An Integrated System for Regional Environmental Monitoring and Management Using IOT

Research Paper Summary

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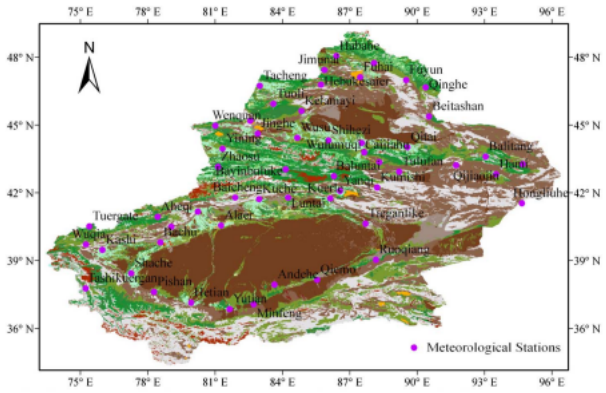

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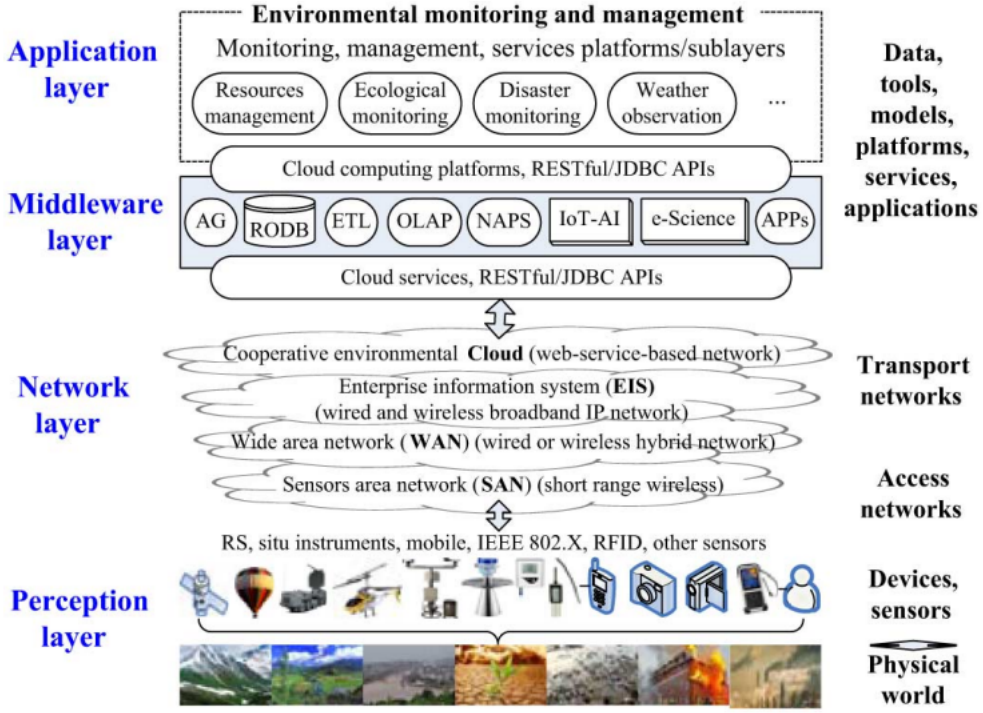
Integrated Environment Management using IOT



0.1 Summary

In the recent years, there has been a growing popularity around Environmental issues like global warming,unexpected and frequent climate changes and scientist and research persons are Monitoring the Environment to gain a better understanding and the factors to those environmental issues. they also try to understand the environmental processes and use scientific and engineering principles to improve the environmental conditions. they use (EIS) environmental Information systems to collect,process and transfer the data.Automated data acquisition have become possible with the help of RS remote Sensing, (GIS) geographical Information Systems, RFID, Radio Frequency identification, (DSS) decision support systems, (IEIS) integrated environmental information systems and have made the environmental monitoring easier and effective. however with the Inclusion of IOT with this has made environment management possible by taking actions on the results of environment monitoring and modelling.

10 years back IOT was just an concept with no major applications have been made, but now along with the accelerating growth on development and application of cloud networks, cloud computing and wireless sensor network (WSN), Furthermore many startups have been emerging with products ranging from home appliances to industrial machinery as IOT devices, and RFID technology, sensor network and detection technology, Internet technology, intelligent computing technology which are the key technologies of IOT is now being used majorly in urban cities and major tech areas.In the past few years IOT applications have started to grow rapidly like smart product management,waste management, intelligent shopping, urban planning, continuous care, sustainable urban environment, smart meters,emergency response, smart events, home automation, and so on usually the architecture of an IOT consists of perception, network, middle ware and application layers.

System Architecture

1. **Perception Layer** is used mainly for the collecting important data and other physical information usually including real time data sets, models/methods e.t.c, Real time data collection happens through a set

of multiple sensors ranging from RS platforms, situ instruments, digital devices (like smartphones, PCs, Laptops), short range communication networks like WiFi, Bluetooth, ZigBee,RFID, e.t.c. The perception layer is the layer that connects the multiple sensors and devices and does real time multi-source data acquisition, this the core and base layer where rapid development and wide application for sensor technologies will occur.

