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SMART CITIES & THE INTERNET OF THINGS
IOT - TECHNOLOGY

ONLINE TRAINING

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Online Course

BEYOND SMART CITIES & THE INTERNET OF THINGS (IOT) TECHNOLOGY

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05

IOT Functional Capabilities Create Smart Cities

SECTION - IOT TECHNOLOGY & SMART CITIES

IOT Functional Capabilities Create Smart Cities

05.

WHAT YOU WILL LEARN

- IOT technology provides numerous benefits to the environment.
- It promotes the progression of future sustainability by developing smarter and more efficient cities.
- In particular, it can reduce challenges and population stresses occurring in the architecture, agriculture, safety and surveillance, and health and sanitation sectors.
- This section provides an overview of the IOT's technological capabilities and how they can function within different urban sectors.

The Architecture Industry

IOT has many environmental benefits. . It reduces population stress in architecture, agriculture, safety and surveillance, and health and sanitation. This section describes the IOT's technological capabilities and their applications in urban sectors.

The IoT technology functions by integrating a number of different devices into one another inside any given setting, such as a house.

- These many devices encompass a variety of technological applications, including "audio and video equipment, lighting, curtain control, air-conditioning management, security systems, digital cinema systems, video servers, shadow cabinet systems, network appliances, and more."
- The detection of water shortages is one application of the middleware layer that can be found in IOT technology.
- The Internet of Things (IoT) can establish a connection to the cloud computing public service centres of a city in order to monitor temperature changes and water shortages.

The Architecture Industry +

- The middle layer focuses on the transformation of the cloud's housing system into a "intelligent town."
- The information that needs to be transmitted to the cloud storage system is done so by the application layer, with the assistance of the middle layer.
- IoT is able to make use of the data stored in the home's cloud computing system and further transmit signals to the mainframe cloud of the city, where they can alert the appropriate authorities about the time, amount of water used, location, and nature of any incident that has occurred in a matter of seconds.

By turning such information into both device and consumer knowledge, IoT technology can be used to help guide individuals and their living situations if it has access to the data that the city collects. The Internet of Things (IoT) technology has the ability to convey knowledge in a manner that is actionable in languages that can be understood by both humans and technological devices.

The middle layer focuses on the transformation of the cloud's housing system into a "intelligent town." This intelligent community makes use of the application layer in order to gain access to a user interface that controls a number of different services and domestic appliances.

Agricultural Sector

- The data that is stored in the cloud can also be used to analyse the success of plants based on tagging, analyse trends in the data, and force meta-data compilation and assessments to increase productivity and help farmers make decisions.
- Another part of cloud computing is how the effects of plants on productivity and the management of resources.
- Using computer simulations and mathematical modelling, cloud computing can figure out a production function for each measurement of an input.
- The way that X inputs are handled determines how the manufacturing line moves.
- Farmers now have a way to keep track of their successes and failures and figure out what went right and what went wrong.
- When it comes to making sure farm produce is safe, cloud computing makes it possible to make a tracking system that can follow the product from farm to farm and all the way to people's dinner tables.

Agricultural Sector +

- The data that is stored in the cloud can also be used to analyse the success of plants based on tagging, analyse trends in the data, and force metIt also helps plants grow by keeping track of and encouraging openness in farming practises by looking at parts of data that are saved on a cloud for agriculture.
- Through the Internet of Things, dynamic plant factories can be built.
- In the article, one of the authors makes a claim that, "An article called "Smart Agriculture Based on Cloud Computing and IOT" says that a plant factory is a "highly efficient agricultural system that produces crops continuously throughout the year by keeping the environment in the building very well controlled."
- It uses computers to automatically control temperature, humidity, and the amount of carbon dioxide in the air so that crops that aren't limited by natural conditions can be grown with less work.
- It also decides what solution is used to grow the plants ".
- IOT technology can make a successful plant factory by combining components for sensing, delivery, and intelligent control.
- Biosensors, global positioning systems, and radio frequency identification are all types of sensors that can be used to analyse the environment.
- All of these can be used by the plant factories to build a sensing structure.

Agricultural Sector +

- For example, the Internet of Things can be used to keep track of the germination phase, the growth spike, and the stages of development in sensing systems.
- Botany's spectrum analysis can be used to find out how healthy a plant is and what kind of environment it needs to get used to.
- The sensing layer gathers important information, while the delivery layer makes sure that data is sent and received reliably.
- Wireless connections like WLAN802, Bluetooth, and ZigBee can move data at different speeds and at low costs for quick and short-term distribution needs.
- In conclusion, the intelligent control layer is made up of things like a "PDA or controller, regulating equipment, and operational terminal," among other things.
- For example, the system can make parameters based on data from the internet, such as those that control how the weather and irrigation work.
- IoT technology makes it possible to specialise each crop daily by directing a plan based on daily factors like wind, weather, soil, and sunlight.
- Smart agriculture is based on measuring each part of a system so that you can get a full picture.

Agricultural Sector +

- There are parts that need to be measured in every subsystem.
- Agroecological systems can be made up of three different parts.
- The first is to check the quality of the water, fertilise the soil, and check the soil's moisture, light, wind, and air.
- The second part of the system is made up of the automated greenhouses, automated water irrigation, and automated pest monitoring.
- The third agroecological subsystem is made up of farm machines and the equipment and buildings that monitor, control, and run them.
- IOT technology includes a management system, a resource pool, a presentation layer, and a user interface.
- These are what are used to put these systems to work and make them fully functional.
- Smart agriculture not only helps build smart cities and the Internet of Things, but it also has the potential to create more technological solutions that can be used to solve the many problems in agriculture.

