Realization of the Data Acquisition and Transmission for PIC Based on LabVIEW

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Abstract

This paper shows a monitoring program, and this Exploiting monitoring program is a program for real-time monitoring the current and voltage which is produced by wind generators. And this program helps to check efficiency and situation of the wind generator; therefore, it uses LabVIEW for this real-time monitoring program. It is expensive that the specific network is needed in the common LD (long distance) data transmission. So in this paper, it shows the transmission method which use ezTCP/LAN (Serial-port←→LAN-port converter) and combine with the TCP/IP based on LabVIEW. And in this method the specific network is not needed for using the Internet network to transmit the data，which can reduce the application cost of the system.

1. Introduction

With the ponderance of the environmental disruption and energy depletion, the new energy has been more and more accounted of. Among the new energy, wind and sun power has the point that it can produce clean energy illimitably without polluting. So in this paper, it shows a wind generation system with the monitoring program which can do monitoring to the wind generator and do measurement and analysis to the collective data.

In the data acquisition of the system, it uses the PIC to collect data. But if we use the common LD data transmission method the specific network should be needed, which will increase the application cost of the system. So in this system, it uses the Internet network to transmit the data, which can improve the utilization rate of the resources and reduce the application cost. And the transmission mode which is faced on scheme can keep the assurance of the transmission accuracy. And in the data transmission, it uses the ezTCP/LAN (Serial-port←→LAN-port converter) to connect the PIC to the Internet network.

2. Brief introduction of the technology in the system

2.1 wind power generation system

The wind power generation system has two 500W generators, so its output is 1000w. Fig.1 is the picture of the wind generator.

Fig.1 The photograph of 500W Wind generator

2.2LabVIEW

LabVIEW (Laboratory Virtual instrument Engineering) is a Graphic language and is used in the data acquisition, controlling, signal processing and data expression widely. It provides a new programming method: do the graphics combine operations to the Software Object" Virtual Instrument".

2.3 TCP/IP

TCP/IP agreement system is the most successful and the most frequently used internet agreement. As a popular industry standard, TCP/IP technology has the practicality and openness point. In data transmission, TCP/IP network make specific network technology transparent to the user and the application program, which make the specific communications separated from the network details and make the using of the network agile. Embodying to the application of the LabVIEW, we can use the TCP module directly to finish the preparation process without paying too much attention to the underlying implementation.

2.4 ezTCP

ezTCP is a network equipment brand name, which provide integrated hardware and software solutions for those who want to add network connectivity into products. It can make most of the existing equipment connect to the Internet easily. And the specific application is showed as the Fig.2.
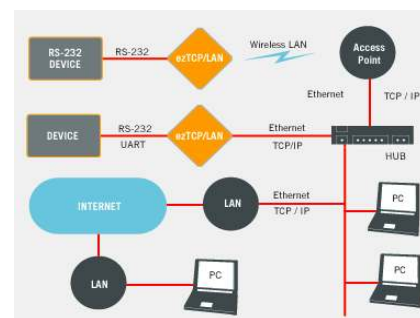

Fig. 2 Specific application of the ezTCP
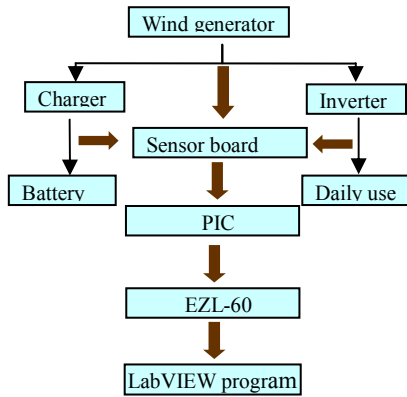
3. Design of the system

Fig.3 the transmission path of the data and the structure of the system

Fig.3 shows the structure of the whole system and the transmission path of the data. The system is composed of wind generator, charger, battery and inverter. The monitoring program collects and manages the data by connecting the output terminal of the wind generator, the input terminal of the battery and the output terminal of the inverter. The power source which is produced by the wind generator charges the battery, so the monitoring program should do monitoring to the output voltage and current of the wind generator. And the monitoring program should get the states of the battery. It uses the PIC to collect the data, and send the data to the LabVIEW program through the Internet network after the conversion of the EZL-60. Based on these, we design the system as the flowing.

3.1 Design of the LabVIEW program
3.1.1 Wind generator monitoring program.

Fig.4 Main screen of wind generators monitoring program

Fig.4 shows the voltage and the current of the wind generator, and the block diagram is showed as Fig.5.
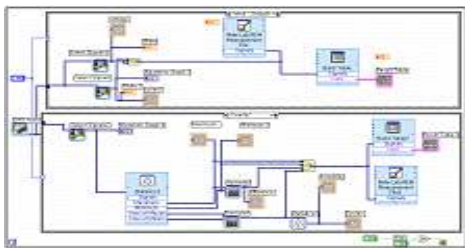

Fig. 5 TREND screen of wind generator monitoring system

3.1.2 Battery monitoring program
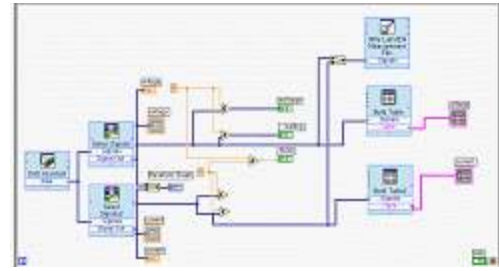

Fig.6 Monitoring screen of battery

Fig.7 TREND screen of battery monitoring system

From Fig.6, we can get the state of the battery by the recharge, finish and waiting LED. Fig.7 is the block diagram of the battery monitoring program.

