Intelligent Refrigerator with monitoring capability through internet

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ABSTRACT
In conventional or standard refrigerator there is no system of automatically monitoring the materials or food items and also it will not replace immediately. An intelligent refrigerator is one which possesses self monitoring capability of food item or material with minimal or no human intervention. Such a product should have the capability of automatically detecting and alerting the consumer of the need to restock or replenish dwindling supplies. In our system the refrigerator automatically keeps the track of the amount of empty space, and therefore indirectly the amount of items in refrigerator compartments. The system will automatically inform the owner about the status of the refrigerator through short massage service (SMS) and also shop owner through the fast Ethernet network. The system also has LCD display screen and buzzer on the door of the refrigerator. LCD display screen displays the message when the items are over and at the same time buzzer is on, which indicates to home members about the stock of the refrigerator

Key Words: SMS, LCD, EAD

INTRODUCTION
THIS project is mainly focused on designing and intelligent refrigerator which finds out the stock of the material present in it and then automatically places order for the nearest on line shop via internet using IEEE 802.3U Ethernet technology if the stock is below threshold. This system is uses few volume sensors that monitors the stock level of the items in the refrigerator. If the item below the threshold level ARM processor sends the message to the super market computer through the Ethernet adapter that is connected to the ARM processor through the RS232 interface. This unit is also having LCD display unit for user interface. In the supermarket computer there will be software that will be running in the computer that connects to such refrigerator and whenever send a request to the supermarket computer then it pops up a message informing the request sent by the refrigerator.

PROCEDURE
This is an intelligent refrigerator. This consists of three sensors (In our project). Each sensor represents each item (Ex: Tomato, milk, fruits). Each sensor consist an IR sensor and is kept in a particular threshold level of the item. When the level of the item goes below the threshold level, sensor sends the signal to ARM Processor.

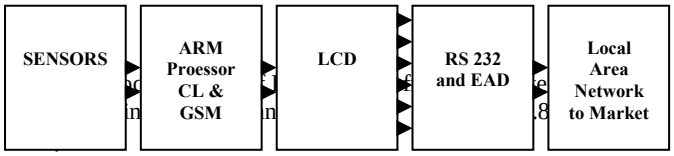
A. ARM Processor
Here LPC2129 Philips 32 bit controller is used. It continuously monitors each sensor. When the sensor sends the signal then controller reads the input. Based on the input signal, it will send the information to supermarket computer through EAD and also display in the LCD.

B.EAD
EAD means Ethernet adapter it converts RS232signal to Ethernet protocol or IEEE 802.3U LAN protocol and vice versa.

C. Super Market Computer
Software is developed in computer that is situated at supermarket. Whenever the refrigerator send a request to the super market then it pops up a message informing the request sent by the refrigerator. It gives the details of the items.

D. Features of ARM7TDMI Processor
16/32-bit ARM7TDMI-S microcontroller in a 64 or 144 pin package.
16 kB on-chip Static RAM
128/256 kB on-chip Flash Program Memory. 128-bit wide interface/accelerator enables high speed 60 MHz operation.External 8, 16 or 32-bit bus (144 pin package only)In-System Programming (ISP) and In-Application Programming (IAP) via on-chip boot-loader software. Flash programming takes 1 ms per 512 byte line. Single sector or full chip erase takes 400 ms.
Embedded ICE-RT interface enables breakpoints and watch points. Interrupt service routines can continue to execute whilst the foreground task is debugged with the on-chip Real Monitor software.
Embedded Trace Macrocell enables non-intrusive high speed real-time tracing of instruction execution.
Two/four interconnected CAN interfaces with advanced acceptance filters.
Four/eight channel (64/144 pin package) 10-bit A/D converter with conversion time as low as 2.44 ms.
Two 32-bit timers (with 4 capture and 4 compare channels), PWM unit (6 outputs), Real Time Clock and Watchdog.
Multiple serial interfaces including two UARTs (16C550), Fast I2C (400 kbits/s) and two SPIs™.
60 MHz maximum CPU clock available from programmable on-chip Phase-Locked Loop.
Vectored Interrupt Controller with configurable priorities and vector addresses.
Up to forty-six (64 pin) and hundred-twelve (144 pin package) 5 V tolerant general purpose I/O pins. Up to 12

