IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Smart Village System for Rural Development

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Abstract:

Smart village system is developed in rural sector to support value-added services for various attributes in the village and Rural developments are designed to support the Smart village mission, which aims at exploiting the most advanced communication technologies. The global focus on waste, energy and water management and conservation and the cloud based system plays a key role in extending the connected benefits of the smart village beyond the distribution, automation and monitoring being done by utility. IoT based Monitoring system will help consumers to monitor their own usage and adjust behaviours. The proposed system regulates automatically by operating during off-peak energy hours and connect to sensors to monitor occupancy, waste collection system, lighting conditions, and also optimized irrigation management attributes.

Keywords: Energy management, Smart village, Smart irrigation system, Waste management.

I.INTRODUCTION

Smartness plays a major role in the global world. Government of India is trying hard for all round for the growth under the leadership of Hon. Narendra Modi. Many schemes are launched like Make in India, Skill India, Start up India, Smart Cities, Smart Village etc., But till today 70 % of our population is staying in villages. It's a need to make our villages smart for effective implementation of all other schemes. These projects aims to bring smartness in four different aspects of any village Digital Display of the Government Subsidies and offers to farmers, smart garbage management, PH level of the water, intensity based street light monitoring and digital water supply system. The emerging concept of Smart Villages refers to rural areas and communities which build on their existing strengths and assets as well as on developing new opportunities. [1][2] In Smart Villages traditional and new networks and services are enhanced by means of Digital, Telecommunication Technologies, Innovations and the better use of knowledge, for the benefit of inhabitants and business. Digital technologies and innovations may support quality of life, higher standard of living, public services for citizens, better use of resources, less impact on the environment and new opportunities for rural value chains in terms of products and improved process. The concept of Smart Villages does not propose a one-size-fits-all solution.

In recent times, there is an immense interest in the development of Smart Cities. But as we

perceive, in Indian context, villages are the heart of the nation.[3][4] Hence, for the development to percolate to the grass root level, focus must be devoted to the progress of village locational and competitive advantages. Rurban-[5]aims to strengthen the rural areas by provisioning physical infrastructure, economic and social facilities. The envisaged components are

shown in the figure 1

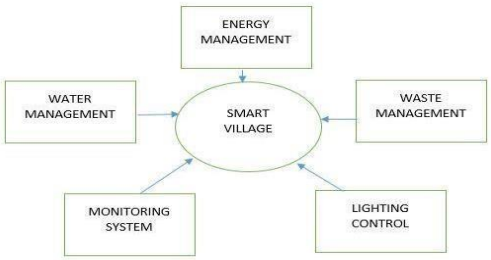

Figure 1. Block diagram for Smart Village

IoT based smart village can help to reduce cost improved process efficiency and productivity. The tracking of devices is improved using sensors and communication devices which can be benefited from real-time data and to make smarter decisions. The growth and convergence of data, processes and things on the internet would make such connections more relevant and important, creating more opportunities for people, business and industries. Fig.1 represents the overall block diagram of the smart village system. [7]The enormous IT infrastructure is required by rural development along with the huge financial support which is to be incorporated. Sensors, thousands of networking equipment and computing devices are built in this complex network. Operational and maintenance cost of such a complex real time system will be much higher which is evident to meet stringent reliability and efficiency improvement. In case of smart irrigation management system each field has to be fitted with a sensors and data control unit which are highly efficient and reliable.

2. NEED FOR SMART VILLAGE

Every country has developed a reputation as a global leader in upgrading the city as smart city initiatives in its larger urban areas. The Rural areas are in need of essential infrastructure like roads, drinking water and power. The future development mainly concentrates on improving big metropolises into connected cities but failed to see where most of the population resides. Villages more than cities need to be made smart for the overall improvement and development of the country.

The Development of opportunities for youths in villages, thereby discouraging migration to cities. [8]Farming remunerates occupation, with guidance and mentoring to farmers on how to get the best yield and market at remunerative prices for the future rural development. Proper implementation which presides over the benefits such as crop insurance, soil health card, and pesticides which can reach the grassroots. The importance should be given to develop an economically viable and culturally sensitive ecosystem in villages. The challenges remain the same, direct access to the global market has been a major challenge largely due to multiple intermediaries and lack of skilled workforce. The large population lives in villages, we always fail to improve economic potential and basic services by creating smart village.

The most villages lack essential infrastructure like proper irrigation system, electricity and water. To overcome this challenge, three strategy can be followed:

1. Provide education on technology that supplements indigenous skills,
2. Ensure digital and IT awareness, and
3. Connect skill oriented programs to market

3. ENERGY MANAGEMENT

The challenges in load control for the power grid is now more severe than ever, due to advancement in communication layer and the creation of a two-way infrastructure for real- time communication between people and the utility. The operator of the smart grid accesses the information and communication technologies to enhance grid security and reliability, to enforce controllable use of energy, and incorporate various components such as green resources, distributed generator and power storage premises. Fig. 2 shows the energy management circuit diagram it is the process of monitoring, controlling, and conserving energy in a building or organization. It can also be defined as the strategy of adjusting and optimizing energy, using systems and procedures so as to reduce energy requirements

Typically, this involves the following steps:

i. Metering your energy consumption and collecting the data.

