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Cell Phone Based Liquid Inventory Management Using Wireless System

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Abstract – Liquid inventory is very difficult to track because there are so many factors that affect the inventory levels. Some of the factors that make liquid inventory so hard to measure and track. However, just because liquid inventory is difficult to measure and track, doesn't mean it isn't worthwhile. Designed this automated tank gauging and data tracking system to solve many problems tank owners, tank managers, operators, and producers were having with managing their liquid inventory. In this project we will have the float sensor kept in all the oil containers and this data is then fed to the micro controller as shown in the block diagram above. The micro controller is then connected to the user cell using the blue tooth module. The cell phone has software using which the user can connect to the micro controller using the blue tooth present in the cell phone. The software will read the data from the micro controller and it will display the same depending on which oil content the user would like to know. Thus it's the best possible way how the person can keep track of the oil stock and plan for the same without any human intervention and the risks associated with the same. This system can provide custom solutions that can bypass our controller and send signals straight to your system. Users can remotely receive conditional text, messaging when conditions require a response.

Keywords – Pic Microcontroller, Blue Tooth Module,Smart Phone

1. Introduction

Liquid Inventory management is primarily about specifying the size of stocked liquid. Inventory management is required at different locations within a facility or within multiple locations of a supply.

The old way of managing fuel, with manual or infrequent measurement and regularly scheduled delivery routes, is grossly inefficient, it's essential for companies to manage liquid and bulk inventory. Inventory management application that allows remote tank monitoring and just-in-time replenishment even for mobile or rolling stock.

Remote monitoring are becoming more and more popular in oilfields .Without a system like the Tank Warden, tracking the liquid inventory becomes tedious, inefficient, and unreliable. Company that operates a tank farm, terminal, refinery or bulk storage facility has its own business requirements for managing bulk liquid petroleum assets. Meeting these requirements, through one flexible, configurable interface, remote tank monitoring performs carefully tracking how much inventory is on hand.

With a simple, secure login, you can instantly know quantity of your resources, with easy-to-install sensors and affordability and flexibility, you can track of the oil stock. Manage tank levels for fuel, propane, saltwater and other chemicals. The system lets personnel know, automatically via text. The project is focus to make the user use the cell phone to know the status of the oils in the containers without opening the lid and with utmost ease.

In this project we will have the float sensor kept in all the oil containers and this data is then fed to the micro controller as shown in the block diagram above. The micro controller is then connected to the user cell using the blue tooth module.

The cell phone has software using which the user can connect to the micro controller using the blue tooth present in the cell phone. The software will read the data from the micro controller and it will display the same depending on which oil content the user would like to know.

Thus it's the best possible way how the person can keep track of the oil stock and plan for the same without any human intervention and the risks associated with the same. This system can provide custom solutions that can bypass our controller and send signals straight to your system. Users can remotely receive conditional text, messaging when conditions require a response. This system is able to communicate directly with any Modbus-RS485/RS422/RS232 communication system.

Another competence TankLogix uses is their ability to customize these tank gauging and inventory systems to the customer. Each customer has different data that they like to track, different fluids that they are tracking, which require

slightly different components and programs. TankLogix is prepared to track any fluid, in any tank, in any environment, anywhere in the world

2. Problem with the Existing System

The old way of managing fuel, with manual or infrequent measurement is grossly inefficient. Without a system like the Tank Warden, tracking the liquid inventory becomes tedious, inefficient, and unreliable. There are many technologies that offer automatic remote tank monitoring that use some remote communication system. But problem with existing solution for remote liquid inventory management is not able to communicate directly with any Modbus-RS485/RS422/RS232 communication system. And the existing remote liquid inventory fails to receive data from sensors which are remotely located when feedback sensors are many in numbers.

3. Solution for Problem

This system can provide custom solutions that can bypass our controller and send signals straight to system. Users can remotely receive conditional text, messaging when conditions require a response. With a simple, secure login, you can instantly know quantity of your resources, with easy-to-install sensors and affordability and flexibility, you can track of the oil stock. Manage tank levels for fuel, propane, saltwater and other chemicals. This system is able to communicate directly with any Modbus-RS485/RS422/RS232 communication system. The software application developed can receive data from the remote any number of feedback sensors on request from the receiver side.

