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Project Topic: IOT ENABLED SMART FARMING APPLICATION SYSTEM

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ABSTRACT:

One of the important applications of Internet of Things is Smart agriculture. Smart agriculture reduces wastage of water, fertilizers and increases the crop yield. In the current agriculture system the specification such as temperature, moisture, humidity are detected manually which increases the labor cost, time and also monitoring cannot be done continuously. In this paper irrigation process is done automatically using different sensors which reduces the manual labor. Here a system is proposed to monitor crop-field using sensors for soil moisture, humidity and temperature. By monitoring all these parameters the irrigation can be automated. The agriculture industry has just become smarter and data oriented. Today world the IOT is most important for Farming side due to the following reasons.

The recent lively growth in IOT based technologies has redesigned the way many industries start to work. This revolutionary change in Farming has generated various opportunities as well as new disputes. It's time for us to beat the clock and implement various IOT technologies in agriculture for higher production to keep up with the never-ending increasing demand for food all over the world. Supervising agricultural fields can be done with the help of data collection by various sensors for the farmer to monitor. Our Proposed System uses four different sensors with real time update on the status the sensors provide unlike existing systems which provides the status from time to time.

LITERATURE SURVEY :

In the literature there are numerous examples of versatile IoT applicationoriented studies. In [4], an example of control networks and information networks integration with IoT technology has been studied based on an actual situation of agricultural production. A remote monitoring system with combining internet and wireless communications is proposed. Furthermore, taking into account the system, an additional information management sub-system is designed. The collected data is provided in a form suitable for agricultural research facilities. In their work Liu Dan et al. [5] take a CC2530 chip as the core and present the design and implementation of an Agriculture Greenhouse Environment monitoring system based on ZigBee connectivity. Additionally, the wireless sensor and control nodes take CC2530F256 as a core to control the environment data. This system comprises front-end data acquisition, data processing, data transmission and data reception. The ambient temperature is real-time processed by the temperature sensor of the terminal node and is send to the intermediate node through a wireless ZigBee based network.

A Semantic Framework for Internet of Things-enabled Smart Farming Applications Andreas Kamilaris:

In this paper, we have described Agri-IoT, an IoT-based framework applying real-time stream processing, analysis and reasoning in the domain of agriculture, based on semantic web technologies, facilitating more informed and accurate decision making by farmers and event detection. We have investigated the introduction of IoT in smart farming and its opportunities, through the seamless combination of heterogeneous technologies, as well as the semantic integration of information from various sources (sensors, social media, connected farms, governmental alerts, regulations etc.), ensuring increase of production and productivity, better products' quality, protection of the environment, less use of resources(e.g. water, fertilizers), faster reaction to unpredictable events and more transparency to the consumer. Agri-IoT achieves this by offering interoperability between sensors, processes, data streams, farms as entities and web-based services, exploiting open data, making use of semantic technologies and linked web data. Our evaluation efforts focusing on two realistic and demanding farming scenarios indicate the good performance of the proposed framework in medium-to-large farms, while our discussion reveals the large opportunities arising in farming by introducing open standards and semantics based on IoT. In this study, we presented an overview of IoT and big data for the smart agriculture sector. Several issues related to promoting IoT deployment in the agriculture sector have been discussed in detail. Survey results indicate that many studies have been performed to apply IoT for smart agriculture, aiming to enhance productivity, reduce human labour, and improve production efficiency. The benefits of applying IoT and big data in agriculture were discussed. In addition, we also pointed out the challenges we need to overcome to be able to accelerate the deployment of IoT in smart agriculture. Conclusion The review undertaken in this research paper aims to fathom the depth and breadth of the need and application of cryptographic security in the area of Survey results indicate that many studies have been performed to apply IoT for smart agriculture, aiming to enhance productivity, reduce human labour, and improve production efficiency. The benefits of applying IoT and big data in agriculture were discussed. In addition, we also pointed out the challenges we need to overcome to be able to accelerate the deployment of IoT in smart agriculture. Conclusion The review undertaken in this research paper aims to fathom the depth and breadth of the need and application of cryptographic security in the area of Agriculture 4.0. The survey identifies the applications of IoT in agriculture and its benefits along with the attacks and possible remedies. A number of existing test beds for smart agriculture are studied. A layered architecture is proposed for smart agriculture that can be generalized for any application scenario and layer-wise security requirements are pro-posed. Various security protocols have been studied in the subsectors of cybersecurity applicable in agriculture. It can be understood that research in the design of authentication protocols in the area of smart farming remains stunted even though a wide range of test2 beds have been studied, developed and implemented. Moreover ,Vangalaetal. surveys the authentication protocols based on block chain in smart farming and other IoT based areas and finds that very few block chain based solutions have been developed for smart farming.

