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Universal Modbus RTU Datalogger

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ABSTRACT

In Computer Field, there are large number of peripheral an embedded devices are available which provides specific information. The System aims to design a software that uses Modbus serial communication protocol to interface various devices. Any Modbus device can be connected to computer at communication (com) Port. The data received at connected com Port will be displayed on computer with report and graphical format for implementation purpose LXT-330 sensor device will be used.

Keywords : Modbus, RTU, LXT-330.

I. INTRODUCTION

Universal Modbus RTU Datalogger can be used universally by various type of embedded devices, the devices only which are connected to Modbus by COM port. In this project we have used RTU protocol for sending data from device to GUI.

1.1 Problem Definition

In industry embedded device like pH sensor, speedometer etc is used to generate reading, but this reading display on device for few second. A system have been introduced that uses Modbus serial communication protocol to interface such devices to computer. It displays reading in textual as well as graphical format from sensor or device using Modbus RTU protocol.

1.2 Existing Systems

Various sensors like pH sensor, speedometer etc generates reading on its LCD display and these readings are temporary. So these readings must be stored for future reference. We can't record the reading of devices, if we need this reading in future for any task. Multi-channel devices are not supported in current system.

1.3 Need for New System

In industry embedded devices are used to generate reading, but this reading display on device for few seconds and the readings were not stored for future so we can't use it.

The need of this system is that it enables Modbus RTU protocol to interface devices to computer that shows readings in graph, reports and real time readings and also stores the records of the readings for future references.

1.4 System Objective

The objective of this project is to develop a software module that is capable of connecting the embedded devices to computer for visualizing the readings through Modbus RTU protocol. Also the efforts are taken to create an easy to use graphical interface system for the operation of such devices. This main objective of this device is that it stores the readings for future reference.

II. LITERATURE SURVEY

2.1 Related Work

2.1.1 Modbus 32 (Modbus Master Simulator)

Modbus Master Simulator is an excellent tool to simulate a Modbus Master and test slave device.
-Supports Modbus RTU and Modbus TCP/IP
-Read Coil status (0xxxx), Input status (2xxxx), Input registers (3xxxx) and holding registers (4xxxx)
- Data can be displayed as: Decimal, Integer, Hexadecimal, Binary, 32 bit float, 32 bit sw. float, 64 bit float, 64 bit sw. float
-Supports multiple connections
-Connection definitions can be saved for use in future
-Extremely easy to use with its intuitive interface

2.1.2 Oakes

Modbus RTU Data-logging Software was designed for engineers, technical support personnel, and others who need an easy way to reliably gather, review, and log data from devices using the standard Modbus RTU protocol interface to a PC computer. Where possible configuring Modbus data has been simplified and error checking and error recovery has been automated.

Configuration files can be saved and loaded so that information does not have to be re-entered multiple times. Data is easily viewed via onscreen indicators, readouts, and trending plots and values can be data logged to CSV files for later review and processing.

III. P ROPOSED SYSTEM AND METHODOLOGY

Various sensor were used for reading purposes. This system have been proposed because if there is a need of any reading for future references so for that purpose the readings can be stored. This readings can be displayed in Graph, Report and Real time Reading.

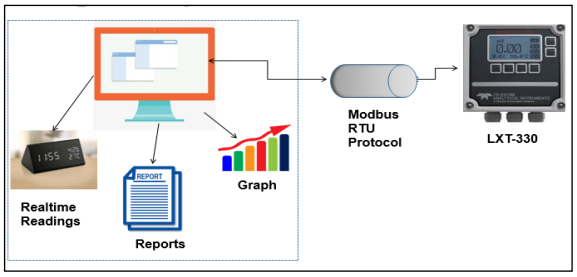

Fig 1. System Architecture

3.1 Modules

Sensor- It is a device which generates the readings and module whose purpose is to detect events or changes to detect events and send the information to computer. A device which provides a usable output in response to a specified measured. A sensor acquires a physical parameter and converts it into a signal suitable for processing.

Modbus - It is a serial communication protocol between master and slaves. Modbus RTU is by far most common implementation using binary coding and CRC error checking. Modbus RTU devices are typically is one of three electrical interfaces that are RS 232, RS 485 and RS 422.

GUI- It is a software module that have displayed various functionalities in three formats like displaying textual reading, graphs and real time values.

3.2 Procedure

Step 1: Connect device to PC.
Step 2: Check that the device registered or not.
Step 3: If device is already registered report will be generate automatically.
Step 4:If device is not registered, then
a) Register device with proper parameters.
b) Store device details in database.
c) Initiate device and start reading holding registers.
d) Transfer data from device to user interface through Modbus RTU protocol.
Step 5: Display real-time reading.
Step 6: Store data in database.
Step 7: Generate Graph.

Step 8: If device stopped by user, then GUI will generate report.

