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Rural Empowerment with Internet of Things

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ABSTRACT

More than 70% of Indian people live in villages. Their main occupation is agriculture. Health care, education, support systems, access to products and services are all meagrely available to these rural people when compared to their urban counter parts. The Internet of things technology can provide better access to health care, education, products and services to the rural people thereby bridging the gap between rural and urban India. In rural India, Internet of Things (IoT) can bring a revolution by empowering millions in rural areas and connecting rural people to the mainstream India. This paper focuses on the current scenario of Internet of Things in rural India, the issues generally faced by the rural India and how the Internet of Things is providing solutions to the problems of the rural people.

Keywords: Rural empowerment, Internet of Things, Applications in agriculture, Smart villages through IoT

I. INTRODUCTION

The world is moving towards Internet of Things because of its ability to integrate these connecting technologies into an improved living experience for the people. IoT with its macro level capabilities can reduce cost with massive production of materials like sensors, thus making it operationally sustainable and socially transformable. IoT changes the way we live and also finds solutions to the major problems we face like non availability of doctors in rural areas, increasing crop losses for the farmers.In rural India, the Internet of Things is negligible as the companies do not find a market here when compared to the urban areas.

In rural India, Internet of Things (IoT) can bring a revolution by empowering millions in rural areas and connecting rural people to the mainstream India. While technological innovations in farming are not very recent, the IoT wave promises a bright future for agriculture and rural development in India.

II. LITERATURE REVIEW

"It is a sure-fire way of channeling the benefits of a digital economy to the largest part of the country. IoT will enable delivery of education, health, governance and financial services to otherwise underserved areas," Oracle India managing director Shailender Kumar says.

For example, most patients in rural areas do not have access to specialists. Thus, several large hospitals in the metros are beginning to offer remote consulting services in rural villages using media-rich network capabilities.

"The doctors can see and interact with patients in remote telemedicine centres, with the case history and medical data automatically transmitted to the doctor for analysis. Similarly, the IoT technology can be leveraged to offer high-quality remote education in high schools across the country," Shailendra Kumar says.

The IoT connectivity also offers a host of development opportunities to untapped areas, including manufacturing and e-commerce to market local and traditional products.

"A host of 'localisation' technologies can help different regions to communicate; so language is not a barrier. Relevant information and updates can be provided in local languages and scripts," the Oracle executive added.

According to K.S. Viswanathan, vice-president (industrial initiative), Nasscom (National Association of Software and Services Companies), as IoT emerges as the next big thing to become a $300-billion global industry by 2020, India is all set to capture at least 20 per cent market share in the next five years.

"The IoT is dramatically altering manufacturing, energy, transportation, medical and other industrial sectors worldwide," said Mr. Viswanathan while launching the "NasscomIoT Centre of Excellence" in Coimbatore last week.

Andhra Pradesh has taken a lead when it comes to leveraging the IoT potential in the country. The state government has approved the first-of-its-kind IoT policy with an aim to turn the state into an IoT hub by 2020 and tap 10 percent market share in the country. "We will develop state-of-the-art IoT infrastructure that matches global standards to grab an Indian market share of $1.5 billion by 2020," said State IT Minister PalleRaghunatha Reddy as the Centre is currently drafting a policy to create an Indian IoT industry worth $15 billion by 2020.

III. METHODOLOGY

For Secondary sources and information Journals, articles, newspaper, internet, books are referred. The secondary data is also collected from the published reports of World Bank.

IV. LIMITATIONS OF THE STUDY

The study is conducted based on the secondary data available which is only a conceptual research and no empirical results are available.

V. INTERNET OF THINGS AND APPLICATIONS IN AGRICULTURE

India is a land of different weather conditions and versatile soils. Every year Indian farmers are facing the problem of sudden rain in their areas without any correct weather forecast which leads to damage of the already grown crops. The second major problem pertaining to Indian farmers is the lack of sufficient knowledge about their soil. The soil forecasting of how the soil structure is changing day by day due to different weather condition and other external factors, and which crop will be optimally suited to be grown in such soil are some of the problems common to the farmers. These problems can be addressed by making use of IoT by the farmers on Indian agricultural land. The solution proposed will have a centralized data server to analyze the data and report to the farmer the precautionary steps to be taken in advance for the safety of the crops. The solution proposed will have eco-friendly energy management through the solar plant and wind energy which make the IoT device more portable and at the same time makes implementable in any rural areas of India.

Rapid population growth, dietary shifts, resource constraints, and climate change are confronting farmers who need to produce more with less. Efficient management and optimized use of farm inputs such as seeds and fertilizer will be essential. However, managing these inputs efficiently is difficult without consistent and precise monitoring. For smallholder farmers, who account for 4/5 of global agricultural production from developing regions, getting the right information would help increase production gains. Unfortunately, many of them still rely on guess work, rather than data, for their farming decisions.

This is where agriculture can get a little help from the Internet of Things (IoT)—or internet-enabled communications between everyday objects. Through the IoT, sensors can be deployed wherever you want–on the ground, in water, or in vehicles–to collect data on target inputs such as soil moisture and crop health. The collected data are stored on a server or cloud system wirelessly, and can be easily accessed by farmers via the Internet with tablets and mobile phones. Depending on the context, farmers can choose to manually control connected devices or fully automate processes for any required actions. For example, to water crops, a farmer can deploy soil moisture sensors to automatically start irrigation when the water-stress level reaches a given threshold.

