

INTERNET OF THINGS: FOCUSED AREAS TO BUILD IOT BASED SMART VILLAGES IN INDIA**Dr. P. Kavitha* & L. Selvam****

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Abstract:

The Internet of Things (IoT) indicates the growing paradigm of connecting "things" to internet and the communication that happens between these "things" and other Internet-enabled devices and systems. India lives in its villages, and whereas the cities are growing enormously over the last 20 years. While we are focused on smart cities, the Rural areas are still plagued by problems of starvation, illiteracy and lack of basic infrastructures like schools, colleges, hospitals, sanitation, etc. In this paper we are proposing some of the ideas that can be easily implemented and areas to be concentrated to turn villages in to smart villages by connecting with its neighbouring urban areas based on Internet of Things (IoT). In addition, it encourages the developers, makers and industries to concentrate on the growth of the rural India.

Key Words: IoT, Smart Villages, Smart Energy Management, Smart Education, Smart Farming & Smart Health.

1. Introduction to Internet of Things:

The Proliferation of growing objects that can directly connected to the Internet is leading to new pervasive computing paradigm. Certainly, the deployment of internet and its usage has experienced noteworthy growth in past four decades. The next improvement is to connect all the "things" and devices that are connected with wireless or wired connectivity to control and manage structures that support data collection and analyse decision making and actuation. The "things" may include persons, animals, machines, vehicles, smart phones, home appliances, soils, as well as enterprises. This new paradigm enriches the traditional internet into smart Internet of Things (IoT). While the Internet is a communication network connecting people to information, the Internet of Things (IoT) is an interconnected ecosystem of uniquely addressable physical objects with varying degrees of sensing, processing, and actuation capabilities, sharing the ability to communicate and interoperate through the Internet as their common denominator.[1] The vision of the Internet of Things (IoT) is to attach tiny devices to every single object to make it identifiable with its own unique IP address. These devices can then autonomously communicate with another one. The success of the internet of things relies on overcoming the following challenges:(1) The current manner of using IP addresses must be changed to a system that provides an IP address to every possible object that may need one in the future. (2) The power behind the embedded chips on such devices needs to be smaller and more efficient. And, (3) the software applications must be developed that can communicate and manage stream of data from hundreds of interconnected non-computing devices that comprise a 'smart' which can adapt and respond to changes [2]. One of the important goal of IoT is to create connection of different "things."Then, the next thing is to provide back appropriate application-specific telemetry. An intermediary next step is to provide a web application as an interface to the "things" and finally to actuate a function to perform by an actuator.

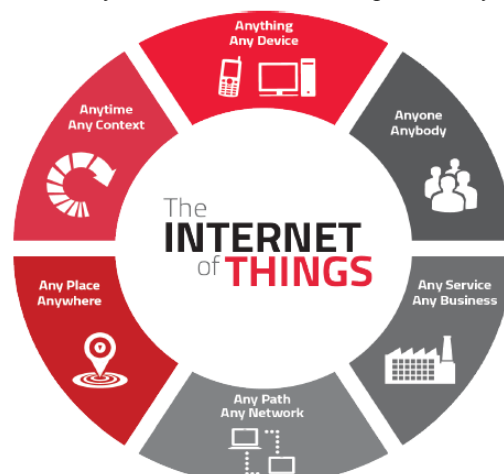


Figure 1: Concept of Internet of Things [3]

There are variety of technologies being used in IoT. At the low end, information of thing's is coded as unique identification (UID) or electronic product code (EPC) then it is stored in a radio frequency (RFID) electronic tag and then the data is read by RFID reader. Microprocessors, embedded active wireless devices, sensors are also being used in data gathering and control functions. Wireless Sensor Networks (WSN) is also used to collect wide variety of environmental data like temperature, humidity, light intensity, chemical content, etc. When the whole India talking about smart cities, still most of the villages are not getting their basic needs like Power Supply, Security, Education and Health Assistance. Most of the remote villages can be turned into smart villages by connecting their neighbouring urban areas through IoT devices.

2. Smart Village:

2.1 Smart Farming: Agriculture is the heart of India. Villages are playing vital role in agriculture. Farming or agriculture in Indian villages has been the foremost profession for the people since the ancient period, as they earn their livelihoods from agriculture. The people cultivate various types of crops throughout the year. The newer scenario of decreasing water tables, drying up of rivers and tanks and unpredictable environment present an urgent need of proper utilization of water. To cope up with this use of temperature and moisture sensor at suitable locations for monitoring of crops is implemented in it. [4] IoT may assist in agriculture and breeding. Indeed, regulations for traceability of animals require a continuous monitoring of animals and of their movements in order to report promptly to the appropriate authorities any relevant events, e.g., diseases. Usage of IoT identification systems (e.g., RFID, sensors) allows to identify and monitor animals. [5] Technologies like soil moisture sensors, weather meters, microprocessors, etc. are the key features to enable transformation of traditional agriculture to smart farming.

