2018 International Conference on Applied Smart Systems (ICASS'2018)
24-25 November 2018, Médéa, ALGERIA

Smart Irrigation System Based Thingspeak and Arduino

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***Abstract*— Information and communication technology has contributed to the development of many sectors, particularly in the agricultural sector through the effective transfer and exchange of information across multiple media, such as the Internet. In this context and in this paper an IOT platform based on ThingSpeak and Arduino is developed and tested where the goal is the farmer will be able to control the irrigation by using a pc or smartphone from anywhere and anytime, to monitoring the water parameter and reduce his efforts and also to optimize the use of water .the results test show the success of the system idea.**

Keywords*— IOT platform, ThingSpeak, Irrigation, Arduino, water parameters.

I. INTRODUCTION

The water issue in Algeria is one of the most serious challenges facing its economic growth as a result of increased demand and pressure on water resources through various economic or social activities. As the agricultural sector is the first user of water by 70% of the total use, and due to poor use efficiency in this sector, it was necessary to seek solutions for good control and rational management for it. In many countries irrigation is done using traditional methods such as sprinkling and drip irrigation with many inconvenient like the excessive water consumption [1].

Technology development has played an important role in the agricultural field and especially in the irrigation where it contributed to solving the problem of water shortage, and the development of various irrigation system [2]. In this context many works are realized, in [3] a web application is developed and connected to Arduino via Wi-Fi shield for monitor the greenhouse and control the temperature and the soil moisture, and in [4] an automatic irrigation system based on IOT is realized which allows the optimal remote control of the water consumption. An interesting control and monitoring result has been achieved has allowed the preservation of water in agriculture using a low-cost system. Many others works based on IOT and phone are created to help in an automated irrigation system[5][6][7].

The main objective of this work is to achieve a technological solution based on IOT and Arduino to facilitate the task of monitoring plant, control the irrigation process, to help the farmer and reduce its efforts. A ThingSpeak channel is created and connected to Arduino by using esp2866 Wi-Fi module to sending and receiving data using the cloud, where the user can access the channel via username and password to remotely monitor and control. The test result shows the efficacy of the system.

II. PROPOSED SYSTEM

An automated irrigation system based on cloud and Arduino is proposed to optimize the use of water for farmland and assist the farmer to monitor his field. The structure of the proposed system is illustrated in figure1, the system has a distributed composed of a soil moisture sensor that measures the soil moisture level and send it to the ThingSpeak cloud via the Wi-Fi module ESP8266 to monitor the soil condition. An algorithm has been developed with soil moisture intervals that have been programmed into an Arduino to make a decision to irrigate or not, the latter is done provided that the tank is not empty. For this we use a water level sensor, which is used to detect the water level in the tank. This system also offers the ability to detect the outside temperature imported from a weather web site as (this is an advantage, where we don't need to use a sensor to measure the temperature, we retrieve the information directly via the website). If the humidity level is at well-defined intervals, you can know the state of the soil if it is dry or wet, which opens the solenoid valve and thus provides water to irrigate the soil.

To build this system we used the following hardware and software components:

- Arduino uno: is a microcontroller board based on the ATmega328P (data sheet). It has 14 digital input / output pins

