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A Study on Internet of Things in Agriculture

O.P. Uma Maheswari^[1], M.Savitha^[2]

Assistant Professor, Department of Computer Science, PKR Arts college for women, Gobichettipalayam,
Tamil nadu, India

M.Phil Scholar [Part Time], PKR Arts College for women, Gobichettipalayam, Tamil nadu, India

ABSTRACT: Internet of Things is one of the most emerging area of research and development. IoT has received a huge attention due to support of technology and its ability to penetrate into the existing system very effectively for the purpose of improvement in performance. The Application of IoT technology is in hot discussion and research, but quite less on the field of agriculture. Thus, in this paper, it is analyzed the study and application of the Internet of Things in agriculture. As agriculture growth is great in a country that may lead great development of a country in all aspects.

KEYWORDS: Wireless sensor networks, Smart grids, Internet, IEEE 802.11 Standards, Monitoring, Wireless communication.

I. INTRODUCTION

The Internet of Things (IoT) is a great importance in establishing development of information technology [2]. IoT provides networking to connect people, things, applications, and data through the Internet to enable remote control, management, and interactive integrated services. Some advanced IoT services will need to collect, analyze, and process segments of raw sensor information, raw.

The architecture of the Internet of Things consists of mainly three layers:

1. Sensing Layer
 - RFID Reader, RFID Label
 - Sensor Network, Sensor
 - Access Network, Intelligent Terminal
2. Network Layer
 - Cloud computing platform
 - Internet
 - Mobile Communication network
 - Satellite Communication network
 - Cable television network
 - Information center
 - Network Management network
3. Application Layer
 - Intelligent Home
 - Intelligent Medical
 - Intelligent City
 - Intelligent Transportation
 - Intelligent Green
 - Intelligent Justice
 - Intelligent Agriculture
 - Intelligent Logistics

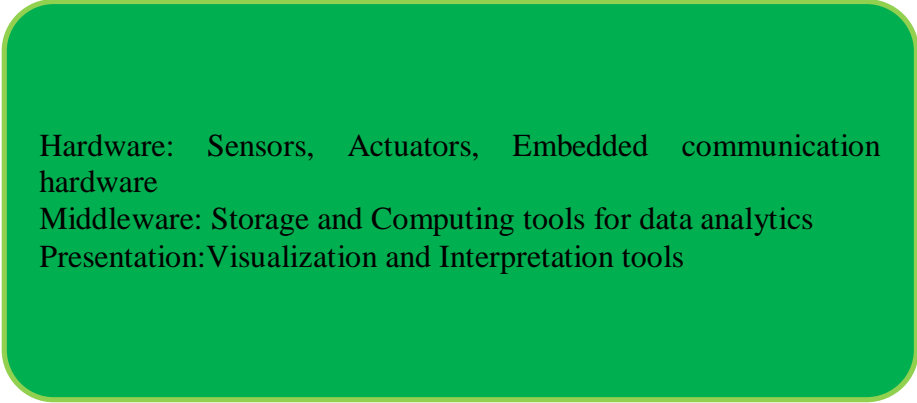


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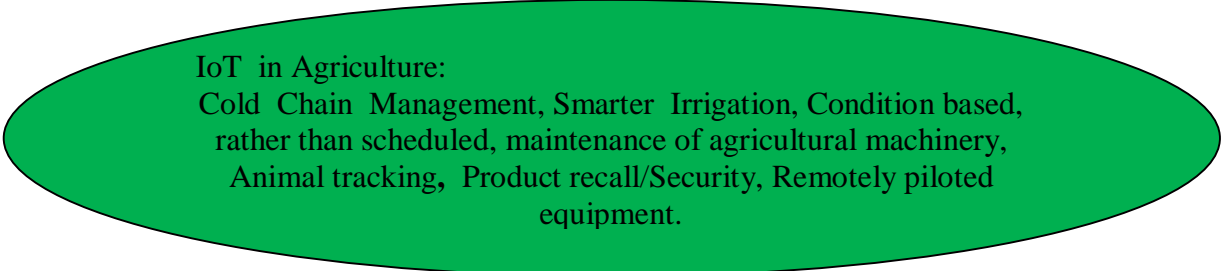
Hardware: Sensors, Actuators, Embedded communication hardware
Middleware: Storage and Computing tools for data analytics
Presentation: Visualization and Interpretation tools

