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Design & Development of an Integrated Control of Real Time Data Monitoring for Remotely Located Micro Hydro Station and Solar Power Station

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Abstract-Data monitoring is foremost need of any system to have a contentious and regular check on the operational parameters. This data not only provides the information about the healthiness of system, but also provides the guidelines for the operator for the actions to be taken or any future possible breakdown / uncertainty. In many cases, where systems are remotely located, it is very difficult to capture data at regular intervals and as a result of same, many often times the systems are installed but due to failure of regular monitoring systems become functional and is of no use to the end consumer. In this paper a data monitoring system is described which is capable of collecting data from remote stations with the help of RF modem to a control room and then from this control room data is transmitted to the server room through GSM. A prototype for the system is developed and results shows system is energy efficient and reliable.

Introduction- Livelihood of the remotely located people can be enhanced by bringing then closure to technological developments. Technology has largely limited to larger community staying at towns or cities. Because of various reasons, technology has not reached to villages, in particularly remotely located villages. One of the many constrains, that technology has not reached villages is proper monitoring & maintenance of systems. In many cases, it is observed that, technological systems / projects are installed at many locations but without proper monitoring and maintenance, the technical projects are standby and are of no use. The maintenance is practically not possible as they are remotely located and physical access to the systems is challenging and time consuming. Hence they remain unattended or rarely attended resulting in to either failure or disoperation.It is required to design and develop a system that could transmit the all required information related to the particular remotely located technical project. With widespread technological advancement and communication development, it can be made possible to measure and monitor the parameters for remotely located systems.

Yang Yanget.al. describes a smart grid application in monitoring using ZigBee and GPRS (General Packet Radio Service) technology and also provide the warning of metrological disasters before the damages [1]. Sunet.al. describes the electric Power Monitoring System based on ZigBee and GPRS. The CC2430 is used for communication to design monitoring node. The GPRS is used for remote transmission [2]. G. V. Satyanarayanaet. al discusses a wireless sensor network to monitor the agriculture field parameters like soil moisture, humidity and temperature. GSM and GPS is also used for long range data transmission and getting the location[3]. N. Javaidet. al discusses the various hardware techniques to monitor and control the power management and PDA with Graphical user interface is used as logging facility [4].Soyoung Hwang et. al describes the Zigbee based wireless personal area network design for monitoring and controlling of remote station [5]. Zanglet.al demonstrates the online data monitoring of power lines by using wireless link. The transients signal and high current measurement also take into account [6]. Javaidet. al Discusses the suitable wireless protocol to achieve strong communication link for Smart grid [7].Bai et. al describes the system using zigbee and embedded board to on/off control of devices and current of electric outlet [8]. JY Cheng et. al designs a integrated system with Digital signal processing , zigbee and web technologies for power management system [9]. Qiang Zhang et. al proposes the zigbee communication in smart grid to monitor and control [10]. WoongHee Kim et. al proposes home gateway and WSN to control the home appliances [11]. Devidas et al proposes the architecture for single phase and three phase electricity distribution system with communication link [12]

Methodology- A system is developed to monitor, measure and control the specified parameter for a particular technological system. Two Electrical Power Generating units are controlled using the proposed work. The Electrical Power Generating units are 'Micro Hydro' & 'Solar Panels'. Basically Voltage, Current & Angle between voltage and current are sensed using sensor network. These basic parameters primarily provides all required information related to a power station to take an immediate action (On/OFF).These sensed parameters are connected to signal conditioning block and through isolator it is connected to DA Card. It is presumed that one of electrical generation station (Solar) is within the accessible GSM network and other Electrical Station is not within the reach of GSM network.Parameters sensed from Solar station, which is within reach of GSM network, is connected to the GSM

communicating network, through which parameters are transmitted over long distance.

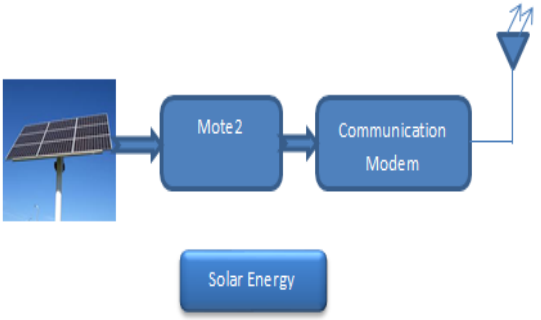


Fig.1: Data transmission for the solar power station (in GSM vicinity)

It is pretended that, the micro hydro station is at remote location and there is no access for GSM or any other communication network. In such case, the DAC of Hydro station is connected to the WLAN and through which it is transmitted over specified distance using this WLAN technology. The receiver at the specified distance receives the data and that will be connected to coordinator which is integrated with GSM communication network.
The GSM network with transmit the data globally, for both the nodes.

