Wireless Rolling Display with GPS Clock using nRF Module

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Abstract: *now a day the notice boards are the primary things. At institution or organization or in the public places just like the bus stops, railway stations or parks notice boards are there. But sending several notices day to day is a very difficult task. The purpose of the proposed system is to display the message on a matrix display send by the user. The system consists of transmitter at user side and receiver connected to the display. It totally based on real time i.e. no need to store the instruction in the database. Its operation is based on microcontroller ATMEGA64 programmed in assembly language. When user sends message it receives at receiver and for that wireless communication nRF24L01+ can be used. Also it contains a LM35 temperature sensor to show the nearby temperature, humidity sensor to show the presence of water in the air and most important GPS clock. The date and time is directly display on the notice board with the help of Global Positioning System (GPS), no need to set date and the time every time.*

Keywords: Wireless communication, RF module, sensors, matrix display, controller

1. Introduction

Recently there has been significant change in the world of digital advertisements. Now the big shops and shopping centers are use digital displays. Also, in trains and buses the information like the platform number or ticket information is displayed in digital boards. Also at institutional level the digital displays are used to show the notices. People think that the world is at their finger-tips. Light Emitting Diodes (LED) Dot-Matrix digital display has made their way easy to the digital world, attractive advertising, traffic lights and other display systems. This digital display has and is gaining popularity around the world because light emitted from the LED is very clear and bright. And also the way it can be display such as rolling left to right, right to left or other various fancy looks. Even some shopkeepers are using dot matrix displays to attract the customers to have a look for their good deal. They are easily available in different sizes, different colors, features and lines. Some can display the graphics with alphanumeric. The main attraction for viewers is brightness of the LED's and the way it appears or displayed is a main attraction. In big screen LED televisions simple alphabetical electronic moving display has just enough attraction to relay information to the viewers. Along with that we generally think that the GPS is navigation or positioning system but the fact that every GPS receiver is matched to universal time which makes it the most commonly available source of precise time. Hence here we are using this is to show the exact time.

The proposed system can be used extensively in real world applications at different public places such as bus stops, railway stations, shopping centers, hospitals. Also it found it's applications at university or college levels to display notice board for students. Such a display are very easy to use as it can be replace by the wired network, so automatically the space required is less. We can also connect the several displays at a time for a single user. This display is very flexible that it connects with any device such as computers, laptop or mobile phones.

Dr. S. Venkannah, D. E. B. Mallet discussed the primary research topics within multirobot system. Sometime the problems may occur that the person want to send a message does not have the contact details of the person at the other end. This report explains the design of an autonomous or remote messenger (robot) use the GSM network that can receive and send the messages. This robot is used at any time to inform the target group. A legal person simply sends the appropriate codes using the Short Message Service (SMS) to the robot. This robot receives the SMS and conveys the message to the persons at a desired location [1]. Foram Kamdar, Anubbhav Malhotra and Pritish Mahadik discussed message display on notice board with the help of GSM. In this notice board based on the SMS which use the GSM module which is used to make the communication of displaying message on notice board by using the user's mobile phones [2]. Password protected wireless electronic noticing system by GSM with the help of robust algorithm has describe by Morsalin, Abdur Rahman Md Abu Bakar Siddiqe, Prattay Saha, Md. Reduanul Halim. The proposed notice board is a SMS based system which is protected by the password. The communication and information transfer between the user and the LCD display unit is done via GSM, so any notice can be displayed on the electronic board from the user's mobile SMS from distant places [3]. Joaquin Del Rio, Daniel Mihai Toma, Shahram Shariat Panahi, Yves Auffret and Antoni Manuel Lazaro propose the smart IEEE–1588 GPS clock emulator for cabled ocean sensors. They discus that the accurate time marking of ocean sensor which is very important in various marine applications. The device was designed and implemented to provide accurate timing data to any ocean sensor [4]. Ahmad Zaki bin Hj Shukor, Muhammad Herman bin Jamaluddin discus an automated remote messaging system by using GSM communications. In this they discuss a method for implementing Global System for the mobile communications (GSM) control of a Light

Emitting Diode (LED) messaging display for advertising purposes. The LED display will be used and is integrated with the GSM controller board, including microcontroller for control and data transmission to the GSM modem [5].