Figure:1 Elements of IoT[3]

II. APPLICATION OF IoT IN AGRICULTURE

The application of the IoT develops rapidly, but due to the special requirements of some applications, the existing technology can not meet greatly. Much research work is doing to build IoT. WiFi-based Wireless Sensor Network(WSN) has the features of high bandwidth and rate, non-line-transmission ability, large-scale data collection and high cost-effective, and it has the capability of video monitoring. The research on WiFi-based WSN and its application has high practical significance to the development of the Internet of Things and Smart Grid in the field of Agriculture.[2]

IoT technologies have the potential to alleviate poverty and uplift the standard of living of the rural farmers. For example, organic greenhouses make it possible to grow a wide range of crops that can not only be consumed locally but also for export to other countries. This enables farmers to generate extra income that help uplift their standard of living and also to contribute to the gross domestic product (GDP). The rural farmers can also leverage the investments in the IoT technologies that support agriculture to improve the standard of living. For example the tapped solar and wind energy can be also be used not only to light houses but also to stay in touch with current affairs through radios and television sets.[6]



IoT in Agriculture:
Cold Chain Management, Smarter Irrigation, Condition based, rather than scheduled, maintenance of agricultural machinery, Animal tracking, Product recall/Security, Remotely piloted equipment.

Fig:2 Some interesting considerables in IoT [7]

The Supply chain management of Agriculture in terms of Internet of Things includes production , transportation and sale stages.Each agriculture product carries its way along production,transportation and sale stages.

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Table 1: Requirements For Agricultural Domain[3]

Requirements	Smart Agriculture
Network Size	Medium/Large
Users	Few, landowners makers
Energy	Energy Harvesting
Internet Connectivity	Wifi, Satellite Communication
Data Management	Local Server, Shared server
IoT Devices	WSN
Bandwidth Requirement	Medium
Example Testbeds	SiSViA

To improve the efficiency of agricultural production, agricultural mechanisation is a key measure. The Chinese have developed an intelligent scheduling platform for agricultural machinery working with integrated ICT such as the internet, mobile phone, fixed phone, satellite navigation systems, cloud computing to implement the guidance and service of administration departments to agricultural mechanisation production, promote the restricted flow of machinery countrywide and improve its utilisation. The platform commands and dispatches farm machines, executes tillage, cultivation and harvest according to factors such as crop maturity time, weather, farm machine distribution, etc. It can realise functions including inquiry of farm machine positions, tract review, information reception and release, remote failure diagnosis, and measuring farmland area and estimation of crop yields (Zhiguo, 2011).[1]

