Fault Detection System using Zigbee and Embedded base Meter Reading

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ABSTRACT: The development of automatic meter reader using zigbee is presented in this paper. This system consists of zigbee digital power meter installed in every consumer unit and electricity e-billing system at the energy provider side. The zigbee digital power meter is a single phase digital kWh power meter with embedded zigbee modem which sends the power usage reading using information back to the energy provider wirelessly. The power provider side an e-billing system is used to manage all received meter reading, compute the billing cost, and update the data base and to be published billing notification to its respective consumer through wireless. The working principle, hardware and software tools are also explained in detail. A system of automatically interrogating metering without the need for site visitation has many advantages, both to the supplier and to the consumer. This paper presents a case study of the design of such a system starting from scratch. The system design begins with interfacing the metering to a communications system. The development of an interface for an automatic meter reading system is described. In this case study, the power lines in a power system are used as the communications channel. A smart meter is the source of power data and communicates with a logging PC when interrogated. What is involved in the initial design process is described. Serial communication is used to collect the instrument data and to communicate with the logging PC. Specialized circuits in this design that make use of FSK are identified and the entailed implementation problems are described. Measurements of the interface’s output are given.

Keywords: Zigbee, Meter Reading, GSM network, WAMRS

1. INTRODUCTION

The wide proliferation of wireless communication propose and explore new possibilities for the next generation Automatic Meter Reading (AMR) whose goal is to help collect the meter measurement automatically and possibly send commands to the meters. Automation ranges from Connecting to a meter through an RS-232 interface for transmitting the meter measurements all the way from the meter to the utility company via GSM network.

The system structure of wireless automatic meter reading system (WAMRS) is shown in figure. The networked meter-reading system consists of terminal measure meters, sensors, intelligent terminals, management centre and wireless communication network.

- Intelligent terminal or AMR interface, a hardware connected to a meter or a network of meters, which gathers data from meter(s).
- Management Center, mainly a computer or a network of computers, which collects the data sent by the AMR interface.
- Communication medium or GSM network, which enables communication between the AMR interface and the center.

Meter-reading, computation and charge can be finished at the management centre of each residence. The charge message i.e. SMS or Email would send to resident at regular intervals. The GSM network
establishes a two way link in between the intelligent terminal and the management center providing useful features as mentioned above.

Block Diagram of WMR

II. LITERATURE REVIEW

In Scene ZigBee based on IEEE802.15.4 which characterizes a low-cost, low power, and short range wireless communications, aims to construct a scalable and autonomous network. In particular, the ZigBee devices are extremely limited in resources including processing, memory, and power. In addition, ZigBee is an autonomous network. Therefore, the network is unexpected error environments such as abrupt system failure link errors, and resets. These errors are caused by various hardware faults, battery depletion, or Memory errors. In addition, the 2.4GHz band, which is one of the most popular frequency bands supported by the standard, is directly exposed to numerous other interference sources [5]. The ZigBee network layer natively supports both star and tree typical networks, and generic mesh networks. Every network must have one coordinator device, tasked with its creation, the control of its parameters and basic maintenance. Within star networks, the coordinator must be the central node. Both trees and meshes allow the use of ZigBee routers to extend communication at the network level. ZigBee builds upon the physical layer and medium access control defined in IEEE standard 802.15.4 for low rate WPANs. In addition, four main components: network layer, application layer, ZigBee device objects and manufacturer-defined application objects which allow for customization and favor total integration. Besides adding two high-level network layers to the underlying structure, the most significant improvement is the introduction of ZDOs. These are responsible for a number of tasks, which include keeping of device roles, management of requests to join a network, device discovery and security [4]. In the ZAMI, the system operates with multiple channels and frequency hopping and coexists with potential interferers. In this method if any tariff variation occurs, the new tariff the previous tariff rate will be displayed on the LCD display. This may cause major problems in billing. Here, there are no intimations given by the electricity board to the consumers about the status of energy consumption. There are no details about the previous month’s consumption and the amount of bill paid. We are focusing about these drawbacks and overcome in our project.

In order to overcome the above mentioned drawbacks, we are proposing a new method which is having the advantages such as no need of manpower, errorless tariff calculation, tripping can be done from the EB side in case of not paying the bill and intimation about tariff variation, amount to be paid and due date for payment [3]. The implementation of WAMRS provides with many vital features as compared with the analog utility meter reading with manpower. Using WAMRS on distribution automation can supply many capabilities such as efficient meter-reading, distribution, power monitoring and control, load management and time-of-use rate. In addition, with rapid growth of mobile communication network, future application service will gradually concentrate on data transmission service. GSM has been developed maturely and has many practical applications at present. It has many advantages such as more stable network with robust features covers virtually all parts of the world, maintenance and security of data.
transmission. It satisfies the need of speed for data transmission required for automatic meter reading system [2]. The main methods of metering at home and abroad are: manual meter reading, IC Card prepaid meter, wire-line and wireless meter reading system. Manual meter reading has been for decades, but with the implementation of one home one meter, drawbacks of this method of reading are more and more, like difficult entrance to home, low efficiency of fee settlement, etc. management sector. Since it does not need meter reading on site, partially solve the problem of manual meter reading because of no need to be on site. But some problems exist in the actual operation process: IC card meter is easily damaged due to its direct contact with user and no real-time monitoring. It also fails to avoid theft, damage, and fault of meter [1]. It enables real-time metering, real-time monitoring, and real-time control, and can also detect equipment damage, illegal use, etc. But there are some issues: piping, cable wiring, so it needs to design in advance. In addition, it also has problems of long construction period, high installation cost and maintenance cost, expansion of the system upgrade and compatibility with other network.

III. AIM AND OBJECTIVES

The main aim of the project is to detect and correct the fault of Electric Meter automatically.

Objective
1) Collection of all required data and literature survey.
2) Study of ZigBee modules (transreceiver) with reference to physical layer and medium access control layer.
3) Study of sensors and detectors for meter reading and temper detection.
4) Study of AVR Adereno kit for interfacing of ZigBee and storage of data records.
5) Study of GSM modules.
6) Write program for all the modules using Assembly language and Embedded C to interface each devices which has important role in terms of communication and record maintenance.
7) Check and modify the program for expected results with the help of simulators.
8) Assemble the hardware and burn the program in Adereno kit.

IV. METHODOLOGY

The proposed AMR system is divided into two sections i.e. transmitter section and receiver section. The Methodology of AMR can be explained through below flowcharts.

Figure 3: Flowchart for Tx Unit

Figure 4: Flowchart for Rx Unit
V. CONCLUSION

The successful development of the wireless automatic meter reading system described in this article is based on the high performance, extremely low power consumption, high level of integration, and low price of ZigBee technology. The technology has strong market competitiveness. ZigBee wireless meter reading system uses short-range wireless communication and computer network technologies to read and process metering data automatically. Wireless automatic meter reading technology can not only save human resources, but also improve the accuracy and instantaneity of the meter reading. It enables management sector to timely and accurately access power consumption messages. Moreover, no cabling is required with relatively economical investment. For the proposed wireless automatic meter reading system, wireless communication links can be quickly built, Engineering period significantly shortened, and it has better scalability compared to a wired system. If a fault occurs, simply checking wireless data module can quickly find it out and restore the system in normal operation.

REFERENCES


