smoothness information interpolated by the image Laplacian is propagated along the isophotesdirections,which are estimated by the gradient to fimagerotated by 90degrees. Exemplar Based method proposed by Criminisi et al. [2] used a best exemplar patch to propagate target patch including missing pixels. This technique uses an approach which combine structure propagation with texture synthesis and hence produced very good results. In [3], the authors decompose the image into sum of two functions and then reconstruct each function separately with structure and

texture filling-in algorithms. Morphological technique is used to extract text from the images presented in [4]. In [5], the inpainting technique is combined with the techniques of finding text in images and a simple algorithm that links them. The technique is insensitive to noise, skew and text orientation. The authors in [6] have applied the CCL (connected component labelling) to detect the text and fast marching algorithm is used for Inpainting.

The work in this paper is divided in two stages. 1) Text- Detection 2) Inpainting. Text detection is done by applying morphological open-close and close-open filters and combines the images. Thereafter, gradient is applied to detect the edges followed by thresholding and morphological dilation, erosion operation. Then, connected component labelling is performed to label each object separately. Finally, the set of selection criteria is applied to filter out non text regions. After text detection, text inpainting is accomplished by using exemplar based Inpainting algorithm.

III.METHODOLOGY

A. The smart agriculture

- The applications for IoT are all manner of varied.
- They are used in firebase applications to monitor data via PC and give the order by mobile phone.
- All most electronics devices were connected to the PC, such as wired sensors and camera.
- Smart stations were installed indoor and outdoor to monitor and measure temperature, water, humidity, weather, and climate data for smart agriculture.

B. Fuzzy Logic Controller

- Smart agriculture developed a temperature control system using FLC.
- The DHT11 and LM35 temperature sensor detect current temperature after that an analog-to-digital is a system that converts analog value to the FLC.
- The plant is designed between input and output are related, including three triangular membership functions 3*3 fuzzy logic rule matrix.
- According to the membership function is converted into FLC triangular input and output.

C. IoT Technology and Software Development

- As smart agriculture-based research and development in the IoT and cloud-based.
- The IoT based device consists of various enabling technologies such as the internet and search engines, cloud-based, big data, wireless sensors etc.
- The evolution of smart agriculture IoT based devices is assisting farmers for systematic environment monitoring and real-time information and includes to inspect the product for quality issues.
- Various strategies used for firebase client and also firebase client library allows to build for any language such as HTML, CSS, and JavaScript for implementation.

D. IoT Technology and Hardware Design

In this section, Smart agriculture IoT based developed for help framers monitoring of water, soil, and weather conditions by using Arduino Microcontroller, firebase client, and cloud computing technology.IoT interface with sensors based device consists of components as follows:

- Arduino Mega 2560 &Nodemcu 8266

- Temperature Sensor & Soil Moisture Sensor
- Push button and Switch Inverter and Driver Camera, interface for Audio and Video

III. EXPERIMENTAL RESULTS

Sensor Outcomes:

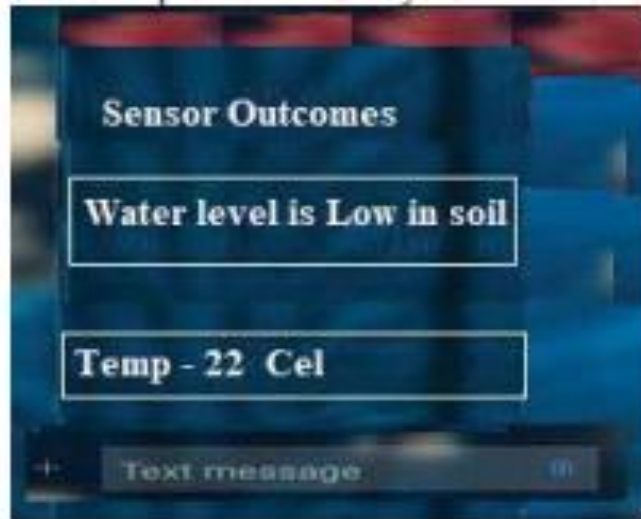


Figure 3. Outcomes of sensors – Smart agriculture

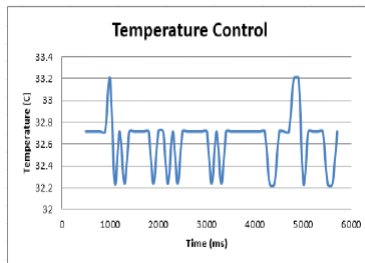


Fig. 10. Illustration of indoor temperature control for smart agriculture.

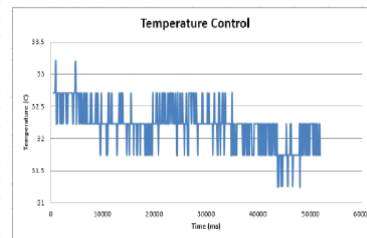


Fig. 11. Illustration of outdoor temperature control for smart agriculture.



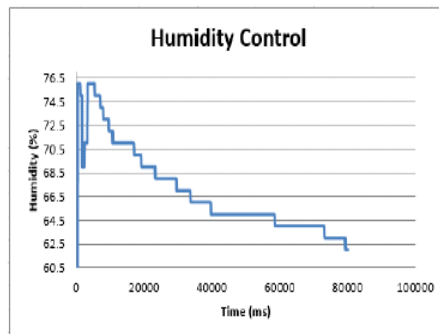


Fig. 13. Illustration of outdoor humidity control for smart agriculture.

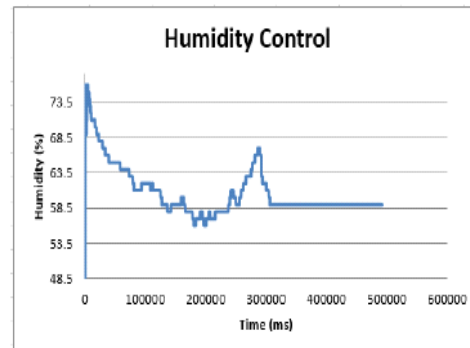


Fig. 12. Illustration of indoor humidity control for smart agriculture.

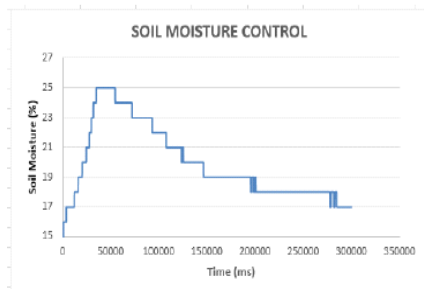


Fig. 14. Illustration of indoor soil moisture control for smart agriculture.

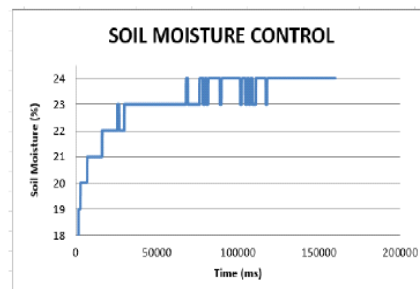


Fig. 15. Illustration of outdoor soil moisture control for smart agriculture.

IV.CONCLUSION

- IoT to better support the smart agriculture and sustain able agriculture development.
- One the other hand, IoT and networking communication applications to achieve the different nodes in intelligent and automatic control.
- An FLC and MATLAB SIMULINK technique are provided to set the temperature of smart agriculture and humidity related around 32.5 C0 and 58.5 %
- And soil moisture by comparing with indoor and outdoor that indoor soil moisture is to fix atmospheric moisture lower than outdoor soil moisture at 17% and 24%, respectively.

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