independent external interrupt pins available (EIN and CAP functions).
On-chip crystal oscillator with an operating range of 1 MHz to 30 MHz.
Two low power modes, Idle and Power-down.
Processor wake-up from Power-down mode via external interrupt.
Individual enable/disable of peripheral functions for power optimization.
Dual power supply.
Bloak diagram of our approach is given in Figure 1.



I/O power supply range of 3.0V to 3.6V (3.3V +/- 10%).
Sensors and detectors
Volume sensor is made up of infra red sensor using LM555 timer. It consists of IR emitter and detector circuit. IR emitter circuit is made up of LM555 timer working as astable multivibrator. IR detector circuit is also made of LM555 timer working as monostable multivibrator.
The LM555 is a highly stable device for generating accurate time delays or oscillation. Additional terminals are provided for triggering or resetting if desired. In the time delay mode of operation, the time is precisely controlled by one external resistor and capacitor. For astable operation as an oscillator, the free running frequency and duty cycle are accurately controlled with two external resistors and one capacitor. The circuit may be triggered and reset on falling waveforms, and the output circuit can source or sink up to 200mA or drive TTL circuits.
For For generating 38 KHz frequency of IR ray 555 timer working as a astable multivibrator to avoid the other ray. If the output is high initially, capacitor C starts charging towards Vcc through RA and RB. As soon as the voltage across the capacitor becomes equal to 2/3Vcc, the upper comparator triggers the flip-flop, and the output becomes low. The capacitor now starts discharging through RB and transistor Q1. When the voltage across the capacitor becomes 1/3Vcc, the output of the lower comparator triggers the flip-flop, and the output becomes high. The cycle then repeats. Internal diagram of LM 555 is shown in Figure 2.

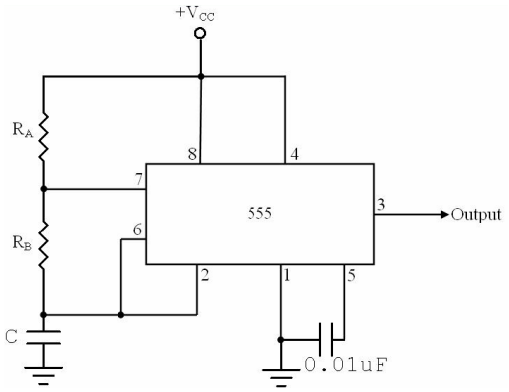


Figure2. Internal diagram of LM 555

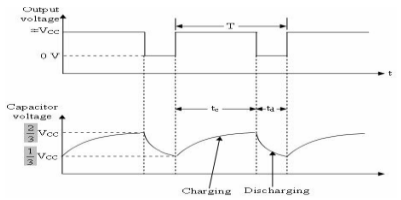


Figure 3. IR emitter circuit
IR emitter circuit and its output voltage waveform is shown in Figures 3 and 4.

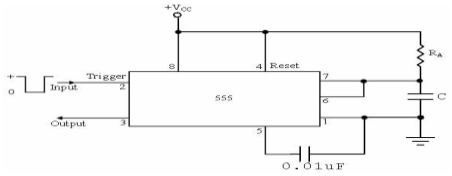


Figure 4. Output voltage and waveform
IR detector circuit and its output voltage waveform is shown in Figures 5 and 6.