Existing System consist of communication between the user and the noticing system i.e. display by using the GSM. But it needs the communication range which is costly. Every time the mobile phones are interfacing with the modem. The communication protocols are use to send the massage. But every time it is not possible. Hence this paper explains the possible intercommunication which is based on GSM between the users and the display. Also after resetting the system we need to set the date and time every time.

2. System Architecture

Figure shows the overall block diagram of the system. In figure 1 the transmitter module which accessed by a user to send a message through an input module such as a keypad or keyboard. For that purpose computer can be used. The computer connected to the RF transmitter using USB to serial communication. The transmitter serially connected to the computer. The information then transmitted using RF technology to the receiver.
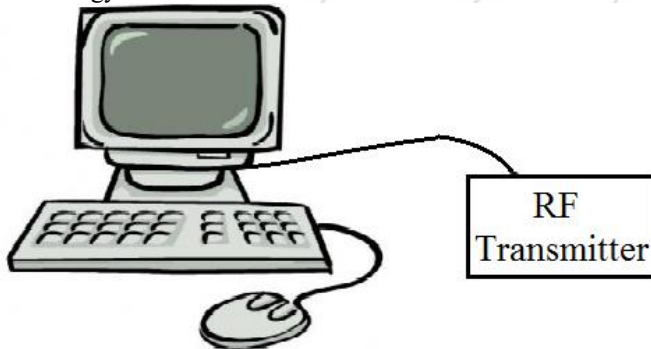
Figure 1: Transmitter Section

Then transmitted data is received by RF receiver at receiver side connected to the microcontroller. It shows in the figure 2.

From the RF receiver block the information is get decoded and transfer to the microcontroller. The various components are connected to the controller such as temperature sensor, humidity sensor, GPS and the dot matrix display. The purpose is to take the input from all this components and transfer it to the dot matrix display. The use of the sensor is to show the temperature and humidity in the room or the area where the controller or the display is located.
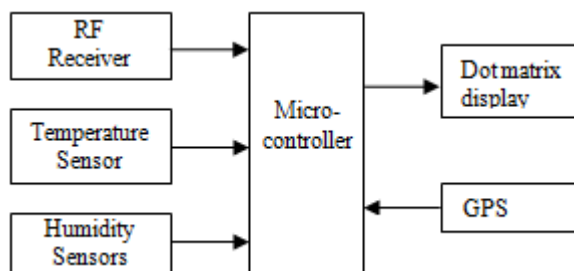
Figure 2: block diagram of controller

The commonly used sensors are those which detect temperature or heat. Temperature Sensors used to measure the amount of heat energy or also used to measure coldness that is generated by an object, system or in the environment which used to sense or detect any physical change to that temperature producing either an analog or digital output. Humidity is nothing but the presence of water in air. Humidity sensor is used to detect the quantity of water present in surrounding air. In the GPS functionality the GPS receiver is synchronized to universal time which provides the accurate universal time.

Initially a text or a message can be taken as a input from the computer or any device as a input. By using the RF transmitter the given data is transmitted given by the computer using USB to serial connection. This data transmit serially as we use serial communication. At receiver RF receiver is use to receive the data and get decoded. This data transmit to the dot matrix display through the controller. Same the temperature sensor calculate the current temperature and humidity sensor show presence of water in air. All this can be connected to display through controller.

3. Components of Proposed System

ATmega64 :- It is a high-performance, Low-power Atmel AVR 8-bit Microcontroller. It contains 32 x 8 general purpose registers. It has 2 Kbytes EEPROM and 4 Kbytes Internal SRAM which used to store program. In this we used two Dual Programmable Serial USARTs which are used to burn the program in the controller. Full Duplex Operation (Independent Serial Receive and Transmit Registers). Here we connect Northwick module for transmitter and receiver & GPS to the receiver. There 8 ADC pins to this controller from which we are just using two pins that one for temperature sensor and other for humidity sensor.

nRF24L01+ :- It is a single chip 2.4 GHz transceiver use in low power wireless application. It has 250 Kbps, 1 Mbps and 2 Mbps data transmitting & receiving rate. We operate & configure it through a Serial Peripheral Interface (SPI).

