INTERNATIONAL JOURNAL
OF PROFESSIONAL ENGINEERING STUDIES Volume 10 /Issue 1 / JUL 2018

COMPUTER VISION BASED IRRIGATION SENSOR

[1]Badugu Leelavathi (M.Tech) [2]Mrs T.Vineela (M.Tech, Assistant Professor)

[1,2]Vasireddy Venkatadri Institute Of Engineering and Technology, Nambur, Kakani, Guntur

[1]leelavathibadugu@gmail.com [2]vineelathoduri@gmail.com

ABSTRACT An automated irrigation sensor was designed and implemented to use in agricultural crops. The sensor uses a Smartphone to capture and process digital images of the soil nearby the root zone of the crop, and estimates optically the water contents. The sensor is confined in a chamber under controlled illumination and buried at the root level of the plants. An Android App was developed in the smart phone to operate directly the computing and connectivity components, such as the digital camera and the Wi-Fi network. The mobile App wakes-up the smart phone, activating the device with user-defined parameters. Then, the built-in camera takes a picture of the soil through an anti-reflective glass window and an RGB to gray process is achieved to estimate the ratio between wet and dry area of the image. After the Wi-Fi connection is enabled, the ratio is transmitted via a router node to a gateway for control an irrigation water pump. Finally, the App sets the smart phone into the sleep mode to preserve its energy. The sensor is powered by rechargeable batteries, charged by a photovoltaic panel. The smart phone irrigation sensor was evaluated in a pumpkin crop field along 45 days. The experimental results show that the use of smart phones as an irrigation sensor could become a practical; here in this process the raspberry pi and the openCV python software are used.

I. INTRODUCTION

MOBILE devices (e.g. Smart phones and Tablets) have powerful computing, sensing, and connectivity resources, and run Apps for multiple purposes. They have a multi tasking operating system for running first- and third-party Apps, resulting attractive developing platforms for a specific applications in different domains. Mobile devices could be used in important economic sectors -such as agriculture embracing the value chain for diverse purposes, from the farm logistics to the consumer, employing diverse sensors and information communication technology.

Applications for the agriculture sector using mobile devices have been developed; for calculating leaf area with image processing techniques, for estimating the leaf area index (LAI) by two indirect methods [15], for monitoring farmland air and soil conditions in real time [16], for implementing a Munsell soil-color sensor for the examination, description, and classification of soils, and for detecting pests and plant diseases on leaves by converting the mobile device into a digital microscope[18]. In this work, an automated agricultural irrigation sensor is described. The sensor is implemented on a mobile device to estimate optically the water contents of the soil nearby the root of the crop through an image processing App. When the water contents drops at an established figure, the required amount of water is delivered to the crops. The irrigation sensor was developed employing an Android smart phone exploiting their built-in components. This sensor was linked by a router node as a new wireless sensor unit to the Automated Irrigation System, and tested in a pumpkin crop field.

II. PROPOSED DESIGN

Block diagram:

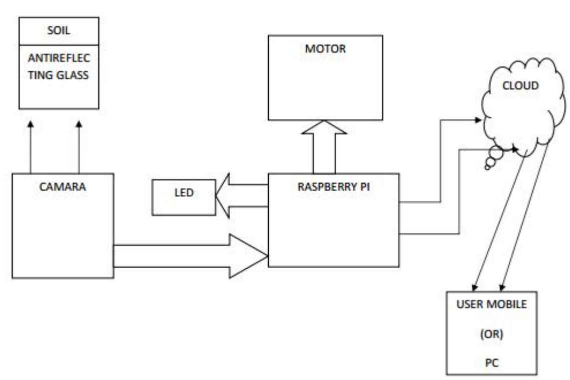

Fig1: Block diagram of proposed system

Description:

The sensor uses a Smartphone to capture and process digital images of the soil nearby the root zone of the crop, and estimates optically the water contents. The sensor is confined in a chamber under controlled illumination and buried at the root level of the plants. An Android App was developed in the Smartphone to operate directly the computing and connectivity components, such as the digital camera and the Wi-Fi network. The mobile App wakes up the Smartphone, activating the device with user defined parameters. Then, the built-in camera takes a picture of the soil through an antireflective glass window and an RGB to gray process is achieved to estimate the ratio between wet and dry area of the image. After the Wi-Fi connection is enabled, the ratio is transmitted via a router node to a gateway for control an irrigation water pump. Finally, the App sets the Smartphone into the sleep mode to preserve its energy. The sensor is powered by rechargeable batteries, charged by a photovoltaic panel.

Block diagram description:

RASPBERRY PI:

A Raspberry Pi is a compact computer board which offers endless opportunities. Simply plug in your TV, keyboard, mouse and power supply, and you are ready to go. There is a whole family of Raspberry Pi's available to you, each providing various functionalities. There are also add-on boards available to enable other uses. The raspberry pi 3 Model B is the third generation Raspberry Pi. This powerful Credit card sized single board computer can be used for many applications and supersedes the original Raspberry pi 2 Model B. Whilst maintaining the popular board format the Raspberry pi 3 model brings you a more powerful processor,10X faster than the first generation Raspberry pi.

USB Camera:

USB Cameras are imaging cameras that use USB 2.0 or USB 3.0 technology to transfer image data. USB Cameras are designed to easily interface with dedicated computer systems by using the same USB technology that is found on most computers. The accessibility of USB technology in computer systems as well as the 480 Mb/s transfer rate of USB 2.0 makes USB Cameras ideal for many imaging applications. An increasing selection of USB 3.0 Cameras is also available with data transfer rates of up to 5 Gb. USB camera can easily connect to any computer with USB port. No extensive installation of additional hardware is required. The included cable offers power supply and transmits data.

