STATUS TRACKING IN INDUSTRIES USING ARM CORTEX M3 BY CAN PROTOCOL

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ABSTRACT

It these days automation in industry's increased rapidly. For safety purpose and to reduce man power in industries, most of the industries are adapting automation. Some automation is fully automatic and some require human control on automation. To provide automation integrating large number of sensor or electronics component in industry plant, In this paper, an intelligent information network called as Controlled area network (CAN) is used to make the system cost effective and efficient for industrial automation. It is a serial bus protocol to connect control system to sensors as an alternative to conventional multi-wire looms. The proposed system is capable of monitoring the number of units manufactured by different machines or manufacturing stations using RFID authentication

Keywords : CAN, RFID, GSM, ARM Cortex-M3

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1. INTRODUCTION

A Controller Area Network (CAN) refers to a network of independent controllers. It is a serial communications protocol that efficiently supports distributed real-time control with a very high level of security. The CAN bus standard was developed by Bosch and Intel and the version of the current standard has been in use since 1990. Are there distance limitations? Can bus is a synchronous network, where all receiving modules synchronize to the data coming from a transmitting module. The electrical characteristics of the CAN bus cable restrict the cable length according to the selected bit rate. You can use cabling up to 250 meters with the baud rate of 250 kbit/s. The maximum bus length with a bit rate of 10 kbit/s is 1 km, and the shortest with 1 Mbit/s is 40 meters. Do I need expensive cabling? In standard industrial environments, the CAN bus can use standard cabling without shielding or twisted pair wiring. If very low EMI is required, a twisted-pair cable is recommended. However, this will normally not be required in most applications. Is the number of nodes (modules on the bus) limited? In CANopen, there are unique addresses available for up to 127 nodes on the bus. However the practical physical limit of nodes is about 110 units per bus. In J1939, there are 253 unique addresses available for the bus.

2. ARM Cortex M3

The LPC176x/5x is an ARM Cortex-M3 based microcontroller for embedded applications requiring a high level of integration and low power dissipation. The ARM Cortex-M3 is a next generation core that offers system enhancements such as modernized debug features and a higher level of support block integration.

High speed versions (LPC1769 and LPC1759) operate at up to a 120 MHz CPU frequency. Other versions operate at up to a 100 MHz CPU frequency. The ARMCortex-M3 CPU incorporates a 3-stage pipeline and uses Harvard architecture with separate local instruction and data buses as well as a third bus for peripherals. The ARMCortex-M3 CPU also includes an internal prefetch unit that supports speculative branches.

The peripheral complement of the LPC176x/5x includes up to 512 kB of flash memory, upto 64 kB of data memory, Ethernet MAC, a USB interface that can be configured as either Host, Device, or OTG, 8 channel general purpose DMA controller, 4 UARTs, 2 CAN channels, 2 SSP controllers, SPI interface, 3 I2C interfaces, 2-input plus 2-output I2S interface, 8 channel 12-bit ADC, 10-bit DAC, motor control PWM, Quadrature Encoder interface, 4 general purpose timers, 6-output general purpose PWM, ultra-low power RTC with separate battery supply, and up to 70 general purpose I/O pins.

3. GSM

The GSM-300 at the receiving side receives the transmitted data. This data is fed to the microcontroller through MAX-232. The serial data received is converted into parallel data by the in-built USART and is displayed on alphanumeric LCD. The received count is also compared to the predefined limit and if the limit is crossed, the system alert the public through message . SMS was considered in the main GSM group as a possible service for the new digital cellular system. In GSM document "Services and Facilities to be provided in the GSM System" both mobile-originated and mobile-terminated short messages appear on the table of GSM teleservices.
The connection between the terminal equipment and the transceiver can be realized with a serial cable (e.g., USB), a Bluetooth link, an infrared link, etc. Common AT commands include AT+CMGS (send message), AT+CMSS (send message from storage), AT+CMGL (list messages) and AT+CMGR (read message).

However, not all modern devices support receiving of messages if the message storage (for instance the device's internal memory) is not accessible using AT commands.

4. RADIO-FREQUENCY IDENTIFICATION

RFID is the wireless use of electromagnetic fields to transfer data, for the purposes of automatically identifying and tracking tags attached to objects. The tags contain electronically stored information. Some tags are powered by electromagnetic induction from magnetic fields produced near the reader. Some types collect energy from the interrogating radio waves and act as a passive transponder. Other types have a local power source such as a battery and may operate at hundreds of meters from the reader. Unlike a barcode, the tag does not necessarily need to be within line of sight of the reader and may be embedded in the tracked object. RFID is one method for Automatic Identification and Data Capture (AIDC).

RFID tags are used in many industries. For example, an RFID tag attached to an automobile during production can be used to track its progress through the assembly line; RFID-tagged pharmaceuticals can be tracked through warehouses; and implanting RFID microchips in livestock and pets allows positive identification of animals. Since RFID tags can be attached to cash, clothing, and possessions, or implanted in animals and people, the possibility of reading personally-linked information without consent has raised serious privacy concerns.