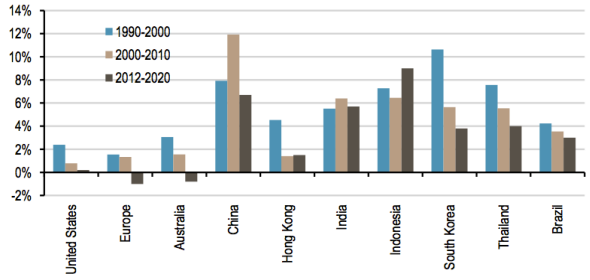

Figure 2 Circuit diagram of energy management module.

ii. Finding opportunities to save energy, and estimating how much energy we could save. You would typically analyze meter data to find and quantify routine energy waste, and you might also investigate the energy savings that you could make by replacing equipment (e.g. lighting) or by upgrading building's insulation.

iii. Taking action to target the opportunities to save energy. Tracking your progress by analyzing meter data to see how well your energy-saving efforts have worked.

The Demand response (DR) scheme shows that incentives are economically balanced according to the effective change of consumer behaviour. It includes minimising or shifting consumption, and using standby generation to change of electricity use from the grid to on- site generation, the Notice periods of about 2-4 hours was considered by the operators as switching time to safely implement a curtail plan with minimal impact on machineries and accessories.

There are various demand response [8][9] as shown in figure 3, and it is as follows

a. Time of Use (ToU)
b. Critical Peak Pricing (CPP)
c. Critical Peak Rebate (CPR)

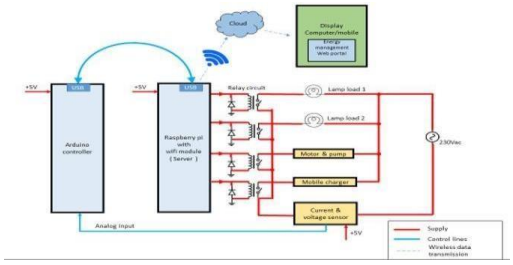

Fig. 3 Statistics of various demand response

Involvement in DR programs enhances the system operators with an intimation of details of the customer which includes resource size which is willing to curtail or shift load according to the response. Since the participation is voluntary in some of these DR programs can comes under the direct load control and hence utility often does not have physical control of the customer's load response. Incentive based demand side management is been followed in the smart rural development to reduce the peak demand, tariffs and minimize. The power demand outages for various countries in various periods and the customer which includes resource size which is willing to curtail or shift load according to the response. Since the participation is voluntary in some of these DR programs can comes under the direct load control and hence utility often does not have physical control of the customer's load response. Incentive based demand side management is been followed in the smart rural development to reduce the peak demand, tariffs and minimise the outages.

The power demand for various countries in various periods as shown in fig Power demand for various countries.

4. *SMART IRRIGATION SYSTEM*

The agricultural productivity is dependent on efficient irrigation system. [10]Field of agriculture has seen the rapid advancement. Irrigation system is improved by latest technologies. As precision advanced irrigation scheduling plays an important role in reduction in water wastage. The usage of various monitoring and controlled system is increased by people in order to increase the yield [11].

Soil moisture plays a key role in the life of the plant. Nutrients in the soil solution provide the plant with food it needs to grow. Water is also essential for regulating plant temperature through the process of transpiration. Plant root systems are better developed when growing in moist soil. Excessive levels of soil

moisture, however, can lead to anaerobic conditions that can promote the growth of plant and soil pathogens.

Agricultural production is affected by poor irrigation management, it is necessary to develop strategies to optimize irrigation. The monitoring and control of various factors derived from field such as humidity, water level, temperature, and human interaction is governed by automated irrigation system.

This system consists of controllers and a wireless sensor infrastructure used to transmit the detected values. The yield can be improved by various automated system which can help the farmers. Sensors can be placed anywhere in the field and system is also tested for different temperature. Only minimum deviation is observed in the sensor output. In recent years communications Infrastructure in the IoT is improved rapidly which can meet the demands between the physical world "things" and "human". Thus, the remote objects are controlled using the smart gadgets. [12].Fig 4 shows the drip irrigation system which is involved the smart irrigation network.

4.1 Drip irrigation system

Drip irrigation is a form of irrigation that saves water and fertilizer by allowing water to drip slowly to the roots of many different plants, either onto the soil surface or directly onto the root zone, through a network of valves, pipes, tubing, and emitters.

Fig. 4 Drip Irrigation System

5.WASTE MANAGEMENT SYSTEM

As the population in the rural areas increases, the accumulation of waste[13] and trash level also gets increased.

The[14] conventional bins with no automation is the existing status. The time rate for dumping the waste differs for each bins and it doesn't provide any details about the status. The proper collection and disposal of these waste becomes a must. In current scenario the garbage collector physically go to each bin and check trash levels which involves more human power and wastes both time and fuel of the containers.

