DESIGN OF INDUSTRIAL ENVIRONMENT MONITORING SYSTEM USING MIMO SYSTEM

K.Rathnavel, M.Shanthi

Abstract—In past few years controlling and monitoring the machines remotely has seen an interesting field of study among researchers. This paper mainly focuses on reviews in the field of remote monitoring, single space total projection technology used and their potential advantages. The paper proposes a remote based controlled automated system with controlling and monitoring the industrial parameters. In this system the industrial parameters like pressure, temperature, level, speed, humidity is taken for controlling and monitoring. All the industrial parameters are controlled and monitored virtually. The simulation part is done using LabVIEW. In this system the information is virtually transferred from external source to LabVIEW. The system informs users about many conditions like status of pressure, humidity, temperature, water level and speed. The controlling and monitoring is done virtually using the software tools available.

Keywords—*LabVIEW, virtual, monitoring, dock light, VSPE, VISA, interfacing .*

I. INTRODUCTION

In the present system, every system is monitored by the local person working in that area. He has to check the say tank level and the level should be maintained. The quality of the water should be checked periodically. If there is any mistake in the checking process then it spoils the whole system. Because the calculation and tests are carried by the human. In another type of monitoring system each and every parameter are monitored by pc in which individual controlling and monitoring set up are made for successful running of process.

In this project single space total projection algorithm has been used for monitoring the MIMO system. The MIMO system is industrial parameters such as pressure, temperature, level, humidity and speed

Single space total projection system provides information about the industrial parameters values individually. Hence individual space (display unit) has been created in simulation for all the industrial parameters for monitoring purpose. All the individual parameters can be monitored at any instant and can also be controlled.

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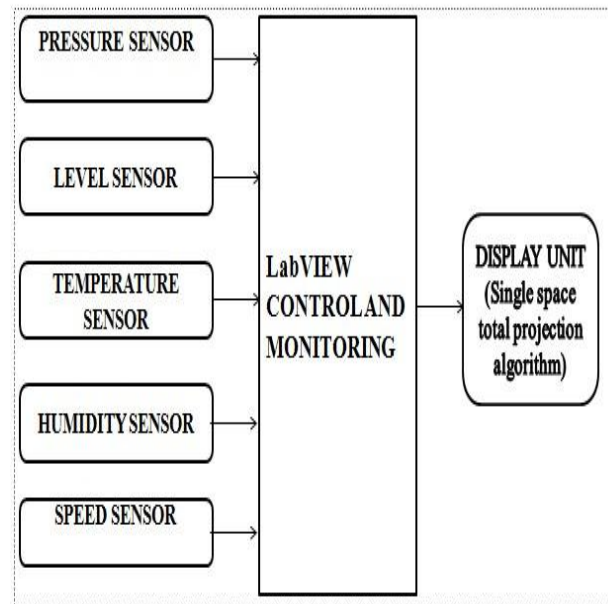
Fig. 1. Monitoring setup

II. SOFTWARE MODULE

Software's are to call the coding of the desired application for the corresponding system. Here totally 3 Software's have been used, LabVIEW 8.5. DOCK LIGHT VSPE (Virtual Serial Port Emulator).

A. LabVIEW

LabVIEW is abbreviated as Laboratory Virtual Instrument Engineering Workbench. LabVIEW is used for virtual controlling and monitoring of systems. Here it is used for controlling and monitoring the industrial parameters like pressure, temperature, humidity, level and speed.

B. VISA

VISA stands for Virtual Instrument Software Architecture developed by VXI plug and play systems alliance. It provides a standardized software interface permitting the use of instruments under RS485, RS232 or any other hardware protocol. This section introduces the VISA Implementation Specification for the G Language. This specification is a document authored by the VXI plug & play Systems Alliance. The technical work embodied in this document and the writing of this document was performed by the VISA Technical Working Group. This section provides a complete overview of the VISA implementation specification, and gives readers general information that may be required to understand how to read, interpret, and implement individual aspects of this specification.

1) VISA LIBRARY

VISA I/O library The VISA specification provides a common standard for the VXI plug & play System Alliance for developing multi-vendor software programs, including instrument drivers. This specification describes the VISA software model and the VISA Application Programming Interface (API). The VISA Implementation Specification for the G Language addresses particular issues related to implementing source and binary level compatibility within G Language framework systems.

a) The basic operations:

1. Establish a link with VISA driver.
2. Open a communication channel with the instrument under VISA.
3. Communicate with the instrument using its command set in standard commands for programmable instruments (SCPI).
4. Terminate the session and close the VISA channel to the instrument.

2) VISA BLOCKS

VISA read-Reads the specified number of bytes from the device or interface specified by **VISA resource name** and returns the data in **read buffer**.