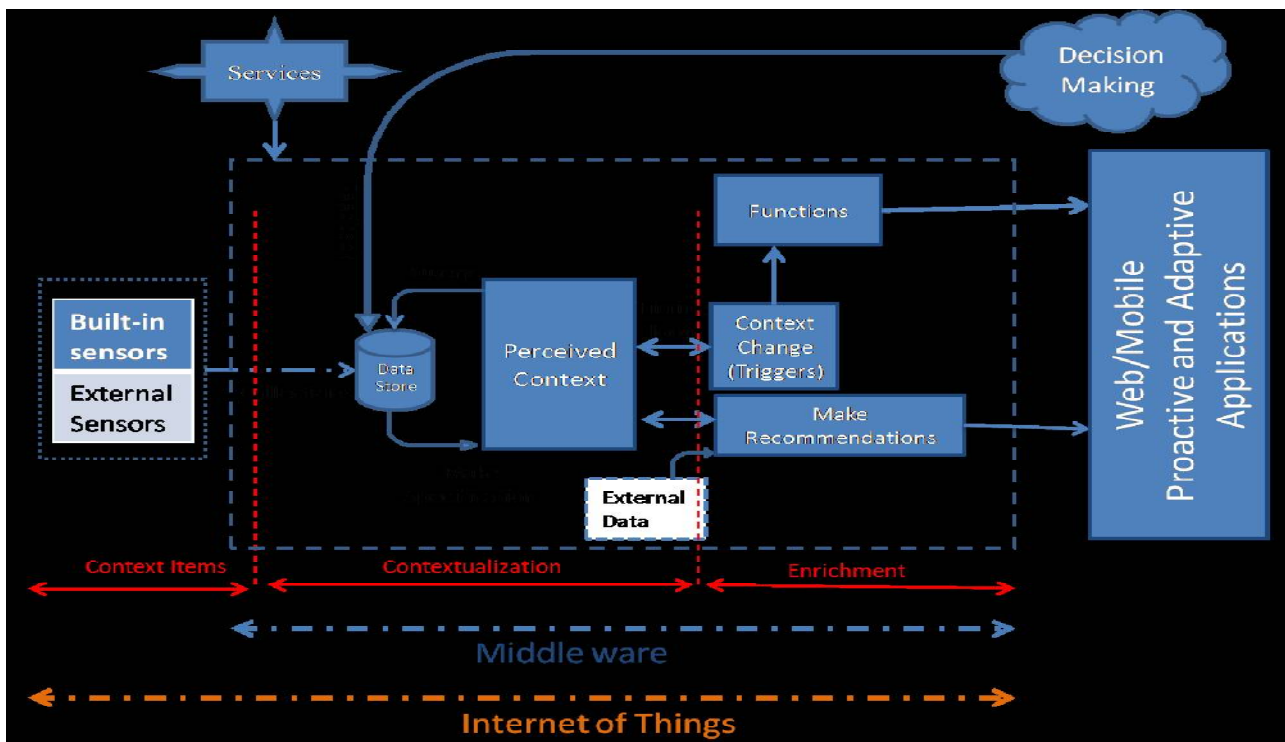


Figure:3 Architecture of Crop Production[12]



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There are many products and applications prevail in the world of Agriculture. They are like from Link Lab, Thingworx, Kaa.

Remote sensing [RS] is generally defined as the technology of measuring the characteristics of an object or surface from a distance. Remote sensing data are acquired from satellites, airplanes or other sensing devices while the other forms of data are retrieved from cyberspace. Remote sensing techniques have been successfully used for agriculture applications (e.g., food security monitoring, pasture monitoring). Combined with human activities and data from social network platforms, remote sensing techniques have become much more powerful tool to significantly improve the effectiveness of production and operation for human welfare [8].

ThingWorx delivers the security and scalability to handle millions of daily transactions. With ThingWorx you can deliver powerful, new smart agriculture IoT solutions in a fraction of the time of other approaches. [9]

III. CONCLUSION AND FUTURE WORK

This paper introduces the concept of internet of things, its appearance, development, and application in agriculture. The development trend and key technologies of agricultural internet of things are analyzed in detail and its application and development strategies are to be posed in future work.

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BIOGRAPHY

[1] O.P. Uma Maheswari MCA., M.Phil., Assistant Professor, Department of Computer Science, PKR Arts College for Women, Gobichettipalayam. Pursuing Ph.D in Advanced Networking in P.K.R Arts College for Women, Gobichettipalayam.

[2] M. Savitha MCA., M.Phil Scholar [Part Time], Department of Computer Science, PKR Arts College for Women, Gobichettipalayam. Currently working as Assistant Professor, Department of Computer applications [UG], Vidyasagar College of Arts and Science, Udumalpet,