2. **Network Layer** is responsible for transmission of data and other important information and serve as the layer that connects the systems and platforms, it generally consists of access and transport networks, protocols which are used for the transmission of the data. Access networks are usually a short range which covers almost every sensors and devices that would be setup along for the particular requirement. they mostly use sensors area connection SAN,2G,3G,WiFi, and ZigBee are the usual components that enables the connection between devices, sensors, controls, platforms and users. Transport networks use various WAN wide area networks which will be connected to broadband IP Internet Protocols which enables remote control of the processes. The setup of transport networks can vary as per the requirement ranging from using M2M machine to machine to enable control for connected devices through wire and within the facility, to using IPv4/IPv6 Internet Protocols of version 4 and 6 to provide users with remote control from anywhere.
3. **Middleware layer** is composed of a set of sub-layers which manages the data,tools,software,platforms, that are interposed between network and application layer. A few tools are used to ensure seamless transfer of massive data transferred by the sensors and devices. we use (ETL) extract transform load to standardize the data. and we use (RODB) Real time operational database for storing the data and transferring them to other layers and to (ETL) before sending them in (ROLAP) relational online analytical processing The NAPS is used to bridge different platforms in IoT sensor's environments.Application gateway (AG), application software for different platforms and tasks (APPs), and IoT application infrastructure were introduced in the middleware layer for services and applications. the middleware architecture follow service oriented architecture which allows us t decompose complex systems into simple components with common interfaces which use APIs to interact with other components, interfaces e.t.c.
4. **Application Layer** is the top level and is the final task which servers as a interface between the IoT device and the network through which it will communicate.it id the bridge between the other layers and application support and cloud computing platforms all the functions for storing, organizing, processing, and sharing the data and other information obtained from sensors, devices, and web services, as well as the functions of taking professional applications in all the monitoring and management. the application layer is the main layer that needs to upgraded when the monitoring becomes more complex and now generates more data than what was the initial requirement it now requires more computational ability and technology and tools for efficiently process the huge volumes of data incoming when compared to before, this is where cloud computing is useful as it uses virtualization technique and using networks as the carrier has benefits of higher reliability and flexibility, thus providing a new technology for data processing and computation , and it can integrate extensible data processing, information storage, and other distributed resources to make them work together.

My views about this paper

In my perspective, IOT is one of the recent technologies which is having a rapid growth on both development and usage across all areas from waste management to defence technologies to smart cities. it has accelerated the development of technologies that help and make our lives easier by bringing a lot of technolog-

ical changes to the devices that are already present. to make it simpler IOT is the technology that acts as an interface for devices, platforms, clouds and various other things basically making human life connected and smart. There are countless applications of IoT into all the domains including medical, manufacturing, industrial, transportation, education, governance, mining e.t.c.

The author focuses on using IOT for environmental monitoring in Northwest China in the region of Xinjiang, being far from sea and one of the typical arid and semi-arid areas in the world, it serves as the perfect study area which is vulnerable to climate change because of human activities, and the climate change directly affect the rainfall and water level of this area which are one of the decisive factors restricting sustainable environment in Xinjiang.

Some of the main results of the paper were, Both the annual total (GPP) Gross Primary Production and (NPP) Net Primary Production were closely tied with the annual precipitation , and the (GPP) Gross Primary Production had a higher correlation coefficient and there is no insignificant correlation between mean air temperature and annual (GPP) Gross Primary Production, but there is a negative correlation between mean air temperature and annual (NPP) Net Primary Production. the results regarding the pixelated map of Xinjiang were, there is no visible correlation between the meteorological factors and the mean (LAI) Leaf Area Index in growing-season of the valued pixels (the areas covered with vegetation) and there is a remarkable correlation between the annual precipitation and the annual (LAI) Leaf Area Index of the valued pixels.

Agreement, Pitfalls and Fallacies

Though I was able to get the basic motive behind the paper what the author is trying to perform, I found it to be a little difficult to relate for the following reasons:

- The initial reason was geographical one, since Xinjiang is not the area that I know of, it was little difficult to understand the topographical area and environmental factors that affect the sustainability of it, I feel I could have probably understood better if the author gave a summary of this particular issue before diving into the calculations and results of the data collected.

- though the execution and data collection to creation of a pixelated map of the Xinjiang was fantastic the data collected includes the historical data and the author did use the formulas and calculations to find a generalised correlation between the GPP,NPP,LAI rather than finding how these perform over a period of time

- I think maybe including any natural/ other non human made events that had a large scale effect on the area could give us more insights whenever they was a spike between the correlation factor of the above mentioned metrics

Though the paper describes a brilliant and underrated application of IOT, in which the author played a major role to clearly bring it forward,it doesn't feel that this paper made justice for balancing the halves of the topics that is Environmental Monitoring and IOT's Application, the author could have focused and detailed how he has setup each and every device/sensors or through which stream he collected the data that is basically he could have gone a bit more into detailing the implementation, in final words even this paper has more inclined towards the environmental monitoring and it's concepts and formulas it will still provide way for others to work on similar ideas to establish a strong foundation in IOT and it's applications