VISA write-Writes the data from **write buffer** to the device or interface specified by **VISA resource name.**

VISA clear-Clears the input and output buffers of the device.

3) VISA SERIAL PORT

Enable Termination Char prepares the serial device to recognize termination char. If TRUE (default), it is set to recognize the termination character. If **FALSE**, it is set to 0 (None) and the serial device does not recognize the termination characteristics. **Timeout** specifies the time in milliseconds, for the write and read operations. The default is 10000. **Baud rate** is the rate of transmission. The default is 9600. **Data bits** are the number of bits in the incoming data. The value of **data bits** is between five and eight. The default value is 8. **Parity** specifies the parity used for every frame to be transmitted or received. **Stop bits** specifies the number of stop bits used to indicate the end of a frame.
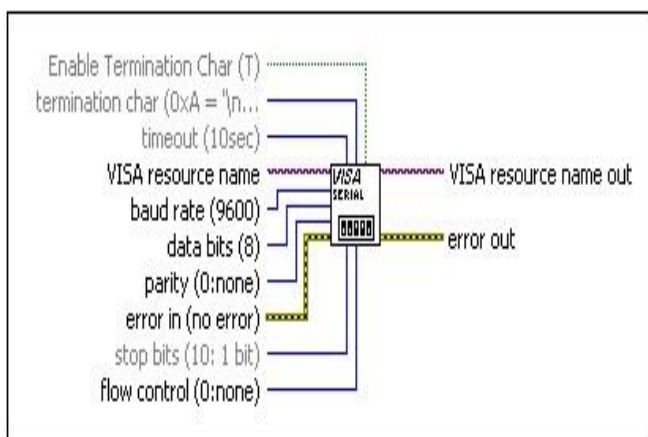
C. DOCK LIGHT

DOCK LIGHT is a special type of software which is used to give the set values of the required parameters virtually. For the values of real time parameters like pressure, temperature, level, humidity, speed **DOCK LIGHT** software is being used. **DOCK LIGHT** transfers the data at a specific baud rate (9600).

Dock light has also been successfully tested with many popular USB to Serial converters, Bluetooth serial ports, GPS receivers, virtual null modems, Arduino, or other Embedded Development environments that add a communication port in windows. Dock light will work with the COM communication ports provided by your operating system. Physically, these ports will be RS232 SUB D9 interfaces in many cases. However, it is also possible to use Dock light for other communication standards such as RS485 and RS422, which have a different electrical design to RS232. Dock light provides both send sequences and receive sequences and the sequences are transmitted and received very quickly.

Dock light lets you specify user-defined answers to the different communication sequences received. This allows you to build a basic simulation for your serial device within a few minutes. It can also help you to trace a certain error by sending out a diagnostics command after receiving the error message. Dock Light RS232 Adapter has two connectors:

- RS232 - SUB D9 Male connector, DTE standard pin out
- USB - USB Type A connector
- Cable length is 2.0m

D. VSPE

VSPE is abbreviated as Virtual Serial Port Emulator. VSPE is a virtual Rs-232 device which is used to transfer the virtual data's from one port to another port which is assigned. In VSPE totally 256 ports are available for the data communication.
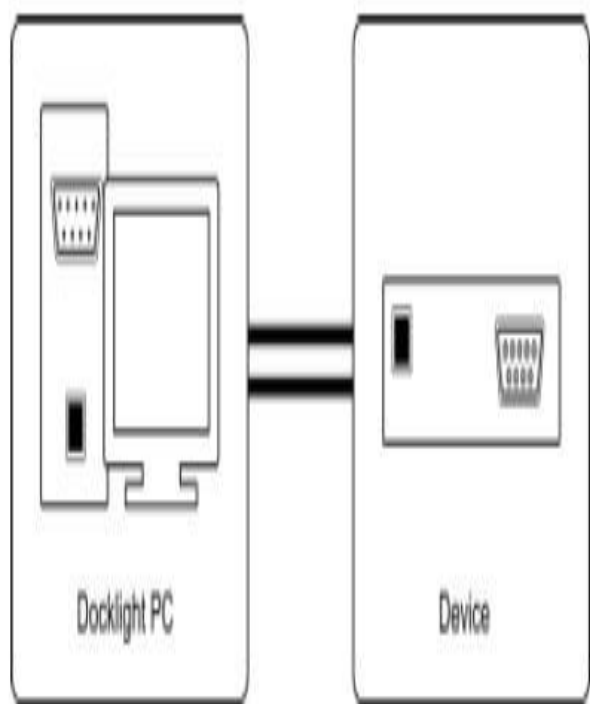

Fig. 2. VISA Serial Port

Fig.3. DOCK LIGHT Interfacing

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It provides binary data exchange between devices or applications. With this program you can share physical serial port data for several applications. You can create several virtual serial ports with different purposes and even one single serial port can be used for several applications also. The program creates virtual devices with different capabilities. Device types Connector, pair and Splitter creates new serial ports with different features. Device types Tcp Server, Tcp Client, Serial Redirector and UDP manager don't create serial ports; they are focuses to the transmission/reception of data.