3.3 Application

i. Industry
a. Chocolate factory.
b. Food factory.
c. Sugar Factory.
d. Boiler temperature sensing.
ii. Agricultural
a. Soil testing.
b. Fertilizers.
iii. Water testing.
iv. Pollution Detection and tracking.

IV. DESIGN

4.1 Use Cases of system

A use case defines behavioural features of a system.

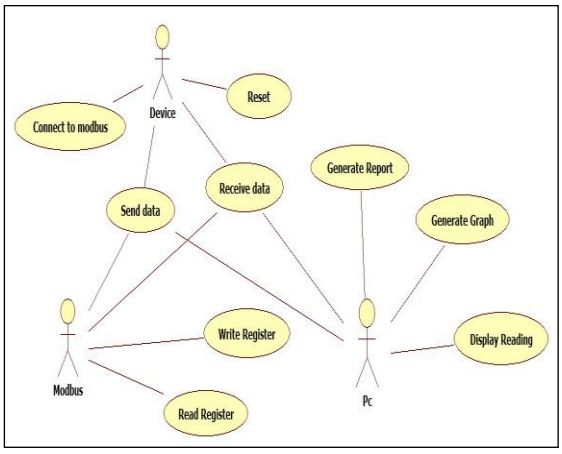

Fig. 2. Use case diagram

4.2 Class Diagram

A class diagram shows a set of classes, interfaces and collaborations and their relationship.

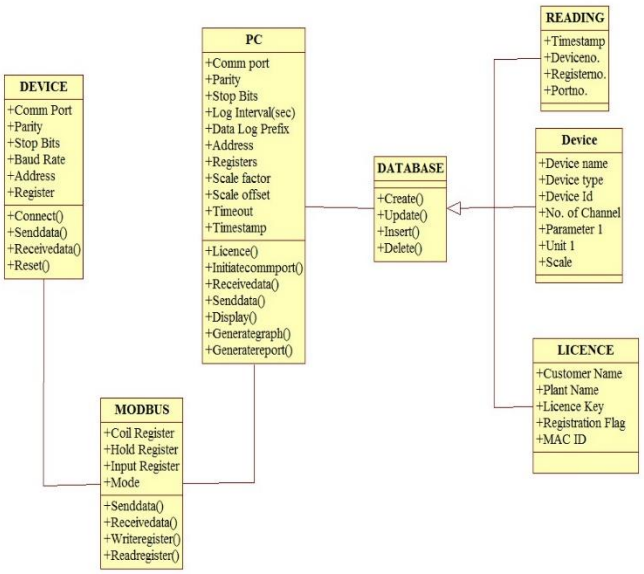

Fig. 3. Class Diagram

4.3 System requirements

Normal Requirements

– Generate Reports.
– Real-time Graph generation.
– Any device conforming to Modbus Protocol can be connected.

Expected Requirements

– Easy to Use.
– Generate Report in different pattern like as parameter, time, and date.

Exciting Requirements

– Generate different types of graph.
– Generate export report in CSV.

V. IMPLEMENTATION

5.1 System Modules

Module 1: Device Configuration

1.1: Add device Details: By this option Max devices can be added upto the value set by (2.1: Set port)

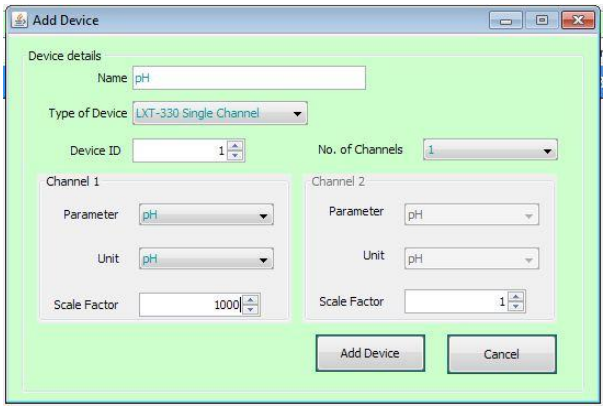

Fig. 4. Add device details

1.2: Update Device Details: By this option user can make correction in existing Device Configuration.

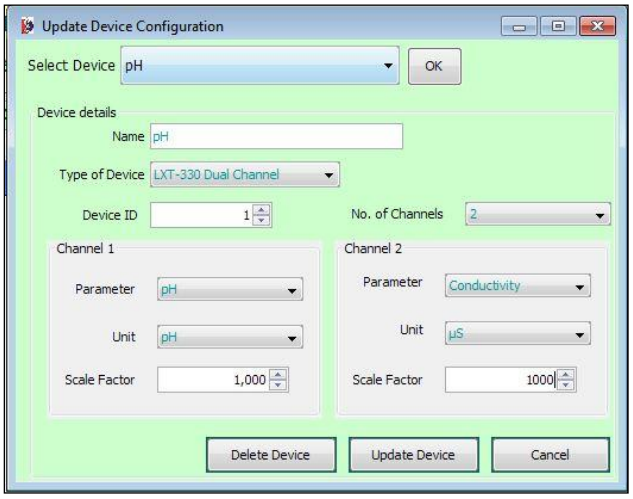

Fig. 5. Update device details

1.3. Delete Device Details: By this option user can delete existing Device Configuration

Module 2: Settings

2.1: Set port: Select port from Existing Port of System.