4. Design and Implementation

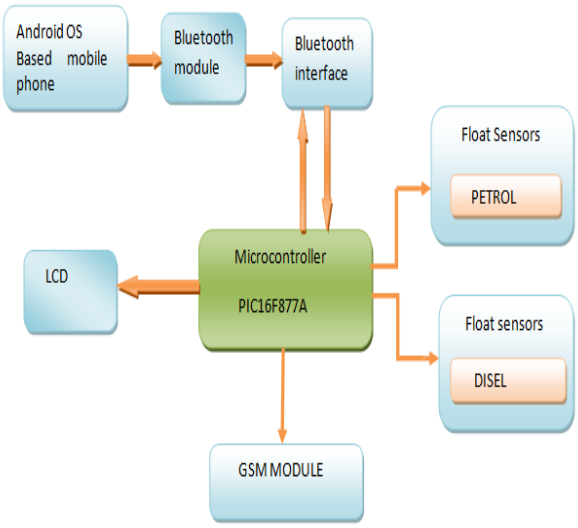

Figure 1: Block of liquid inventry management

The block diagram of the implemented system is including Bluetooth , Float sensors, microcontroller, android OS based device and GSM module associated with data communication. The Smartphone materializes the main computing platform and data storage associated with the liquid level. A distributed data processing is implemented in the system. The primary processing, including acquisition of liquid level value from the float sensors, is performed in the microcontroller of the device. The intermediate processing and data representation is performed at the Smartphone level, while the advanced data processing is performed by the microcontroller. A PIC microcontroller platform performs the signal acquisition, primary processing, and data storage and data communication.

Acquisition, primary processing, data storage and data communication by microcontroller The "brain" of the liquid inventory is a microcontroller platform based on PIC24F. Sensing and signal conditioning components of the microcontroller platform that were previously described. Important tasks such as signal acquisition, primary processing, LCDs user interface control, and data storage and data communication are performed by the PIC24F microcontroller based on an implemented firmware developed in the MPLAB C30 compiler from Microchip.

In this project we will have the float sensor kept in all the oil containers and this data is then fed to the micro controller as shown in the block diagram above. The micro controller is then connected to the user cell using the blue tooth module. The cell phone has software using which the user can connect to the micro controller using the blue tooth present in the cell phone. The software will read the data from the micro controller and it will display the same depending on which oil content the user would like to know. Thus it's the best possible way how the person can keep track of the oil stock and plan for the same without any human intervention and the risks associated with the same.