Virtual Serial Ports Emulator provides a good option to create serial ports since serial ports are not used widely anymore. It creates a lot of virtual serial ports working simultaneously.

III. VIRTUAL INTERFACING

The interfacing between LABVIEW and DOCK LIGHT software is done with the help of the VSPE software. In VSPE 256 ports are available for interfacing purposes. In that any two ports are paired for virtually connecting the LABVIEW and DOCK LIGHT.

A. VSPE INTERFACING

The first step in virtual serial port emulator is to pair any two ports which are available for the communication. After clicking pair option any 2 ports are selected from the 256 ports available for pairing. By pairing the two communication ports the data's can be transferred virtually from dock light to LabVIEW. After clicking pair option any 2 ports are selected from the 256 ports available for pairing. By pairing the two communication ports the data's can be transferred virtually from dock light to LabVIEW.

B. DOCK LIGHT INTERFACING

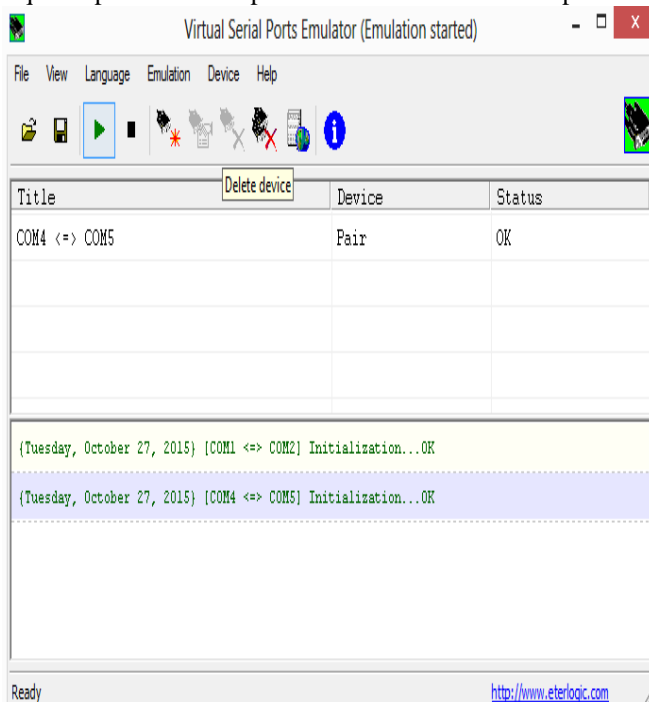The interfacing part in dock light is done by selecting the required ports which is paired in the VSPE. The one port
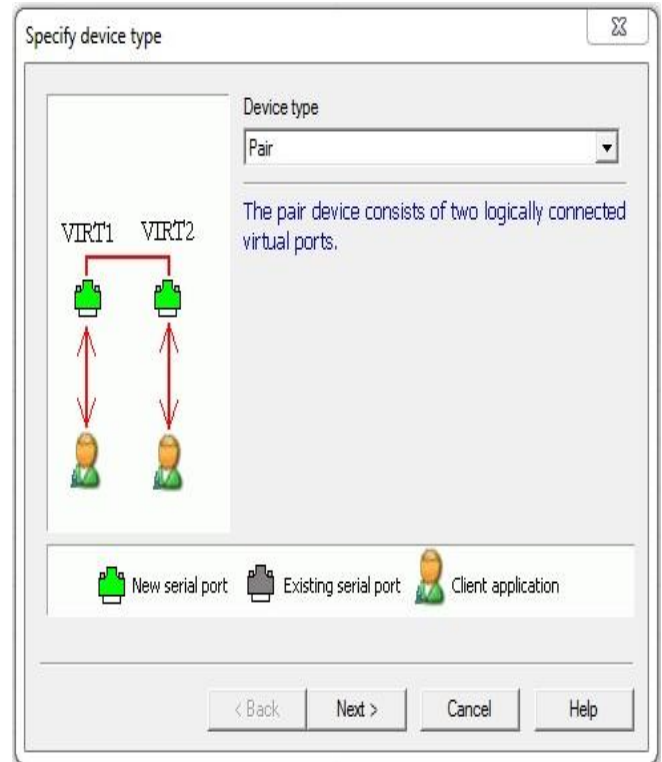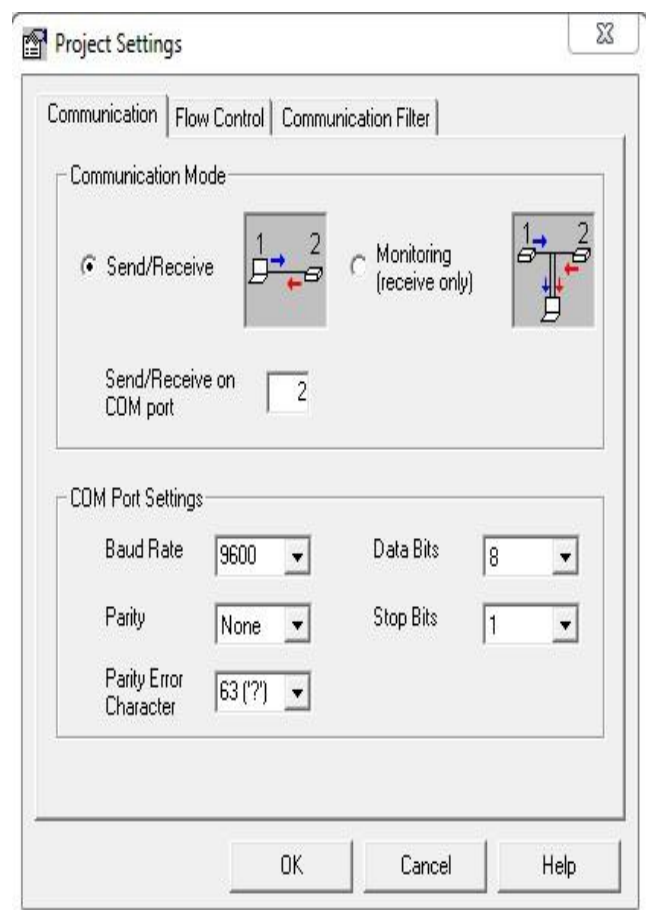