Antireflection Glass:

An antireflective or anti-reflection (AR) coating is a type of optical coating applied to the surface of lenses and other optical elements to reduce reflection. In typical imaging systems, this improves the efficiency since less light is lost. In complex systems such as a telescope, the reduction in reflections also improves the contrast of the image by elimination of stray light. This is especially important in planetary astronomy. In other applications, the primary benefit is the elimination of the reflection itself, such as a coating on eyeglass lenses that makes the eyes of the wearer more visible to others, or a coating to reduce the glint from a covert viewer's binoculars or telescopic sight.

Blynk Cloud:

Cloud computing is an information technology (IT) paradigm that enables ubiquitous access to shared pools of configurable system resources and higher level services that can be rapidly provisioned with minimal management effort, often over the Internet. Cloud computing relies on sharing of resources to achieve coherence and economies of scale, similar to a public utility. Third-party clouds enable organizations to focus on their core businesses instead of expending resources on computer infrastructure and maintenance. Advocates note that cloud computing allows companies to avoid or minimize up-front IT infrastructure costs.

III. ALGORITHM

Step 1: Take snap.
Step 2: processing image in raspberry pi.
Step 3: outcome of image processing is water level (percentage) in soil.
Step 4: Sending soil condition to cloud.
Step 5: accessing data from cloud using mobile (or) pc.

IV. RESULTS

The full photo of the resulting image is shown below:

Fig2: Full frame soil

Graphical results of soil as shown in fig3

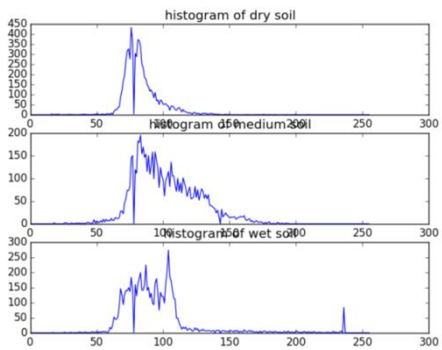

Fig3: Output Waveform

According to the soil condition we will get result in the mobile as shown in fig 4.

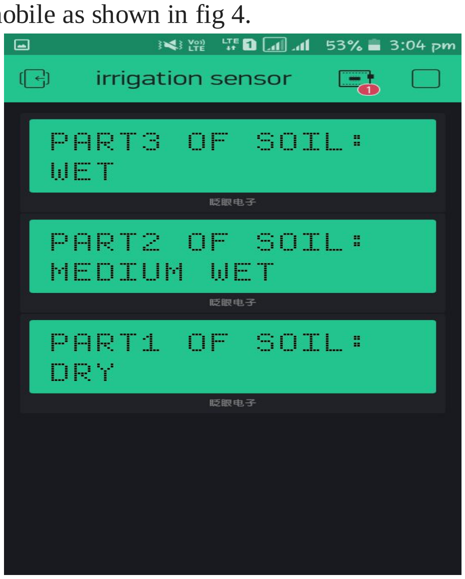

Fig4: Status on Mobile

V. CONCLUSION

A developed Smartphone irrigation sensor complied with the conceived concept of an optically triggered automated irrigation using a soil imaging process. Due to rapid growth of Smartphone appliances at affordable prices, this App represented a simple and practical implementation. The sensor installation in the field can be done simultaneously with the preparation of the cultivation beds and irrigation tubes, so there is no significant additional labor, nevertheless compared with traditional sensors, the installation in the field requires more effort and time. The irrigation sensor has an inherent advantage over other kind of soil moisture sensors for irrigation.

REFERENCES

[1] Chaya Khandelwal S. and Manish Patil M., Implementation of Patient Monitoring System Using GSM Technology, International Journal of Electronics and Communication technology, 4(1) 18-24 (2013).

[2] Qun Hou, Research and Implementation of Remote Heart Rate Monitoring System Based on GSM and MCU, Institute of Electrical and Electronics Engineers, 978-1-4244- 7618-3 (2010).

[3] Edwards S., Heart rate Monitor Book", Leisure systems international, 1(3), 122-134 (1993).

[4] Chiranjeevini Kumari B. and Rajasekar K., Implementation of SMS based Heartbeat monitoring system using PSoC Microcontroller, 2230-7109, International Journal of Electronics and Communication technology, 2(1), (2011).

[5] Mohammad Ari Mazidi and Janci Gillispie, the 8051 Microcontroller and Embedded Systems, (2), 5-17 (2007) [6] Lee. W.C.Y, Mobile Cellular Telecommunications, (2), 463-467 (1995).

[6] A. Dohr, R. Modre-Osprian, M. Drobics, D. Hayn, G.Schreier, "The Internet of Things for Ambient Assisted Living", Seventh International Conference on Information Technology, pp 804-809,2010.

[7] M. Wcislik, M. Pozoga, P. Smerdzynski "Wireless Health Monitoring System", IFAC

(International Federation of Automatic Control) Hosting by Elsevier Ltd. pp 312–317, 2015.

[8] Amir-Mohammad Rahmani, Nanda Kumar Thanigaivelan, Tuan Nguyen Gia, Jose Granados, Behailu Negash, Pasi Liljeberg1, and Hannu Tenhunen, “Smart e-Health Gateway: Bringing Intelligence to Internetof-Things Based Ubiquitous Healthcare Systems”,IEEE consumer communications and networking pp 826-834, 2015.

[9] Hoi Yan Tung, Kim Fung Tsang, Hoi Ching Tung, Kwok Tai Chui and Hao Ran Chi, “The Design of Dual Radio ZigBee Homecare Gateway for Remote Patient Monitoring”, IEEE Transactions on Consumer Electronics, Vol. 59, No. 4, November 2013.