

Convergence of Multi-information System based on Web

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Abstract — We have developed the convergence system that can control a LED matrix, a motor, LCD monitor based on an internet. In order to communicate between PC and system, we have designed user interface, it has several control functions.

Keywords— RFID, USN, LBS, GPS, Convergence

I. INTRODUCTION

Recently, the advancement of an internet and mobile have converged diverse information technology [1]. For example, there are several areas like the navigation technology using the GPS (Global Positioning System), Telematics, LBS (Location Based Service) technology, the USN (Ubiquitous Sensor Network) technology using the R/F and RFID (Radio Frequency Identification). Also, these have accelerated the development of the value added service based on the wireless application technology [2].

The TCP/IP (Transmission Control Protocol/ Internet Protocol) technology have converged network to integrate all devices. These technologies are realized in artificial intelligence building or complex building for a residence and commercial section [3].

In this paper, we have developed the convergence system for unifying the mobile phone, LED, Motor and GPS (global position system).

II. DEVELOPMENT OF H/W

The systems are composed of the main controller, the GPS and mobile part. The main controller part related with the viewer use the 8bit ATMEGA128, the GPS data process part related with the satellite and the motor/LCD/Matrix part related with the mobile phone. Table 1 show the specification of the convergence system.

In order to control each device, we must establish the external I/O address and the memory address area of 32

KB SRAM62256. After that, we must select the elements and modules for the function and confirm the specification.

We use the 113 byte NVRAM DS12C887 for the RTC element. The X-tal oscillator occur the precise reference frequency and count the second/minute /time/day/month in the frequency division. Through the power is switched off, it is ready for the backup circuit for the battery supply.

We have used the 7-segment to control the LED matrix and the 20-character LCD model of the text format and the 128x64 dots model for the LCD of the graphic type.

TABLE 1. THE SPECIFICATION OF THE SYSTEM

Items		Contents
PC		MS Window 98 SE
CPU(micom)		Atmel AVR ATmega128
USART		2 EA
EEPROM		4 KB
RTC		DS12C887
GPS module		module
Ex. antenna		1 EA
Mobile I/F		1 EA
Input	PBSW	8 EA
output	LED	8 EA
	LCD	1 EA(16 char*2line)
	7-segment	4 EA
	DC-motor	1 EA
	Relay	2 EA
Power	Piezo	1 EA
	Input	AC 80 ~ 240 V
	Output	DC +5V(3A), +12V(0.5A)

Figure 1 show the main controller of convergence system diagram. This system is composed of the main controller, LED matrix, Motor driver and the GPS. The main controller part related with the viewer use the 8bit ATmega128, the GPS data process part related with the satellite and the motor/LCD/LED Matrix part.

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We have used the 7-segment to control the LED matrix and the 20-character LCD model of the text format and the 128x64 dots model for the LCD of the graphic type.

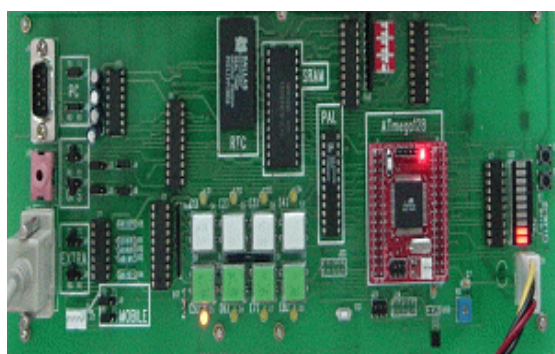


Figure 1. The main controller diagram

III. THE CONVERGENCE SYSTEM

The main controller part are composed of the ATmega128 module and power, USART, RTC, function keys, function LED, status LED and function dip switch. If the RTC device interfaces with the microcomputer, the data process of the RTC use the TDX (time division multiplex) method [1].

The 8 bit ATmega128 has the Havard data bus and the program bus, bidirectional I/O ports of six and a 5 bit bidirectional I/O port. In general, the Port A ~ Port E is performed by the SBI and CBI command, which have different data transmission direction. Each port have the driving signal the output driver in a H(high) or L(low) state, and it drive the LED in the maximum driving current of 40mA.

Figure 2 show the I/O port structure, each Pin has the diode for protection and can establish the pull-up resistor [3]. Also, each port have three I/O register, the DDR register for setting up the input/output direction, the port register for the data

output and he pin register. If we have dismissed all pull-up resistors, then the PDU bit of I/O register is established to 1.

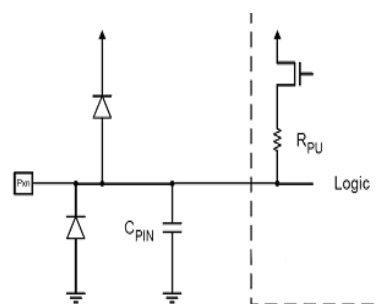


Figure 2. The structure of I/O port

Figure 3 show the registers for establishing the port operation. If we have dismissed all pull-up resistors, then the PDU bit of I/O register is established to 1.

Bit	7	6	5	4	3
	TSM	-	-	-	ACME
Read/Write	R/W	R	R	R	R/W

Figure 3. The I/O register

Table 2 shows the input/output operation of each pin. When we drive the input, there are the delay time of 0.5 ~ 1.5 clock. In order to reduce this error, we drive the delay operation of one clock. Also, on establishing an additive I/O function, we can use functions of ALE, SPI, USART and ISP.