LM35 Temperature sensor :- This sensor is directly use to calculate the temperature in Celsius (Centigrade). This is a big advantage to use of this sensor over linear sensor that this sensor gives the direct reading in Celsius scaling not in kelvin. Normally the range of this sensor is from -55°C to 150°C and operates from 4 V to 30 V and linear + 10-mV/°C Scale Factor.

GPS module :- Here we use SIM28 ML GPS module. It doesn't need any external LNA. Here the GPS module is used to show the exact date and time. There are various signals coming from network like longitude, latitude but we are use only a GGA signals that use to show the exact time. Hence in this way we don't need to set the time every time.

Humidity Sensor :- It used to detect the contain of moisture or water in the air. Here we use Sy-HS 230B model to detect the humidity. Its operating voltage is 5v DC. Operating range

is 10-90 % RH (Relative Humidity). It is use to detect the humidity in the environment.

4. Implementation

The implementation of proposed system gets started from the basic concept by designing the hardware. In this implementation we use ATmega 64 controller to initialize, GPS signals to give exact time, two nRF24L01+ module which is used for the communication purpose to transmit the signal from used & to receive the signal at receiver side for displaying the massages. The wireless communication can be done with help of this RF module. Initially the controller hardware gets designed and gets implemented. Figure shows the implementation for that. It has one ATmega64 controller connected to the different component as shows in the block diagram.
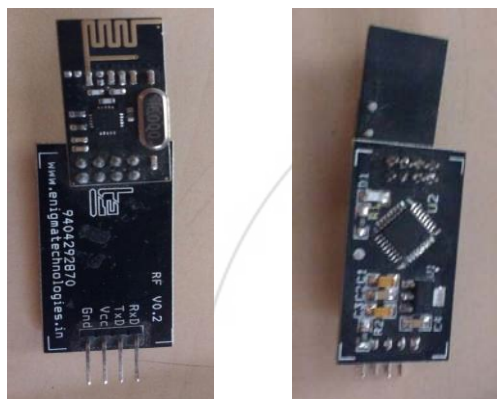

Figure 3: NRF24L01 module

The dot matrix display use transistor diode with the shifter as this display is a rolling display. Initially single display is implemented and another two displays connected in parallel. In this display the current room temperature and the time can be display. To show the current time we used a GPS of series SIM24 ML. The GPS contain various signals like longitude, latitude, elevation but from this we just collect the RMC and GGA signals which are only use to show the date and time.

In figure this display shows the initialization process. This display is connected to the controller as shown. It receives the signal from RF transmitter connected to the user
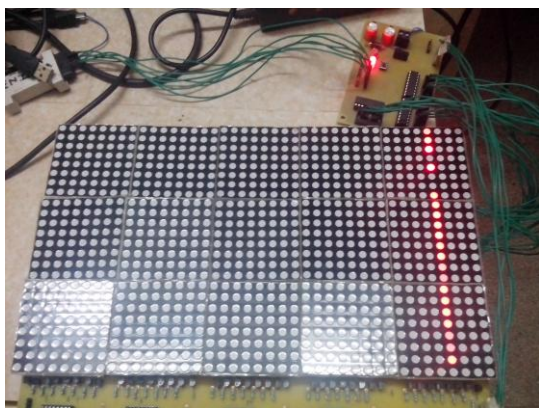

Figure 4: Dot matrix display mobile phones or PC which sends the message that must be show on the display board.

This board is a rolling display that means the message get rolled and move from right to left or left to right.

5. Result

1. The dot matrix display can be design and able to display the notice send by user and the communication achieved properly as designed.
2. The range of the RF module nearly 550 m in residential area and up to 700 m as in unit of Line Of sight.
3. Temperature sensor shows the temperature but vary with 1 Celsius up and down.
4. GPS system responds the signal with accuracy 97% & display accurate current time.

6. Conclusion

The above paper explains how we can develop as well as modify the rolling display. In addition to this, for every new applications every time we need to only burn the HEX code of target program. In this by interfacing an EEPROM with the system which allow it to store more messages at a time and also it can give a recover facility at any condition like power failure or other power problems. Also connect a GPS which gives exact time even after resetting the system. Temperature and humidity sensors are also there which give the present whether condition. Hence the system can be considered the more efficient and improved than previous systems.

7. Acknowledgement

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