Safety and Surveillance Sector

- The Internet of Things (IoT) has the potential to provide smart cities with effective safety and surveillance measures such as "network security, encryption, Public Key Infrastructure (PKI), security analytics, and API security."
- It has the potential to alter the user experience of smart cities by supplying safer street lighting, transportation techniques, ways to ease traffic, and monitoring systems.
- The Internet of Things (IoT) has altered the way safety precautions are taken via the creation of a visual interface through the utilisation of unmanned aerial vehicles (UAVs) or drones to provide security for business and government buildings as well as residential areas.
- As was demonstrated by the East Japan Earthquake, UAVs have the potential to assist with the relief efforts required for environmental disasters.
- In the aftermath of the earthquake, unmanned aerial vehicles (UAVs) were helpful in "coordinating disaster relief efforts, [capturing] images of the damaged reactors at the Fukushima Daiichi nuclear power plant for site assessment, providing real-time data of radiation levels at the nuclear power plant, and assessing the state of the cleanup and reconstruction efforts taking place in Fukushima prefecture.".

Safety & Surveillance Sector +

- The delivery of information and the provision of an informative geographical analysis are both within the capabilities of IOT technology, which can be used to keep the population safe.
- The Open Source Computer Vision-derived Local Binary Pattern History Technique is another another example of how Internet of Things technology may help to improve safety.
- The algorithm's beginnings can be traced back to two-dimensional textures.
- The operating system has the ability to summarise an image by comparing individual pixels to those of their neighbours.
- The intensity of the pixels in the centre of the image is compared to the intensities of the pixels in the surrounding areas.
- A one is assigned to the pixel in question if it has a value that is either more than or equal to that of the pixel to its immediate left; otherwise, a zero is assigned.
- The LBP operator is composed of 3x3 cells that are able to identify faces through the use of binary information.
- IoT technology is able to identify suspicious individuals by monitoring many facial characteristics and expressions, such as whether the person is smiling or not, whether their eyes are open or closed, if they are wearing glasses or not, etc.
- This lays the groundwork for the identification of persons as well as the development of precise monitoring and protection mechanisms.

Health & Sanitation Sector

- The Internet of Things (IoT) has the potential to improve public health and sanitation by preventing hazards and unpleasant odours that are caused by rubbish.
- A system that makes use of IOT technology can ensure that the garbage disposal is functioning properly, thereby preventing the occurrence of the aforementioned problems.
- The Internet of Things (IoT) can be utilised to develop a "smart alert system for garbage clearance by giving an alert signal to the municipal web server for instant cleaning of a dustbin with proper verification based on the level of garbage filling".
- In this system, the level of garbage filling is used to determine when the web server should receive the alert signal.
- The use of ultrasonic sensors that are interfaced with an Arduino Uno in order to monitor the levels of trash can lead to cleaner and more sanitary procedures being adhered to.

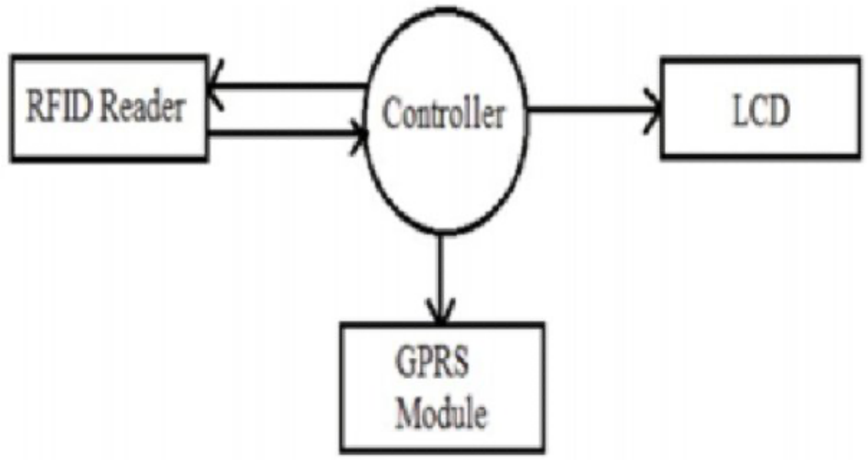
In addition, once sensors in the system's garbage cans identify that there is a significant amount of trash, alarms are sent to the web server.

Health & Sanitation Sector

- Once the alarm has been sent to the employees responsible for the waste disposal, that personnel will be able to clean the bin and use RFID tags to indicate that the task has been completed.
- A microcontroller, a liquid crystal display, a GPRS, an RFID tag, and an RFID reader are all parts of the system that are needed for it to work.
- This method of information transmission can be modelled with the use of a functional diagram.
- An RFID tag "is a tiny device that saves and passes the data to an RFID reader," according to Wikipedia.
- The RFID tag is made up of both active and passive sensors, with the former having the ability to detect objects at greater distances than the passive sensors.
- They do not function in any way using batteries, however, they draw power from RFID readers rather than the batteries.
- The radio frequency that is inserted inside the RFID tag will be identified by the RFID tag, and then the RFID tag will convert that radio frequency into electrical power in order to allow the transmission of data to the RFID reader.

Health & Sanitation Sector

- The RFID tag will reply to the RFID reader, and the ultrasonic sensor will respond to an Arduino UNO R3 that is attached to a power supply.
- These two components will work together to form the garbage alert system.
- At the end of the process, this procedure will be put on a web server and rewritten as an Android app.
- Figure 1 presents a streamlined representation of the data processing workflow for your perusal.



SMART CITY QUOTE

“Smart is not just a word; it's an attitude.”

Ogwo David Emenike

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