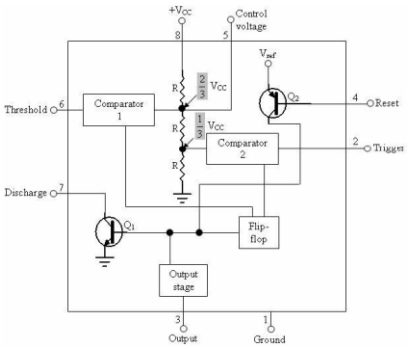


Figure 5. IR detector theoretical circuit diagram

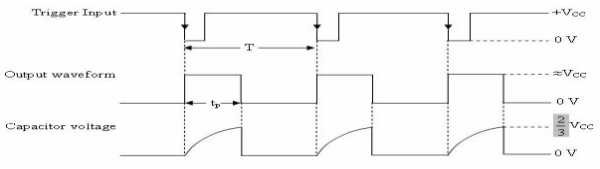


Figure 6. Output voltage and waveform

The EAD 01 –100 device server connects serial devices to Ethernet networks using the IP protocol family. The EAD 01 -100 connects devices through a TCP data channel or through a Telnet connection to computers or another Device Server. Datagrams can be sent by UDP. The EAD 01 -100 contains a web [http] server that allows presentation of custom content and can be easily configured through the server. The EAD 01 -100 has 2 programmable I/O pins/ Signals that can be used to monitor or control attached devices.

FEATURES

The EAD 01 -100 device server based on a miniaturized version of a modular serial-to- Ethernet converter based on an existing Lantronix Xport Serial-to-Ethernet module. The EAD 01 -100 device server package contains a Xport Module which contains DSTni-LX controller, with 256K bytes of SRAM, 2KB of boot ROM, and integrated AMD 10/100phy, 4-Mbit flash memory, Ethernet Magnetic, power supply filters, reset circuit, a 25-MHz crystal (Ethernet), 48-MHz crystal (DSTni-LX) and Ethernet LED's. The EAD 01 -100 Board requires +5V power and is designed to operate in an extended temperature range.

PROTOCOL SUPPORT

The EAD 01 -100 uses the Internet Protocol (IP) for network communications and the Transmission Control Protocol (TCP) to assure that no data is lost or duplicated, and that everything sent to the connection arrives correctly at the target.

Other supported protocols are listed below

ARP, UDP, TCP, ICMP, Telnet, TFTP, AutoIP, DHCP, HTTP, and SNMP for network communications and management.

- TCP, UDP and Telnet for connections to the serial port.
- TFTP for firmware and web page updates.
- IP for addressing, routing and data block handling over the network.
- User Datagram Protocol (UDP) for typical Datagram applications in which devices interact with other devices without maintaining a point-to-point connection.
- SMTP for e-mail transmission.

The EAD block diagram is shown in Figure 7.

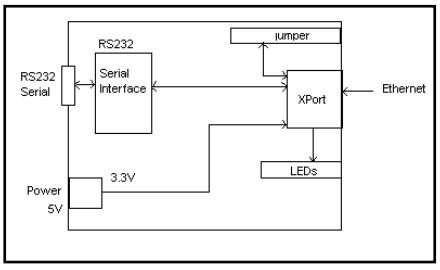


Figure 7. EAD 01-100 block diagram

ADVANTAGES

Completely automatic control through ARM processor

No extra accessories are required as it uses internet.

As this system uses online payment via credit/debit cards the chances of hiding the transaction from the government can also be avoided.

By interfacing the unit with a local computer, we may even generate the requisition forms as well as purchase orders with the help of software running in the local computer

APPLICATION

This system reduces human intervention and therefore this system is very helpful for busy persons. This system can also used to store medicine for biomedical application

CONCLUSION

This Intelligent refrigerator finds out the stock of the material present in it and automatically places the order for the nearest online shop via internet using IEEE802.3U Ethernet technology, if the stock is below threshold level and at the same time the system automatically send message ,informing the owner about the status of the stock in refrigerator through SMS. This system reduces human intervention.

FUTURE SCOPE

The infrared emitters emit IR rays that are not able to pass through the transparent objects such as plain water Thus, items that are transparent will not be detected by the system. With improvement in sensors, the proposed system will be made more robust in detecting status of the all types of items and also helps to send message at different stages of items stock.

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