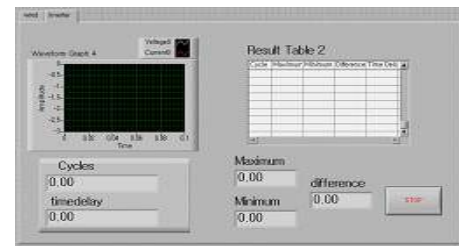### 3.1.3 Inverter output monitoring program
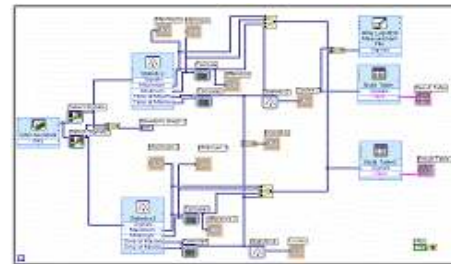

Fig. 8 monitoring screen of inverter

Fig. 9 TREND screen of inverter monitoring system

The inverter monitoring program can measure the pick-pick value of the inverter output, the voltage and the current which are through the inverter. And it also can save the input and output of the inverter. Fig.9 is the block diagram of the inverter monitoring program.

3.1.4 Data receiving and sending program
Since we use Internet network to transmit the data, we need design the data receiving and sending program based on TCP. The VI function module based on TCP connection which is provided in LabVIEW will be used, which is showed in the Fig.10. And they can be used in the block diagram directly.

Fig.10 TCP VI function module of LabVIEW

Design of the work module of the receive part:
(1) Open TCP connection.
(2) Build data transmission channels

(3) Make judgment in connection procedure
(4) Receive the data, using the TCP read module
(5) Do the relevant post treatment to the received data
The receive part program is showed as the Fig.11.
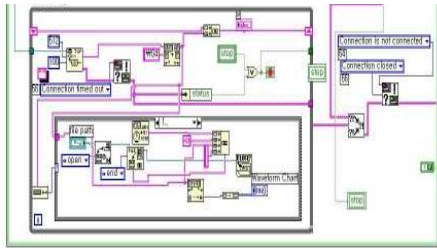

Fig.11 Block Diagram of the receive part

The receive part listen in the LAN-port all time, so it can receive the data real time.

Design of the work module of the sent part:
(1) Open PIC connection.
(2) Build data transmission channels
(3) Make judgment in connection procedure
(4) Sent order, using the TCP write module
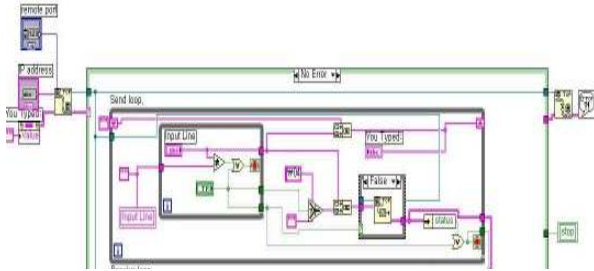The send part program is showed as the Fig.12.

Fig.12 Block Diagram of the receive part

The sent part can send data to the certain IP address. Because every EZL-60 has the IP address itself, so we can send the data to the certain PIC through the EZL-60.

3.2 Design of the PIC program

And in this system, we use PIC16F877 to collect data, PIC16F877 has the A/D module, so when we collect the analogy data, it don't need extra A/D converter. According to the design requirements, PIC should complete four major tasks: system initialization, analogy voltage acquisition, data processing and data sending. The Program flow is showed as Fig.13.
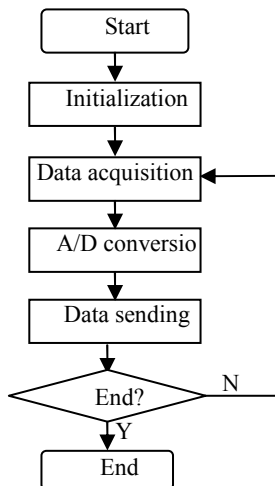

Fig.13 Program flow of the PIC

PIC starts after receiving the start-order, collects the data, do A/D conversation and send out the data from RS232. It will not stop until receiving the stop-order.

3.3 Data conversion and transmission

This system has the point that in the data transmission the special network is not need by using the Internet network. So the data conversion is necessary.

Fig.14 picture of the EZL-60

In this system we use the ezl-60 which is showed in Fig.14 to connect the PIC to the Internet network. EZL-60 is a serial port to TCP/IP converter, in which one serial port and one Ethernet port (10Base-T) are installed. And the work mode of the EZL-60 what we use is T2S mode. In this mode ezTCP always wait for a connection request from an external device without voluntarily connecting itself to an external server or PC.

The serial communication between PIC and EZL-60 Use standard RS232, and use 9 pin serial port connector. But in order to simplify design, here just use the TXD and RXD. So the connecting between serial port connector and PIC serial port is easy, we just need connect the TXD pin connect to the 3 pin of the serial port connector and connect the RXD pin to the 2pin of the serial port connector. But the serial port output and input of the PIC is TTL/COMS level, the serial port output and input of PC is RS232 level, so it is needed to do level conversion between PIC and PC serial ports. In this system, we use the MAX 232 to do level conversion.

4. Conclusions

In this paper, it shows the wind generation system which uses the monitoring technology. And this system is up to the mustard for the location and environment. The monitoring program just uses the software and simple drive circuit without using expensive device. And in the data transmission, it has the point that the special network is not needed by using the Internet network. So it can be operated in long distance cheaply. And the whole system can receive the data correctly and listen in them real time. The work delay is only affected by the network conditions.

Reference

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