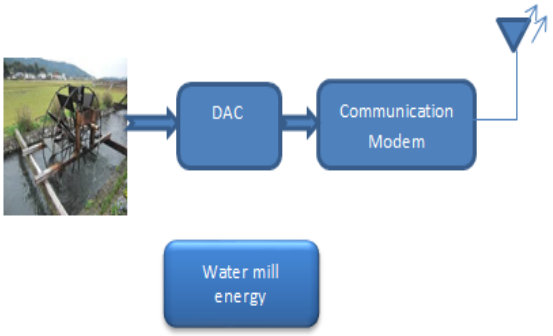


Fig.2 Data Transmission for the micro hydro station through WLAN

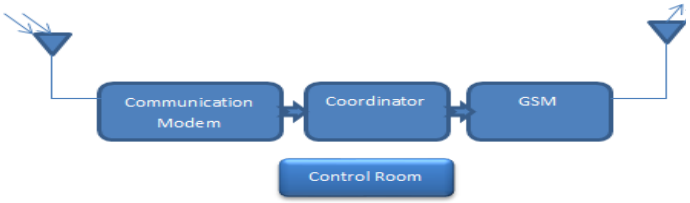


Fig.3 Data Received from WLAN for the micro hydro station and connected to GSM

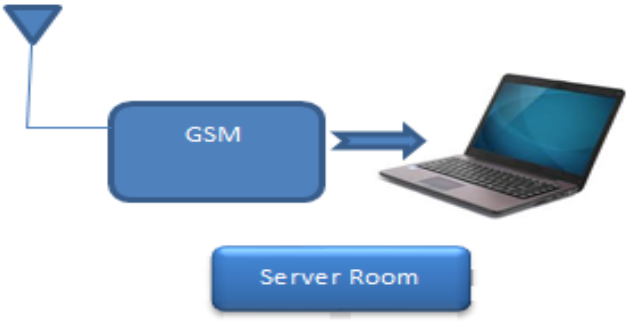
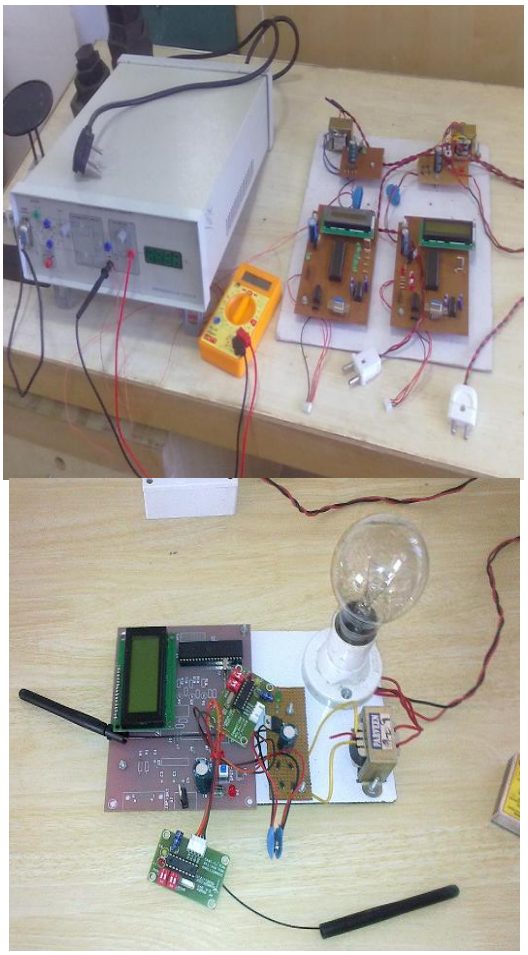


Fig.4 GSM Network transmitting data globally.

When the network coordinator receives the sensor information from the sensor module, it forwards the message to the connected gateway. On the other hand, the coordinator also receives the control command from the gateway. When the control command is received, the network coordinator forwards the control command to the corresponding control device of the wireless sensor network to execute the command. The gateway works as a translator and synchronizer between the wireless sensor network and the web service. It communicates with the wireless sensor network via the connection of the network coordinator.

Result and Discussion-Fig.5 shows the view of the developed system.Informationfrom micro hydro station and solar power stations is collected to a control room through RF communication and GSM modem and saved at server room for future uses. The collected data includes voltage, current, power factor and power. GUI is developed for data display and database management.
Low cost motes are designed to sense the parameters and communicate required information to server.



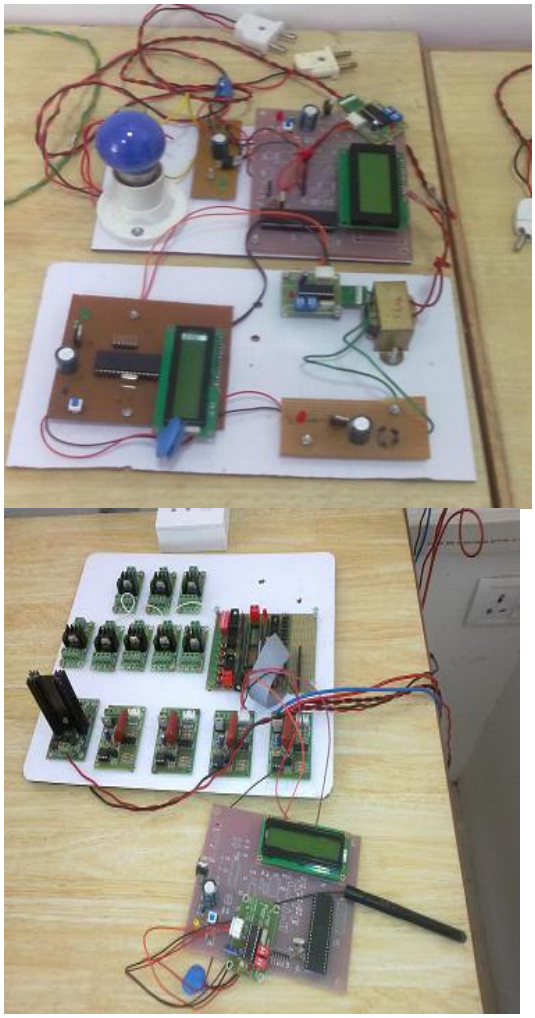


Fig.5-View of System

Conclusion and Future Scope - Smart Grids are upcoming technology during recent years due to its benefits. Smart grid are reliable and energy efficient which are able to reduce electricity usage upto 10–15%.

This study also aims to assess remote data with accuracy and reliability. At present, system is tested with different loads and results are found satisfactory. In future, system can be integrated with co-systems like smart home behavior, online billing and smart metering applications.

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