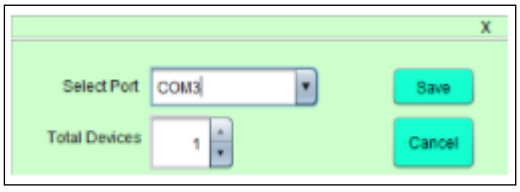

Fig. 6. Set port and Set Device

2.2: Set Device: Select total number of devices connected to system.

Module 3: Registration of Customer

3.1: User information is entered with License Key: This need Physical address of system (MAC Address that will be provided by user before installation) to generate a license key.

Module 4: Reading Display

4.1 Customer Information: The information will be taken as per information entered by user at the time of Registration (Module 3: Registration of Customer)

4.2: Real Time Data Analysis: The data sent by LXT-330 device through holding registers is captured and displayed in short real format

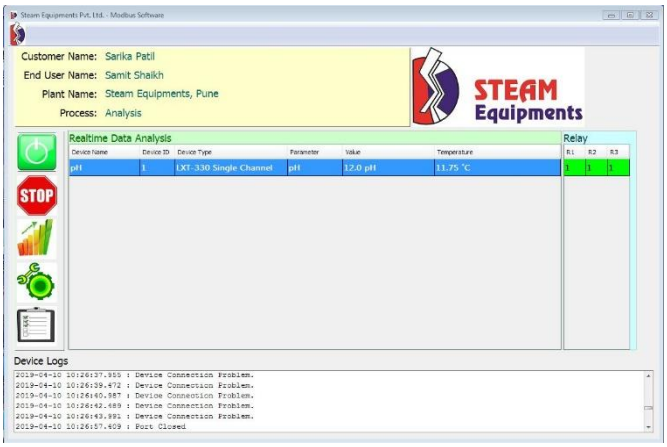

Fig. 7. Real Time Data Analysis

4.3 Graph: Separate Graph for each reading will be displayed by clicking on Graph Checkbox.

Fig. 8. Real time graph for readings

VI. RESULTS

This device records the real-time readings and generates the graphs and reports as shown below:

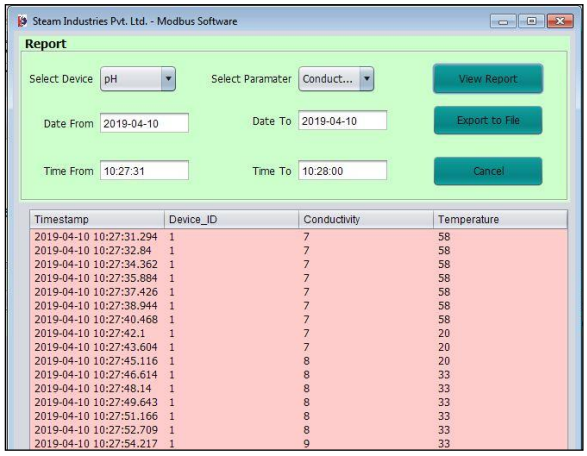

Fig. 9. Report generation and export

	ID	timestmp	dev_no	c1r63	c1r67	c1re1	c1re2	c1re3
1	2484	2019-04-10 10:27:31.294	1	7	58	1	1	1
2	2485	2019-04-10 10:27:32.84	1	7	58	1	1	1
3	2486	2019-04-10 10:27:34.362	1	7	58	1	1	1
4	2487	2019-04-10 10:27:35.884	1	7	58	1	1	1
5	2488	2019-04-10 10:27:37.426	1	7	58	1	1	1
6	2489	2019-04-10 10:27:38.944	1	7	58	1	1	1
7	2490	2019-04-10 10:27:40.468	1	7	58	1	1	1
8	2491	2019-04-10 10:27:42.1	1	7	20	1	1	1
9	2492	2019-04-10 10:27:43.604	1	7	20	1	1	1
10	2493	2019-04-10 10:27:45.116	1	8	20	1	1	1
11	2494	2019-04-10 10:27:46.614	1	8	33	1	1	1
12	2495	2019-04-10 10:27:48.14	1	8	33	1	1	1
13	2496	2019-04-10 10:27:49.643	1	8	33	1	1	1
14	2497	2019-04-10 10:27:51.166	1	8	33	1	1	1
15	2498	2019-04-10 10:27:52.709	1	8	33	1	1	1

Fig. 10.Database entries showing stored values of readings

VII. CONCLUSION

The development of this system took efforts in understanding how universal Modbus RTU Datalogger works by connecting the embedded devices (LXT-330) to computer for visualizing the readings through Modbus RTU protocol.

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