IoT Ecosystem Architecture for Smart Agriculture:

In this section, we present a common framework of an IoT ecosystem for smart agriculture based on three main components, including
(1) IoT devices,
(2) communication technologies, and
(3) data process and storage solutions.
An illustration of the IoT ecosystem for smart agriculture. Appl. Sci. 2022, 12, x FOR PEER REVIEW 3 of 20 In this work, a comprehensive survey of IoT applications for smart agriculture is conducted. An analysis of 135 relevant works published between 2017 and 2022 was conducted. Firstly, relevant 550 papers published in the period of (2017–2022) were retrieved from major scientific databases, namely IEEE Xplore Digital Library, Science Direct, MDPI, and Springer, by using keywords such as IoT-enabled smart agriculture, smart agriculture, Internet of Things, aquaponics, monitoring forestry based on IoT, tracking and tracing, smart precision farming, greenhouse production, Sigfox, LoRa, Wi-Fi, LoRaWAN, and IoT ecosystems. In the next step, we excluded papers that were published in lowrepute conferences and journals, and then we conducted the content analysis for the obtained paper. Finally, 135 papers were selected for the preparation of the present work. In addition, we analyzed and discussed the benefits and challenges, open issues, trends, and opportunities of IoT in the smart agriculture sector. This work is organized as follows: Section 1 introduces our work, and in Section 2, we present an IoT ecosystem architecture for smart agriculture that consists of three main components: IoT devices, communication technology, and data storage and big data processes. Section 3 presents the IoT applications in agriculture, including
(1) monitoring,
(2) tracking and traceability,
(3) precision agriculture, and
(4) greenhouses.
Section 4 introduces some open issues and future research challenges of IoT for smart agriculture. Issues are discussed for two main directions.
The IoT Devices:
An illustration of the common architecture of an IoT device. Embedded systems are programmable interactive modules, namely FPGAs (field programmable gate arrays). Sensor devices are specially designed to operate in open environments, in nature, in soil, water, and air to measure and collect environmental parameters that affect production, such as soil nutrients, humidity, temperature, etc. Smart farming solutions are agricultural operations that are often deployed on large farmlands, outdoors, so the devices that support solutions need some unique characteristics, such as the ability to withstand the effects of weather, humidity, and temperature instability throughout their service lifecycle. Some of their main features, as shown in Figure 4, make IoT devices suitable for smart agriculture solutions [40–42]. Appl. Sci. 2022, 12, x FOR PEER REVIEW 4 of 20 2.1. IoT Devices The common architecture of an IoT device consists of sensors to collect information from the environment, actuators based on wired or wireless connections, and an embedded system that has a processor, memory, communication modules, input–output interfaces, and battery power [38,39]. The common architecture of a typical IoT device for smart agriculture.
Communication Technology

The survey of communication technologies for IoT [43,44] indicated that to integrate IoT into the smart agriculture sector, communication technologies must progressively improve the evolution of IoT devices. They play an important role in the development of IoT systems. The existing communication solutions can be classified as: protocol, spectrum, and topology. Protocols: many wireless communication protocols have been proposed for the smart agriculture sector. Based on these protocols, devices in a smart agricultural system can interact, exchange information, and make decisions to monitor and control farming conditions and improve yields and production efficiency. The typical, low-power communication protocol numbers commonly used in smart agriculture can be divided into short-range and long-range categories based on the communication range. - Short-range: NFMI (near-field magnetic induction) [45], Bluetooth [46], ZigBee [47], terahertz (Z-Wave) [48,49], and RFID [50]. - Long-range: LoRa [51], Sigfox [52], and NB-IoT (Narrowband IoT) [53]. Table 1 presents some typical communication technologies for the smart agriculture sector. The values in Table 1 indicate that short-range communication technologies have a transmission distance of less than 20 (m), high energy efficiency, and low data rate. These protocols are often employed in sensor networks, while long-range communication technologies have transmission distances of up to several tens of kilometres, consume more energy, and are installed for backhaul device-to-device communications. A diverse survey of low-power communication technologies for IoT that presents solutions, challenges, and some open issues is described by Sundaram et al.

Conclusions :

In this study, we presented an overview of IoT and big data for the smart agriculture sector. Several issues related to promoting IoT deployment in the agriculture sector have been discussed in detail. Survey results indicate that many studies have been performed to apply IoT for smart agriculture, aiming to enhance productivity, reduce human labour, and improve production efficiency. The benefits of applying IoT and big data in agriculture were discussed. In addition, we also pointed out the challenges we need to overcome to be able to accelerate the deployment of IoT in smart agriculture. However, there are still some challenges that need to be addressed for IoT solutions to be affordable for the majority of farmers, including small- and medium-scale farm owners. In addition, security technologies need to be continuously improved, but in our opinion, the application of IoT solutions for smart agriculture is inevitable and will enhance productivity, provide clean and green foods, support food traceability, reduce human labour, and improve production efficiency. On the other hand, this survey also points out some interesting research directions for security and communication technologies for IoT. We think that these will be very exciting research directions in the future.

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