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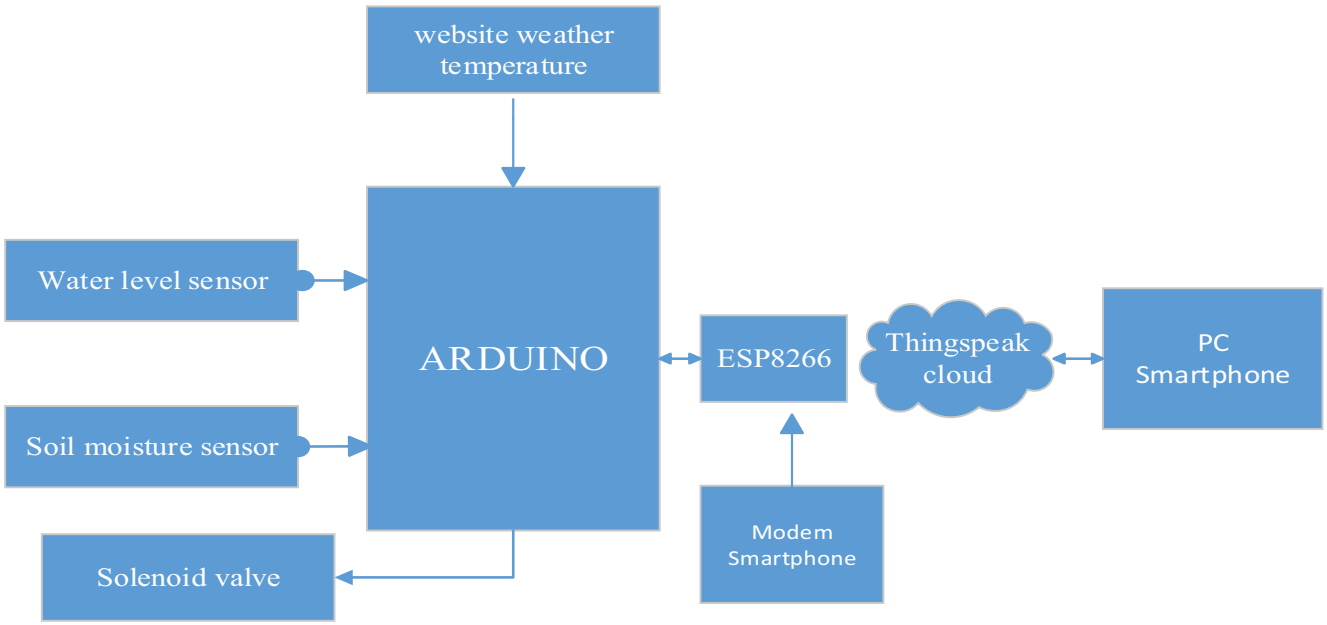

Fig.1. proposed system diagram

and 6 analog inputs, it connects to a computer via a USB cable or power it with an AC / DC adapter or battery [8] (figure2).

- ThingSpeak platform : Is an IOT analytics platform service that can you view and analyse live data in the cloud and also give you the ability to execute MATLAB code [9](figure3).
- Wi-Fi module ESP8266: is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. The Wi-Fi serial module works in both directions: it uses a TX / RX serial link to receive and send data [10] (figure6).
- The water level sensor: is an electronic device that makes it possible to measure the level of the liquid, e.g. water, in a tank or other container (figure7).

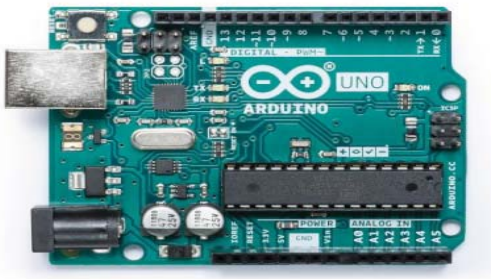

Fig.2.Arduino UNO

Fig.3.ESP8266

Fig.4.ThingSpeak platform

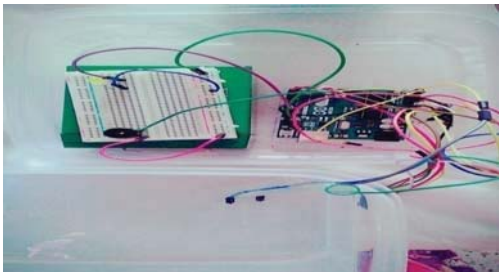

Fig.5. Water level sensor

III. IMPLEMENTATION

The realization of this work is illustrated in figure5.First a MathWorks account is created that allows us to creat a ThingSpeak account (figure6). Then a channel named intelligent irrigation system associated with an ID and a password is also created (figure7). For the exchange of data, we must first connect to our Wi-Fi and then connect the Wi-Fi module to the channel that was created through its API key.

