Abstract—Wireless Packet Data Networks, such as GPRS, hold great promise for applications that rely on machine to machine (M2M) communication. The rapidly advancing mobile communication technology and the decrease in costs make it possible to incorporate mobile technology into home automation systems. Based on an SMS/GPRS (Short Message Service/General Packet Radio Service) mobile cell module and a microcontroller, a home automation server can be established. Powerful microcontrollers are used as parts of most home and office appliances of today. Integrating web servers to these intelligent devices will aid in controlling them over the Internet and also in creating effective user interfaces in the form of web pages. This paper presents the development of AT modem driver, text based command processing software, output for an Atmel microcontroller to facilitate in sending and receiving data via the cell module. The proposed design is implemented using SMS(commonly known as text messages) and GPRS (Internet based protocol) as the main communication protocol.

Keywords—Remote access terminal (RAT), UART, AT Command, AVR, GM862 Board, Modem.

I. INTRODUCTION

Remote control via the Internet is not a new feature and used in home automation systems [1, 4]. However, providing a mechanism for interaction between devices in this environment is quite challenging. The Internet has been mostly used to connect personal computers so far, but shortly all kinds of appliances with embedded computers will exchange information over the Internet. A massive number of microcontrollers are available in today’s devices which can be linked to the Internet. If these intelligent appliances could be connected to the Internet at low cost, the way we control and manage their functions would change entirely. An embedded web server [2, 4] should use the HTTP protocol to transmit Web pages from the embedded system to the web browser and to transmit form data back to the embedded system attached to the appliance. The embedded system requires a network interface, such as Ethernet, a TCP/IP protocol stack, embedded web server software and static and dynamic web pages that form the user interface for that specific device.

To make communication AVR microcontroller board is used. It can talk over a wide range of networks- Ethernet, Bluetooth, Wi-Fi, XBEE and GPRS. This paper is deploying GM862 module interface with AVR, having GPRS and GPS capabilities [6], both accessible with AT Commands [7] and can act as a CPU to communicate between web servers.

II. ARCHITECTURE OF SERVER

The Remote Access terminal consist of two modules, first one is GSM modem mounted on MikroElektronika SmartGM862 Board with GPRS and GPS capabilities [7] and ATmega-328 [8] controller having Transmission and reception capabilities on serial port. The embedded controller (Atmega-328) interfaced with GM862 Board to make basic design of the server. The data to and from the embedded controller platform, can be transmitted and received via GSM modem to cellphone and vice versa. Basically, This Remote Access Terminal communicates to a cell phone which can support JAVA application, developed on it, to access web pages through GPRS [4].

![Fig. 1 The Architecture of the Prototype.](image)

III. SYSTEM DESIGN

A. Power Control

Power control between these modules is very crucial thing because GM862 Board [7] and Atmega-328 controller [6] works on different voltage level. In order to communicate these modules, we need to control the power on input logical pins of GM862 Board through the logical pins of Atmega-328 controller. The logical pins of the GM862 can accept only CMOS 2.8 Volt. For that reason, we will use a voltage divider in the Tx line from Atmega-328 controller to GM862 Board.
Both, Rx and Tx lines should be pulled up to the PWR_CTL line of the module because these pins don’t have an internal pull up resistor. The GM862 Board is powered by a LiPo cell (3.7 V with 2000 mAh) and AVR board is powered by the USB port but it is resolved by using pulled up resistor.

B. Hardware Connections

We provided connection between ATmega-328 [6] to GM862 Board [7], so ATmega-328 can communicate through the modem (Telit) mounted on GM862 Board. For this, we just need simple four connections between these modules shown in fig 3 and Table I.

<table>
<thead>
<tr>
<th>Table I</th>
<th>CONNECTION BETWEEN ATMEGA-328 TO GM862 BOARD</th>
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<tbody>
<tr>
<td>Serial No.</td>
<td>ATmega-328</td>
</tr>
<tr>
<td>1</td>
<td>Tx</td>
</tr>
<tr>
<td>2</td>
<td>Rx</td>
</tr>
<tr>
<td>3</td>
<td>POWER_5V</td>
</tr>
<tr>
<td>4</td>
<td>POWER_GND</td>
</tr>
</tbody>
</table>

The UART input line TXD (rx_uart) of the GM862 Board is not internally pulled up with a resistor. So, an external 47KΩ pull-up resistor is required. If this internally pull-up register is not used, then transmission is possible but a problem arises in the reception of data on the controller from modem [7].

A. AT Command

The AT is an ATTENTION command and is used as a prefix to other parameters in a string. The AT command combined with other parameters can be set up in the communications package or typed in manually as a command line instruction through HyperTerminal.

B. GPRS

Using GPRS as the main communication protocol for the server would improve the system, as it would become more accessible to other devices and protocols via the internet and also it would allow more affordable data transfer within the cellular system.

V. IMPLEMENTED FEATURES

By using Software serial library connection [8] is established and following features are implemented:

- Starting and stopping the module.
- Initialisation.
- Sending/Receiving of SMS.
- Opening a socket, writing and reading (used to talk HTTP) over GPRS.

After Parsing of AT commands, log, that recorded within the IDE.

GM862 monitor
switching on
done
initializing modem ...
AT
->ok
AT+IPR=9600

sending SMS ...
AT+CMGF=1

Fig. 2 Connections between ATmega-328 and GM862.

Fig. 3 A Snapshot of installation System.
After uploading the web page, it is used to command the intelligent devices through ATmega-328.

![Serial Monitor](image)

**Fig. 4 Sending and Receiving Message on Serial monitor.**

**VI. CONCLUSION**

A system for remote access terminal using GPRS enabled embedded server is designed in this paper. Using cellular services such as SMS and GPRS to control remote devices leads to a breakthrough in the way we interact with our homes. Therefore, users can control and manage the intelligent appliances using a GPRS network over the internet. If we use SMS or GPRS services for controlling the intelligent devices we just need to pay per use. The overall cost for data services on GSM as compared to other network such as Ethernet will be reduced by a great amount.

The operation of embedded server is controlled by the data coming from clients. The adaptability of the embedded server is enhanced by making it possible to accept request from a number of clients having diverse working platforms.

**REFERENCES**