4.1. Proposed System

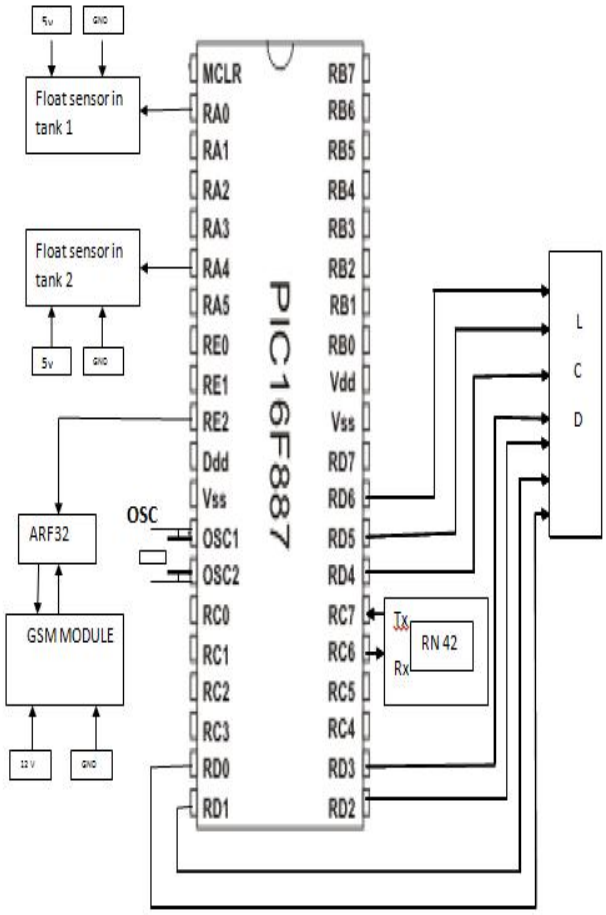

Figure 2: Circuit description

The PIC16F877A microcontroller is the heart of this proposed design. It is a 40 pin, 8 bit CMOS flash microcontroller. It has 5 input/output ports A, B, C, D, and E. It has a built-in 10 bit ADC. The Bluetooth receiver is connected to port C of PIC16F877A. Pin C6 is used for transmission, while C7 is used for reception. The microcontroller and mobile communicate with each other through Bluetooth. The commands sent by android device are communicated Bluetooth through personnel area network of the Bluetooth.

The sensors signals are acquired using the AN3 and AN0 analog input channels of the Microcontroller. The implemented acquisition rate is 200S/s and the programming recurs to TIMER2 of the microcontroller. The voltage required is 12V DC. These are electronic devices that measure liquid level. Apparent level is detected when there is change in the level of the liquid in the tank.

A GSM module is connected to port E of PIC16F877A. The voltage required is 12V dc. These are electronic devices which receive the message stored in the microcontroller whenever the liquid level in the tank goes less than 10 units microcontroller invoke the message and transmit to the GSM module which send the message to the desired mobile number.

LCD which is used for the display of the Message about the process is connected to the port E of PIC16F877A.

Using an ARF32 Bluetooth module connected to the USART port of the PIC16F877A microcontroller the data array is transmitted to the Smartphone. The USART baud rate used in the present application was of 19200bps.

Bluetooth RN42 is connected to the port C of the microcontroller PIC16F877A. Bluetooth acts as both transmitter and the receiver. Bluetooth module RN 42 is connected to the transmitter pin C6 of port C and the receiver pin C7 of the Microcontroller PIC16F877A is connected to the RN 42 Bluetooth module. The module is communicated through Bluetooth of the android device.

4.2. Smartphone Embedded Software

The Smartphone embedded software was developed in order to assure the intermediate processing of the data, and data communication. Regarding the implemented Bluetooth service, it is used to receive the data from the device in an array byte form.

The Smartphone Desire that runs the Android 2.2 mobile OS, which permits the use of Android SDK and the Java programming language to implement the communication, data processing and representation on the Smartphone display as well as the data management. Important elements of the embedded software are the Activity Classes that are mainly related to the implementation of the user computing interfacing. For the present prototype were implemented a set of activity classes: Sync.java that permits to manage all the information's regarding the application; DashBoard.java that assures the numerical and graphical representation of status of the oil level in the tank. A flowchart associated to the DashBoard.java activity class interaction with Java methods of Bluetooth Debug Service is presented in Figure dashboard.java flow chart.

Additional activity classes used in the Smartphone. Additional activity classes used in the Smartphone software implementation are: IconContextMenu.java that permits to create a menu associated with the selection of the main. BluetoothService.java that is related with Bluetooth data communication; BluetoothDebug.java that permits to display the data that is received from the smart wrist-worn device in numerical format. To identify the existing Bluetooth devices near the Smartphone a BluetoothDevices.java class was implemented. The selection of the Bluetooth compatible module can be done manually or in automatically using the information previously stored in the Smartphone memory.