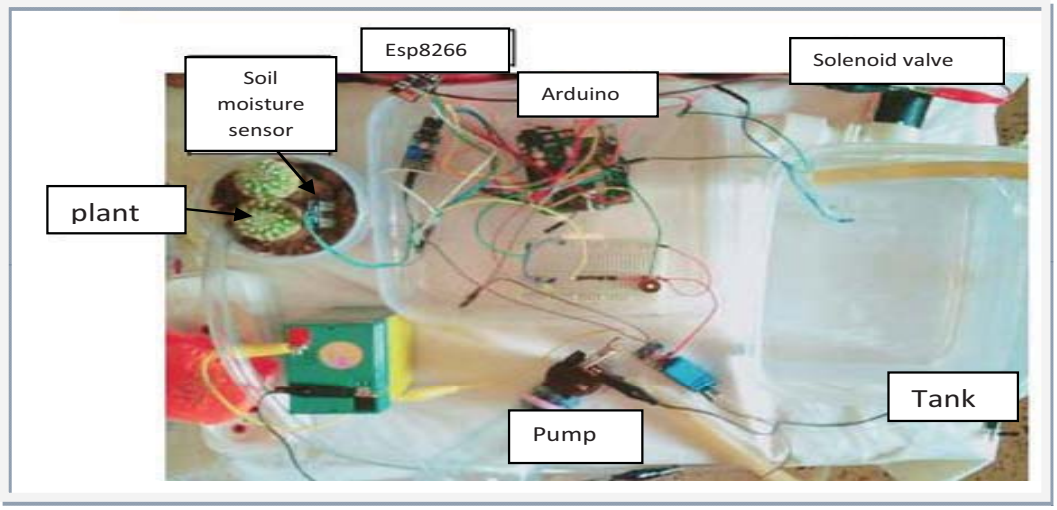

Fig.4.System prototype

Fig.7. ThingSpeak channel

IV. TEST RESULTS

- soil moisture display:

The visualization in the system is performed at the field level to display the soil moisture values as diagrams, or the values are taken at well-defined times in order to monitor the soil condition like illustrate in figure8.

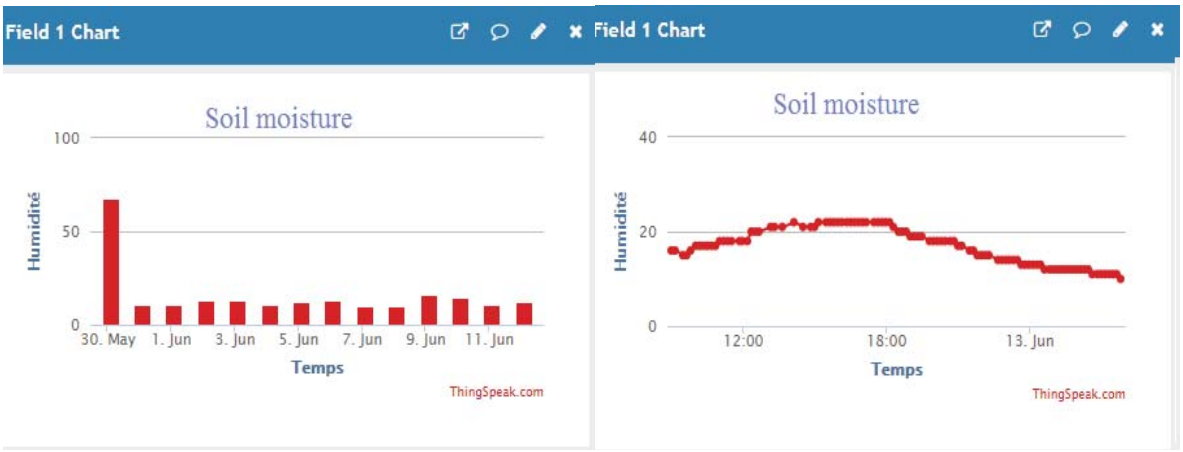

Fig.8. Soil moisture display in different times

- plugins control

  TalkBack is created that allows any device to act on queued commands. For example, if you have an irrigation system equipped with Wi-Fi and a soil moisture sensor, you can queue commands to irrigate your plant or not. When the irrigation system detects a lower value of moisture, irrigates the plant.