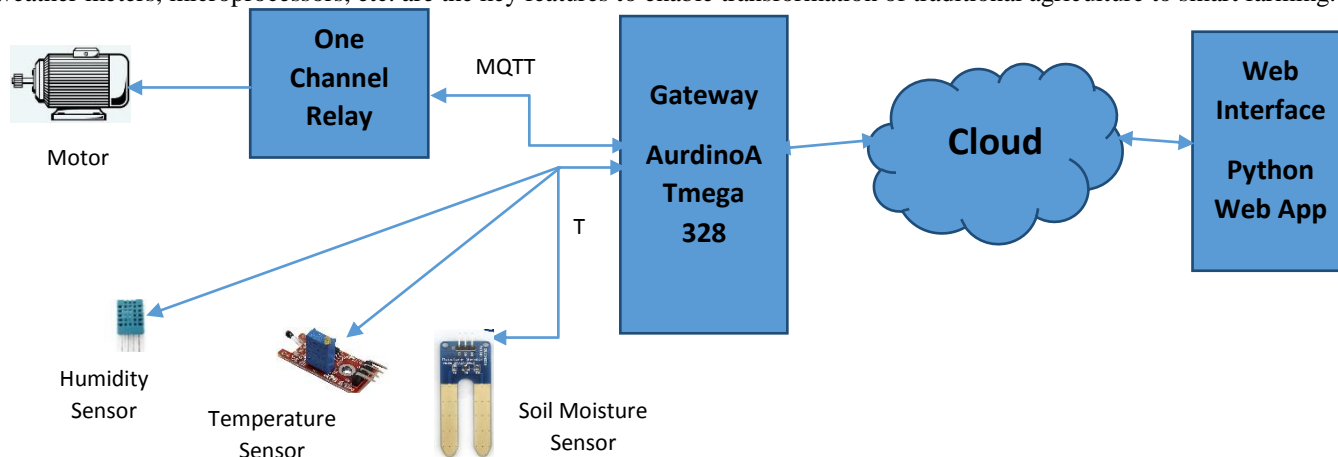


Figure 2: A Model for Smart irrigation

Sensors positioned in the fields may help the farmers providing information to select the crop to sow, sowing prediction of crops based on the type of soil or climate, watering requirements using smart drip based irrigation systems, application of fertilizers according to the nutrient content of the soil etc. The crop diseases and pesticides can also be predicted using data from sensors and crop leaf pictures taken by remote satellites. The farmers can get up-to-date information on their mobile phones. In case of emergencies, alert systems can be activated and provide immediate actions.

2.2 Smart Education: As per the survey by ASER an all-India survey of rural school children conducted on 2014, found that only 48 per cent of children in class V could read II class level text. Half of all children in class V have not yet learned the Basic mathematics; close to half of all children finished eight years but still have not learned basic skills in arithmetic. This may be because of deficiency in Proper textbooks, learning materials, skill-based, relevant and syllabus based on recent scenario. Most importantly, experienced teachers are urgently needed to enable rural children to compete with their urban children even in the global level. Internet of Things (IoT) can make tremendous change in rural education by providing valuable features like smart class rooms, smart boards.

2.3 Smart Grid: Electricity management is a necessity towards a viable environment in the villages and the smart grid represents a new structure for its realization. Indeed, transformation of the outdated electrical distribution system is on the way of distributing energy. The smart grid is defined as an intelligent electrical distribution system that delivers energy flow from producers to consumers in a bidirectional way. [6]