4.3. Flow Chart of System

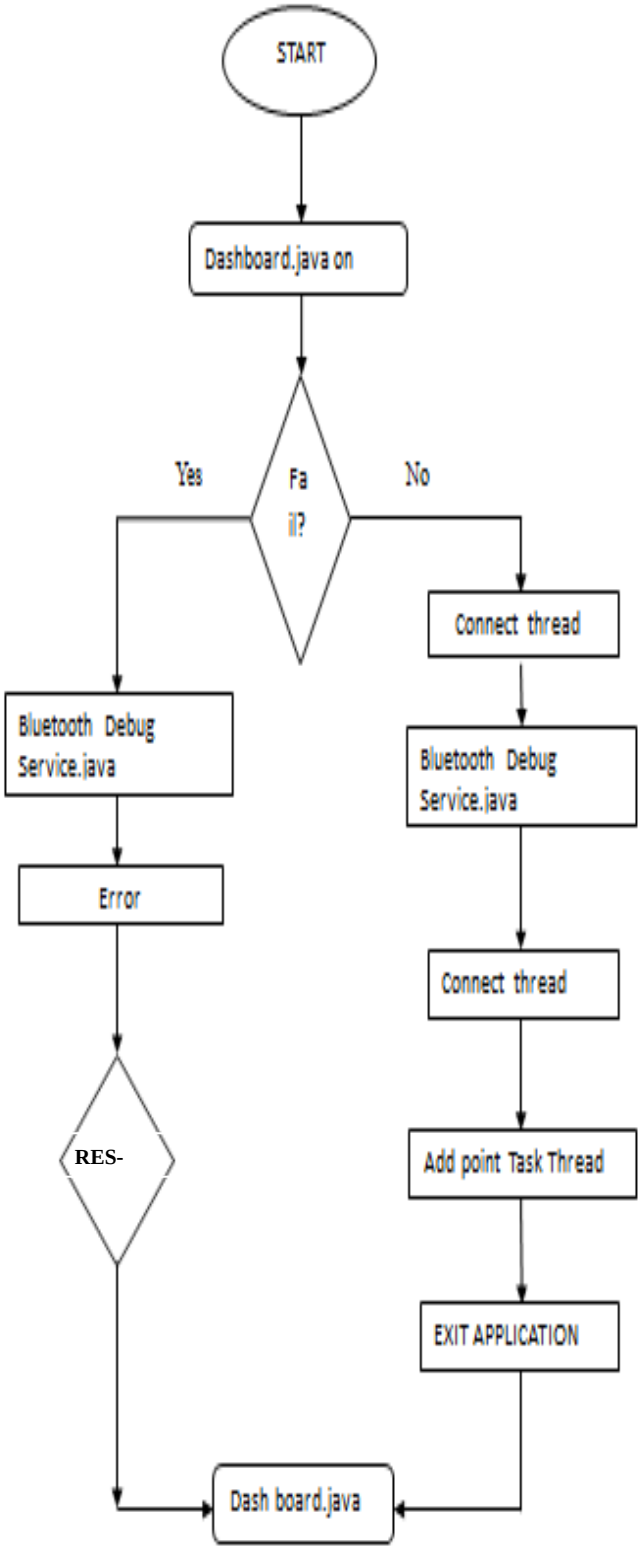

Figure 3: Java dasboard flow chart

4.4. Flow Chart of Liquid Inventory Management Using Wireless System

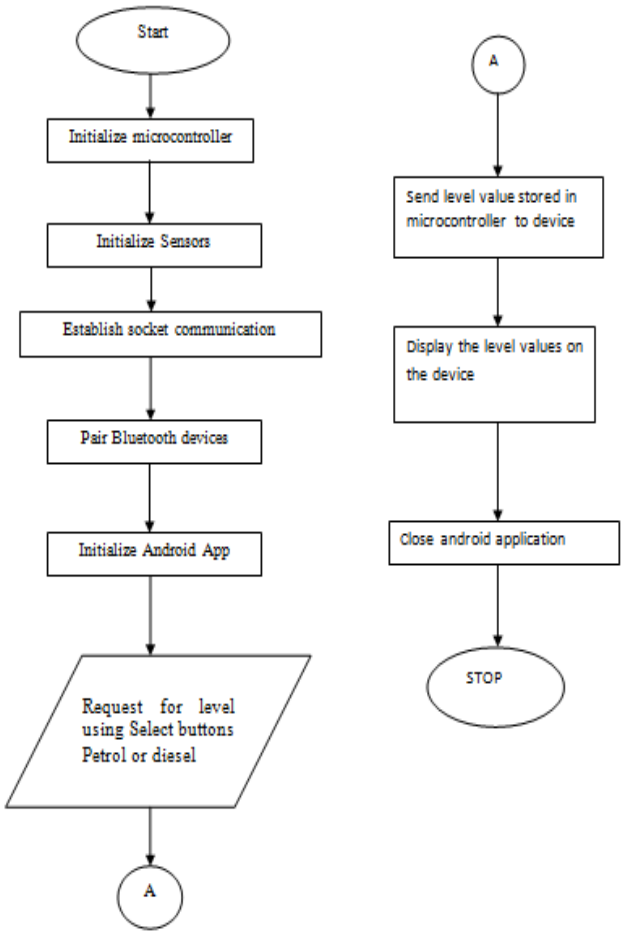

Figure 4: Flow chat of wireless system

4.5. Flow Chart of GSM Part of Liquid Inventory Management Using Bluetooth

Figure 3 shows the complete detailed flowchart of java programming flowchart and Figure 4 & 5 Shows the completed flow of the proposed system and GSM module respectively