Fig. 5 shows the waste management technique which are not managed efficiently may cause serious environmental problems and increase in cost occurs. Therefore, in this paper, by developing an optimizing route for the waste collection is extended to reduce the fuel cost, source through an IoT-based smart waste management (SWS).

Fig.6 shows the optimised route for the smart waste collection system. It is achieved with the help of smart bins. The conventional bins specifically designed and allotted with the sensors behave as smart bins. These sensors are powered with the batteries or green energy sources can be used.

These wireless sensors monitors, provide data at every instant and sends signal to the control center through the cloud. A specific portal is developed for the

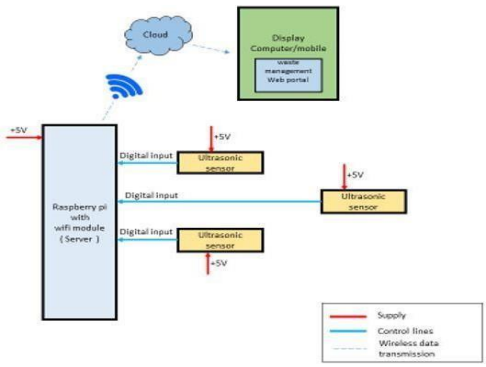

Fig.5 Block Diagram of Waste Management

Monitoring[15] and control of the waste with the help of a centralized hub.

Fig. 6 Optimized routing

CONCLUSION

The technology advancement in various fields of life has created a sophisticated service delivery. The aim of all these techniques in energy management is optimal balancing of supply with demand in which undesired blackouts and outages are eradicated. For successful implementation of demand response technique, modern equipment has to be implemented in the rural areas. The automation in irrigation will be ensured at low cost and high accuracy which minimize the water consumption. With the increasing population and changes in the lifestyle, cloud based waste management is another division where current technology is applied in a more constructive way for disposal of waste related to hygiene and resource management.

In the future, this work can be extended to become all villages as a tradmord villages and crop research centers can be setup for development of villages.

REFERENCES-

[1] Marceau, Jane. "Introduction: Innovation in the city and innovative cities". *Innovation: Management, Policy and Practice* 10. 136-145,2008.

[2] A. P. Castellani, M. Dissegna, N. Bui, and M. Zorzi, "Web IoT: A web application framework for the internet of things," *in Proc. IEEE Wireless Communication. Networks. Conference. Workshops*, 2012.

[3] R. Bonetto, N. Bui, V. Lakkundi, A. Olivereau, A. Serbanati, and M. Rossi, "Secure communication for smart IoT Objects: Protocol stacks, use cases and practical examples," *in Proceedings of IEEE IoT-SoS*, pp. 1–7,2012.

[4] P. Suresh, "Understanding Challenges in e-Governance*," Better Account with egovernance*, pp. 61–63, 2011.

[5] N. Bressan, L. Bazzaco, N. Bui, P. Casari, L. Vangelista, and M. Zorzi, "The deployment of a smart monitoring system using wireless sensor and actuator networks," *in Proceedings of IEEE Smart Grid. Communication*, pp. 49–54,2010.

[6] Alghamdi, Ibrahim A., Robert Goodwin, and Giselle Rampersad. "E-government readiness assessment for government organizations in developing countries." *Computer and Information Science*, 2011.

[7] Fuller, J. C., Schneider, K. P., and Chassin, D. "Analysis of residential demand response and double-auction markets*". In IEEE Power and Energy Society General Meetin*,2011.

[8] Loganthiran, T., Srinivasan, D., and Shun, T. Z. "Demand side management in smart grid using heuristic optimisation". *IEEE Transactions on Smart Grid*, pp. 1244– 1252, 2012.

[09] M. Kovatsch, S.Duquennoy and A. Dunkels, "A Low-Power CoAP for Contiki ", *In Proceedings of the IEEE Workshop on Internet of Things Technology and Architectures*, October, 2011.

[10] R.Hussain, J.Sehgal, A.Gangwar, M.Riyag " Control of irrigation automatically by using wireless sensor network" *International journal of soft computing and engineering*, vol.3, pp. 324-328,2013.

[11] Fan TongKe, "Smart Agriculture Based on Cloud Computing and IOT", *Journal of Convergence Information Technology*, Vol. 8, 2013.

[12] Hong, Insung, Sunghoi Park, Beomseok Lee, Jaekeun Lee, Daebeom Jeong, and Sehyun Park. "IoT-based Smart Garbage System for efficient food waste management." *The Scientific World Journal 2014.*

[13] T. Anagnostopoulos, A. Zaslavsky, "Effective Waste Collection with Shortest Path SemiStatic and Dynamic Routing", *IEEE 14th International Conference on Next Generation Wired/Wireless, 2012.*

[14] Glouche, Yann, and Paul Couderc. "A smart waste management with self-describing objects." *In The Second International Conference on Smart Systems, Devices and Technologies* 2013.

[15] Anagnostopoulos, A. Zaslavsky, "Robust Waste Collection exploiting Cost Efficiency of IoT potentiality in Smart Cities", *IEEE 1st International Conference on Recent Advances in Internet 2015.*