  The control is applied with the plugins which is used to display the buttons and l and the swishes, the TalkBack that makes the ON / OFF commands. This allows control over the internet (figure9).

- Twitter TimeControl:

  TimeControl can be used to send Tweets automatically at predetermined times. In our system, we will send a Tweet each hour to the current value of soil moisture. Figure 10 shows a Twitter account associated with ThingSpeak.

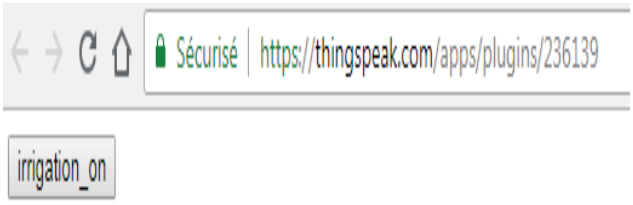

Fig.9. TalkBack irrigation button.

Fig.10. Twitter account associated with ThingSpeak

V. CONCLUSION

In this paper an intelligent irrigation system based in cloud is implemented with success.A channel is created in a open source iot platfrom is created to save and show the soil moisture information and also to control the irragation by internet .

FUTURE ENHENCEMENTS

Using a wireless sensor network to have a bird's eye view of the state of our field.

REFERENCES

[1] R. N. Rao et B. Sridhar, « IoT based smart crop-field monitoring and automation irrigation system », in 2018 2nd International Conference on Inventive Systems and Control (ICISC), 2018, p. 478-483.

[2] M. Monica, B. Yeshika, G. S. Abhishek, H. A. Sanjay, et S. Dasiga, « IoT based control and automation of smart irrigation system: An automated irrigation system using sensors, GSM, Bluetooth and cloud technology », in 2017 International Conference on Recent Innovations in Signal processing and Embedded Systems (RISE), 2017, p. 601-607.

[3] P. D. O. Shirsath, P. Kamble, R. Mane, A. Kolap, et P. R. S. More, « IOT Based Smart Greenhouse Automation Using Arduino », Int. J. Innov. Res. Comput. Sci. Technol., vol. 5, no 2, p. 234-238, mars 2017.

[4] F. Viani, M. Bertolli, M. Salucci, et A. Polo, « Low-Cost Wireless Monitoring and Decision Support for Water Saving in Agriculture », IEEE Sens. J., vol. 17, no 13, p. 4299-4309, juill. 2017.

[5] S. Ghosh, S. Sayyed, K. Wani, M. Mhatre, et H. A. Hingoliwala, « Smart irrigation: A smart drip irrigation system using cloud, android and data mining », in 2016 IEEE International Conference on Advances in Electronics, Communication and Computer Technology (ICAECCT), 2016, p. 236-239.

[6] S. Vaishali, S. Suraj, G. Vignesh, S. Dhivya, et S. Udhayakumar, « Mobile integrated smart irrigation management and monitoring system using IOT », in 2017 International Conference on Communication and Signal Processing (ICCSP), 2017, p. 2164-2167.

[7] S. B. Saraf et D. H. Gawali, « IoT based smart irrigation monitoring and controlling system », in 2017 2nd IEEE International Conference on Recent Trends in Electronics, Information Communication Technology (RTEICT), 2017, p. 815-819.

[8] « Arduino Uno Rev3 ». [En ligne]. Disponible sur: https://store.arduino.cc/arduino-uno-rev3. [Consulté le: 03-août-2018].

[9] « Learn More - ThingSpeak IoT ». [En ligne]. Disponible sur: https://thingspeak.com/pages/learn_more. [Consulté le: 03-août-2018].

[10] « WiFi Module - ESP8266 - WRL-13678 - SparkFun Electronics ». [En ligne]. Disponible sur: https://www.sparkfun.com/products/13678. [Consulté le: 04-août-2018].