5. Results and Discussions

The prototype was designed and implemented including hardware and software associated with three main components: device, pervasive computing through Android OS Smartphone, and Bluetooth for communication. The data from microcontroller formatted in the byte array are wireless transmitted using a Bluetooth connection to the Smartphone which includes the application for communication, intermediary data processing and user interface developed under Android OS.

In Figure 6 is presented the general menu that is used to select the interface for start application. A data communication debug interface is included in the Smartphone general

menu for selecting different options representing different fuel tank.

The data of the information system associated with resulting level of the tank is show in the following fig 7

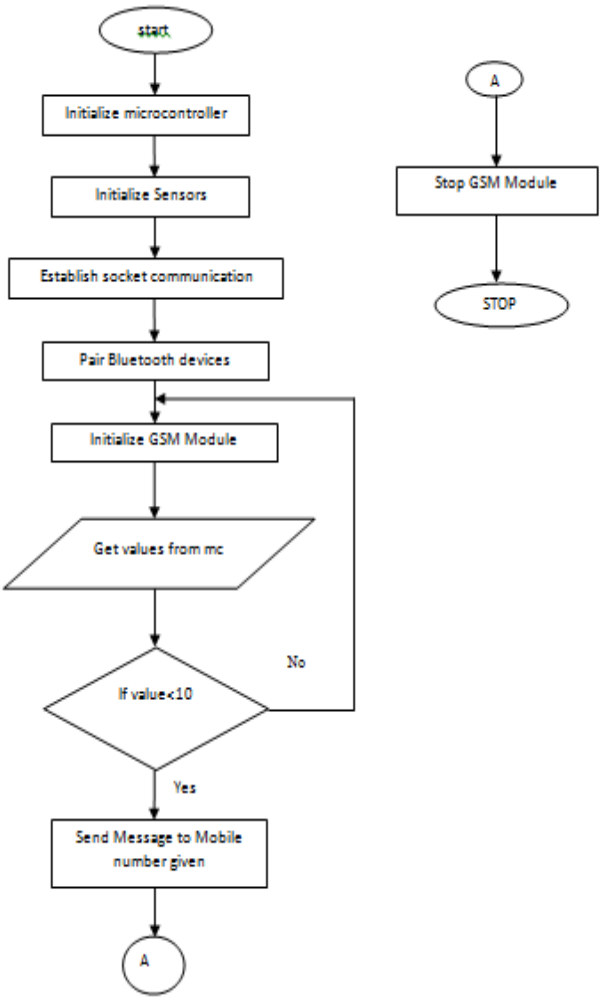

Figure 5: Flow chart of GSM module

Figure 6: General menu for selecting option

Figure 7: Resulting level of the tank

6. Conclusion

A system for long term monitoring of level sensing of oil level in tank and computing was designed and implemented. The system is based on a smart mobile phone and device that incorporates a PIC24F microcontroller and includes two sensing channels that assure the accurate level of the tank using float sensors. The acquired and processed data is transmitted to the pervasive computing unit expressed by a Smartphone. Using an Android SDK and Java based Smartphone application the information from the float sensors received through Bluetooth communication is processed and graphically represented using a graphical user interface adapted to the assessment tasks. Automatically selected data update rate (up to 200 updates/s) permits a real-time visualization of data coming from the Bluetooth module using the Smartphone display. An embedded database was implemented in the smartphone assures the data storage during the interval associated with two synchronizations between the smartphone. Database and the web based information system. Several tests of the distributed system components were carried out proving the effectiveness

of the implemented solution.

7. Future Enchancment

- For long distance communication Wi-Fi can be implemented.
- For moving liquid inventory monitoring GPS can be used.

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