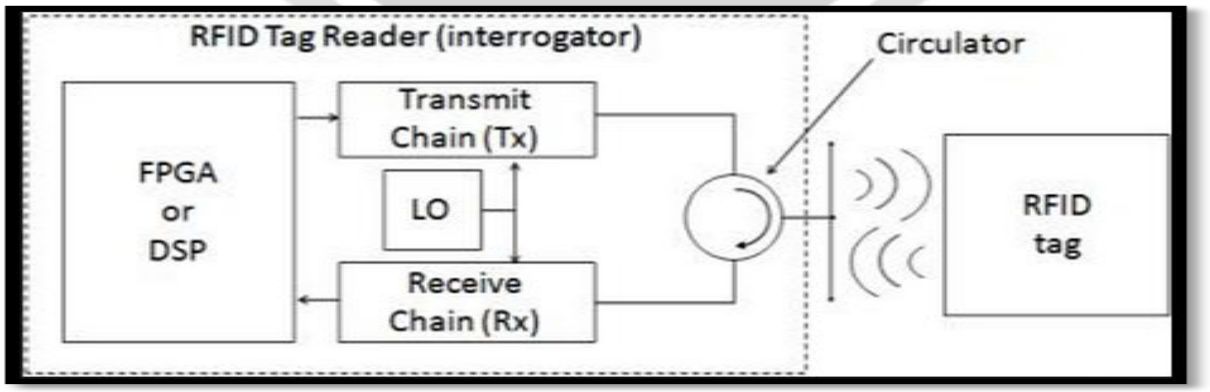

Fig-1: Block Diagram of a Typical RFID Tag/Reader System

5. EXPERIMENTAL DESIGN

Table-1: System Requirements

Microcontroller	ARM Cortex M3
Protocols	CAN
Application Modules	GLCD, GSM, RFID
Software	KEIL uVision 4, Flash Magic

CAN protocol is used to make the requirements of communicating information from different nodes of manufacturing to central Monitoring station. As it uses 2 line communication the cost of communication will be less than the wifi / wireless communication. The Machine nodes used will have an auto read unit, which reads the product manufactured and update the count internally as well as sends the status to the central station for monitoring. The count updated at the central station is periodically updated to the management/ manager using SMS. This makes the system automated and effective.

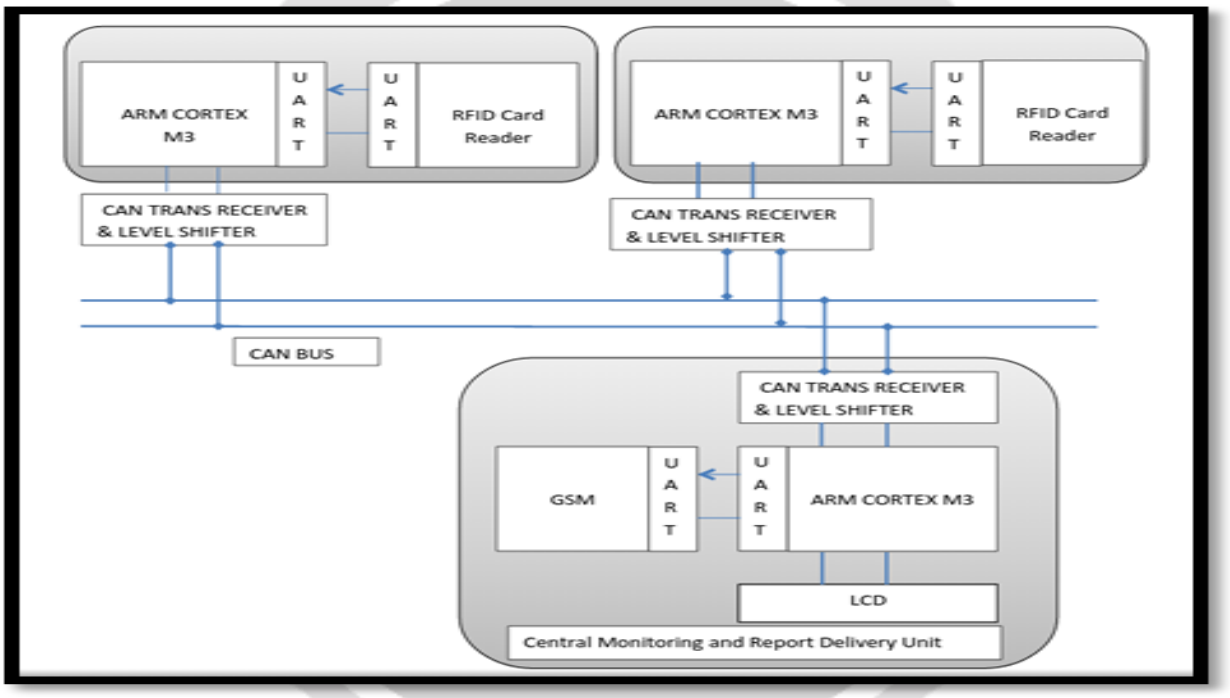

Fig-2: Block diagram of the entire system

6. GLCD

The 16x2_Character_LCDs have their own limitations; they can only display characters of certain dimensions. The Graphical LCDs are thus used to display customized characters and images. The Graphical LCDs find use in many applications; they are used in video games, mobile phones, lifts etc. as display units.

This LCD has a display format of 128x64 dots and has yellow-green colour backlight. Each LCD needs a controller to execute its internal operations. This LCD uses twoKS0108 controllers.

The 128x64 LCD is divided into two equal halves with each half being controlled by a separate KS0108 controller. Such LCDs (using KS0108 controller) involve paging scheme, i.e., whole LCD is divided equally into pages. The paging scheme of the graphical LCD can be easily understood from the following table.

7. HARDWARE RESULTS

Using RFID, the numbers of products manufactured by machine units are known. This number and the product details are sent to the manager whenever required through SMS using GSM. Also, the type of product and its number of units are displayed on GLCD. The GSM and the GLCD are present in the central monitoring unit. Thus, the communication among all machine units and the central monitoring unit is done by CAN protocol.

8. CONCLUSION

The status of the products manufactured by various machine units in industries are tracked, sent to manager and displayed on LCD, automatically. The CAN protocol which takes the automation to a higher level, mainly communicates among all machine units and the central monitoring unit.

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