TABLE 2. PROGRAM FOR THE PIN ESTABLISHMENT

```
// comdef.hpp
#ifndef _COMDEF_HPP_
#define _COMDEF_HPP_
#include <avr/io.h>
typedef unsigned char BYTE;
typedef unsigned short int WORD;
typedef unsigned long int DWORD;
// I/O Base Addresses
#define _BASE_RAM (((BYTE*) 0x8000))
#define _BASE_RTC (((BYTE*) 0x2f00))
#define _FUNCLED (*(BYTE*) 0x2000)
#define _STATUSLED (*(BYTE*) 0x2100)
#define _FUNCKEY (*(BYTE*) 0x2400)
#define _STATUSKEY (*(BYTE*) 0x2500)
#define _BASE_EXPIX (((BYTE*) 0x4000))
#endif // _COMDEF_HPP_
```

The user data address use the 0x8000 ~ 0xFFFF and the address for mode selection use 0x2000 ~ 0x20FF. The address for LED state and key function use 0x2100 ~ 0x21FF and

0x2400 ~ 0x24FF, respectively. Also, we use 0x4000 ~ 0x4FFF for controlling the LCD data, the address from 0x6000 ~ 0x6FFF to 0x7000 ~ 0x7FFF use the segment, dot matrix, relay and motor.

In Figure 4, we use the GPS information of the Block-II satellite projected in 1989. The height of the satellite is about 20,183 ~ 20,187 km, which is rotating twice cycle a day and positioning in six orbit named from A to F. The command center has modified the position of -0.04187 degree one time a year [4].

The satellite use the L1 and L2 carrier based on the fundamental frequency 10.23 MHz, the L1 frequency of 1,574.42 MHz be made of 154 times of fundamental frequency and the L2 frequency of 1227.60 MHz be made of 120 times of fundamental frequency. The L1 is carried on C/A code, P code and navigation message and the L2 : P code and navigation message.

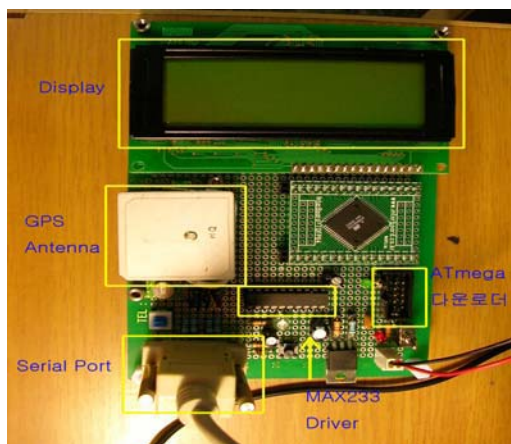


Figure 4. The GPS receiver

The PN (pseudo noise) code carries the P code of 10.23 MHz, the C/A code of 1.023 MHz and the navigation message of 50Hz. The Y code is modulated by P code. Figure 3 show the GPS receiver [5].

In GPS receiver, the GPRMC (Recommended minimum specific GPS/Transit data) to analyze and display the GPS data use the protocol NMEA 0183. In these NMEA 0183, there are \$GPGGA, \$GPRMC, \$GPGSA and \$GPGSV, so on. Table 3 present an example of \$GPRMC data including a GPS information.

TABLE 3. THE DATA FORMAT OF \$GPRMC

20516,	A,	5133.8,	N,	00042.24,	W,	173.8,	231.8
1	2	3	4	5	6	7	8

Table 4 explains the format function of Table.

TABLE 4. THE FORMAT FUNCTION OF \$GPRMC

	Data	Mean
1	UTC time	Standard time of the world
2	Validity	A = OK, V = Invalid
3	Latitude	WGS84
4	N/S Indicator	N = North, S = South
5	Longitude	WGS84
6	E/W Indicator	E = East, W = West
7	Speed in knots	Speed
8	True Course	Direction
9	Data	Day
10	Variation	Magnetic variance
11	East/West	Magnetic shift
12	Checksum	Checksum

Figure 5 show the UI (user interface) for the system control. The UI have the emulator function using the RS232 and display the data received from the GPS receiver on the map.

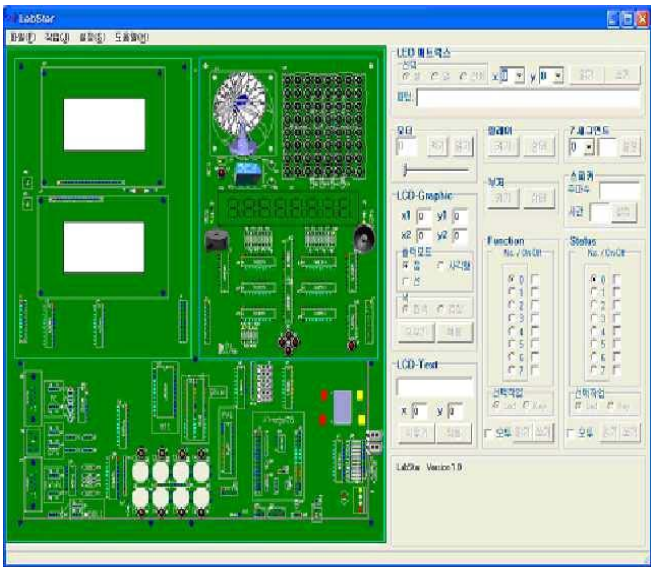


Figure 5. The UI function

IV. CONCLUSIONS

In this paper, we have developed the convergence system for controlling the home appliance based on the internet and wireless mobile. The message data received from the mobile phone can control the application board using the RS-232C and the PC. If we connect the home network in the remote distance, then we can control the motor or character message.

We can display the data received from the GPS satellite on the LCD monitor and map the position detection on the map through an analysis.

Also, the UI design shall represent the function of the convergence system on PC.

In the future, we can apply for ubiquitous system through the system design technology.

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