Fig.5. VSPE Device Pairing

Fig.6. DOCK LIGHT Project Settings

Fig.4. VSPE Software

name is selected in project setting which is available in dock light. After selecting the port and send/receive icon the sequence is been edited in the edit send sequence dialogue box and the data's are transmitted sequentially and continuously from dock light to LabVIEW.

C. LabVIEW INTERFACTING

The I/O name controls and indicators to pass DAQ channel names, VISA resource names, and IVI logical names you configure to I/O VIs to communicate with an instrument or a DAQ device. The other port name is selected in the VISA resource name which is available in the LabVIEW front panel. The port name is selected in the COM port name box.

IV. RESULT ANALYSIS

The required block for all the industrial parameters is inserted in the front panel and block diagram screen of LabVIEW. A string has been created for displaying which set of values is being acquired. The no of bytes per second has also been monitored.

A. SIMULATION FRONT PANEL

The front panel of the LabVIEW has been created for industrial parameters like pressure, temperature, humidity, level and speed.
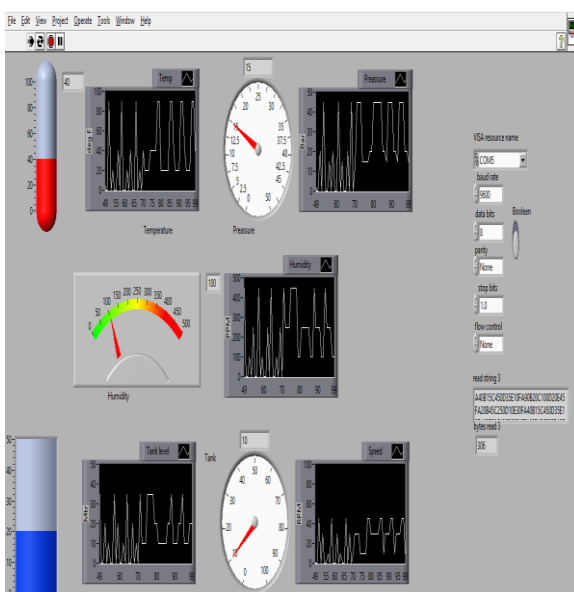

Fig.7.VISA Resource Name

Fig. 8. Simulation Front Panel

V. Conclusion

Hence the simulation block diagram is created for the project. The controlling and monitoring can be done for the simulation module created. The change in the values of the parameters is monitored by a graph. If any changes required means the set values can be varied in DOCK LIGHT. The simulation process helps to control and monitor in DOCK LIGHT and LabVIEW respectively. By single space total projection algorithm ease of monitoring is obtained from the simulation module created. Thus the industrial parameters like pressure, temperature, humidity, level, speed are controlled and monitored virtually.

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