Existing IoT solutions could also help the shrimp farmers. The problems that are usually faced by the shrimp farmers are when should they release fresh water and how much? How often should they check the water salinity? And what if they are out of town? IoT solutions could help the shrimp farmer answer his questions,First, sensors–for water salinity, temperature, and shrimp appetites–could be installed to help him track the conditions of the pond and shrimp. These sensors would be connected to the pond management system—including the water controller, feeders, and aerators—so as to inform the farmer when to release the freshwater to maintain optimal salinity and temperature levels. As long as farmershave an internet connection and a smartphone, they can remotely control the freshwater pond with mobile applications.

Thus, the benefits that farmers get from IoT application in agriculture are twofold. First, these systems help farmers decrease production costs and waste by optimizing the use of inputs. In addition, IoT can increase yields by improving their decision-making with more and accurate data.

VI. CHALLENGES TO IoT IN AGRICULTURE

Challenges to IoT in agriculture persist in less developed regions. First, remote areas tend to lack communication network infrastructure. Also, farmers need to be presented with the right incentives to buy into IoT systems, whose upfront installation costs are still quite expensive.

The good news is that there are organizations and initiatives that have already begun to tackle these challenges. For example, Mimosa Technology is helping smallholder farmers in Vietnam adopt IoT-enabled precision agriculture by leasing hardware devices to farmers' cooperatives, which has helped lessen the cost burden on smallholder farmers. Another example is Eruvaka, an Indian startup that provides IoT-based aquaculture pond management solutions to help farmers reduce risk and increase productivity.

The most typical difficulty associated in using IoT is security. The possibility of data breaches should be addressed before using IoT. Also there are a lot of devices with proprietory technology in the IoT which makes which makes hirizantal communication between the devices hard.

Lack of interoperatabilitywith increasing costs is the biggest barrier in the use of IoT in rural areas. Data protection, privacy and cross-border data exchange are the important features that can be violated with the extreme connectivity of Internet of things.

VII. SMART VILLAGES THROUGH INTERNET OF THINGS

There is a common problem of gas leakage in both cities and villages. Usage of LPG cylinder is not a safe way of cooking. However, the situation is even more serious in our villages. A probable solution to this problem is the use of a gas sensor plugged onto a micro-controller board (like an Arduino). It has an in-built system that alerts the homeowner through an SMS, smartphone app or a manual alarm.

Villages face the challenge of loss of life due to lack of proper infrastructure and connectivity to major hospitals during emergencies. For example, in the case of a fire or water hazard, people realise the dangers too late. Hence, smoke sensors should come in handy to alert homeowners if a fire breaks out. Moisture sensors can also play a key role in monitoring the life of brick walls. They can warn occupants ahead of time if the walls have become too weak to withstand the load.

A door alarm can be built using NodeMCU ESP8266 with a magnetic strip. It will be useful for keeping homes safe from intrusion while the owner is away. This is important in villages as villagers mostly have single family homes with no guard or safety perimeter around it. This solution is extendable to windows as well.

Livestock monitoring deals with animal husbandry and cost savings. Using a combination of sensors and wireless IoT applications, one can track the health, well-being, and location of the cattle. This data helps to identify sick animals, locate animals and in-turn can also lower labour costs. Symphony Link is one possible solution. Another solution is a wireless retrofitted bolus in the cow's stomach, which can communicate via Bluetooth to an ear-tag.

A lot of wearable tracking devices are available these days to track children, elderly and loved ones. There are a plethora of solutions coming up in the field of personal safety. Similar devices can be used to leverage the assignments of delivery trucks.

A Health ATM allows you to know about your health and check the key body parameters such as blood count, BMI, etc. in a cheap and quick manner.

Water Tank Automation: A simple solution to track the timing of water inflow and operating the water pump can be made. The pump will turn off when the tank is full, thereby saving water from overflowing. Amazon is selling one such device.

Electrical Appliances: IoT-based solutions allow you to control appliances in your home including fans, geysers, air conditioners, etc. Since villages often face a shortage of electricity, an affordable solution can be built coupled with machine learning. This will allow the villagers to use the appliances efficiently.

CONCLUSION

The government of India has already initiated IoT investment in the country with supporting legislation and with the opportunity to transform India as one of the largest economies of the world. More than 70% of Indian people live in villages whose main occupation is agriculture. Health care, education, support systems, access to products and services are all meagrely available to these rural people when compared to their urban counter parts. The Internet of things technology can provide better access to health care, education, products and services to the rural people thereby bridging the gap between rural and urban India.

Internet of things based applications can be deployed in rural areas for cheap as the cost of sensors is decreasing and the mobile internet is undergoing increased market penetration forcing better cellular connectivity. This facilitatesthe introduction of IoTtechnology. Our rural areas face many problems and Internet of Things can be practically applied to

our villages to enable better solutions. Investments on Internet of Things in rural areas will help them to catch-up up with their urban counter parts

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