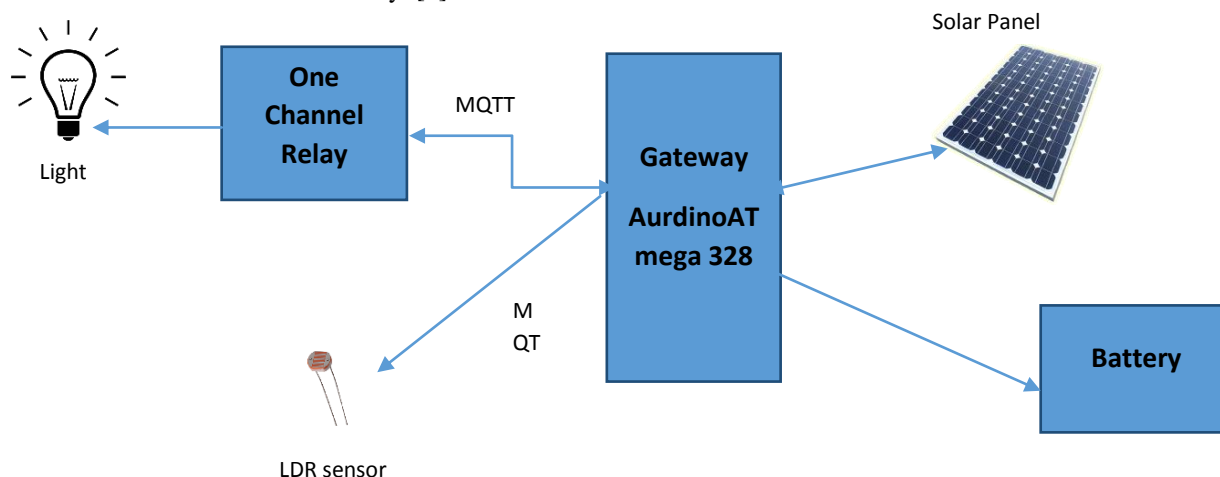


Figure 3: A sample Model for Solar Powered Street Light

2.3.1 Smart Energy and Security Management: Using smart meters, automatic control devices, smart switches and smart appliances, the grid is able to know in advance the expected demands and adapt the production and consumption of electricity. Consequently, it avoids peak loads, eliminating possible blackouts and acting promptly in case of failures/leaks [7]. In many rural areas in India due to natural disasters, electricity lines may cut down in the fields. Electrical leakage may cause to death to people or animals who naively touch it. A model can be designed to blackout power automatically in case of damage or unexpected leakage in the particular area.

2.3.2 Smart Street Light: There are many villages in India where people live with no electricity. Getting electricity is a dream for them. IoT can play a vital role in such places. Smart street lights can be placed with solar charged battery. The light intensity sensor can be used to get the light value when it is dark then the street lights can be triggered by relay.

2.4. Smart Health: Health is basic need of every human. In Rural India, 750 million people are living in 650,000 villages. Unfortunately, most people in rural do not have reliable access to the healthcare that are required to prevent and manage serious chronic diseases. For instance, most people with heart disease in rural India receive no regular medical care. Health care is also a major focus of IoT researchers. Many companies and research organizations focus on projects and case studies whose goals are healthcare improvements and achievement of the foundations for a global health system. [8]

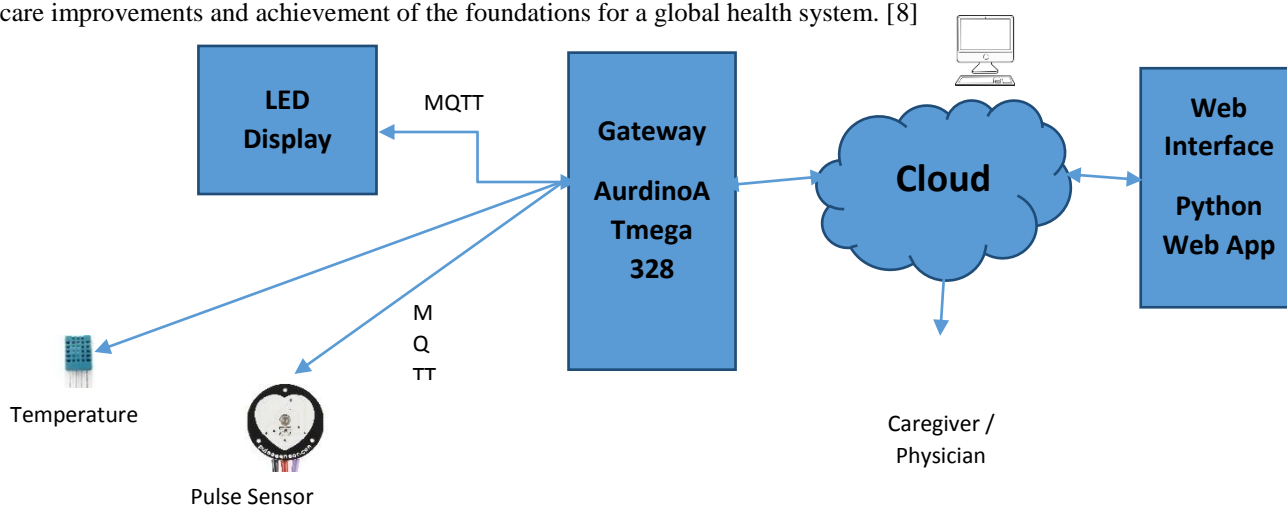


Figure 4: A sample Model for Health Automated System

2.5 Smart Weather: Since most of the people in Indian villages involve in agriculture for their livelihood. The use of sensors like Humidity, Temperature and weather meter, etc. to predict weather forecasts will be helpful for the farmers in a huge scope. Farmers only can sow, irrigate and harvest by depending on the weather. Smart irrigation systems can make use of sensors in the fields and remote satellite data to ensure the optimal use of available water resources. It may be helpful for the farmers to know the climate to sow suitable crops according to the climate. The level of water in the dams and canals can also be monitored and it can be informed through their mobile phones.

3. Conclusion

According to 2011 census around 70% of people are from villages in India. Since majority of Indian population is in villages, there are plenty of opportunities for IoT developers, designers and industries to connect tremendous things with internet. In this paper, we have proposed some of ideas that can be easily implemented and deployed; and areas that can be concentrated in villages for the development of our Nation.

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