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PREFACE

The activities of the International Conference is in line and very appropriate with the vision and mission of the UBL to promote training and education as well as research in these areas.

On behave of the First International Conference of Engineering and Technology Development (ICETD 2012) organizing committee; we are very pleased with the very good responses especially from the keynote speakers and from the participants. It is noteworthy to point out that about 45 technical papers were received for this conference

The participants of conference come from many well known universities, among others: Universitas Bandar Lampung, International Islamic University Malaysia, University Malaysia Trengganu, Nanyang Technological University, Curtin University of Technology Australia, University Putra Malaysia, Jamal Mohamed College India, ITB, Mercu Buana University, National University Malaysia, Surya Institute Jakarta, Diponogoro University, Unila, Universitas Malahayati, University Pelita Harapan, STIMIK Kristen Newmann, BPPT Lampung, Nurtanio University Bandung, STIMIK Tarakanita, University Sultan Ageng Tirtayasa, and Pelita Bangsa.

I would like to express my deepest gratitude to the International Advisory Board members, sponsors and also welcome to all keynote speakers and all participants. I am also grateful to all organizing committee and all of the reviewers which contribute to the high standard of the conference. Also I would like to express my deepest gratitude to the Rector which give us endless support to these activities, such that the conference can be administrated on time.

Bandar Lampung, 20 Juni 2012

Mustofa Usman, Ph.D
ICETD Chairman

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UNIVERSITAS BANDAR LAMPUNG
Bandar Lampung,Indonesia
June, 20-21 2012

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Smart House Development Based On Microcontroller AVR-ATMEGA328

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Abstract— **Microcontroller as a device that capable to managing the data and process, there was integrated RAM and ROM on the chip, that mean this device is a low-speed mini computer. Prices are relatively affordable and easily available in everywhereisaseparateeasytostart using itineveryday life.**
Smarthousedevelopment inthis research is a form of applied use ofthe microcontroller is able to control the device in the house remotelyanddirectly. Controlactivity of lights, doors, windowsandother devices (that must be converted into electric device) in the house that are likely tobe controlled by the owner of the house with this device.
Remote access into thesmart homeis being carried outby connecting themicrocontrollerwithethernetmodule, which can beaccessed globaly using the Internet mediaand the computer network in locally.Whileaccessmanually, building the centralset-top-box modulewith theimplementation ofa miniLCDscreenthat integrate into the microcontroller using digital menus approaches that can bedirectly accessedby the ownertoproperly managed. Otherdevices module will beintegratedin themicrocontroller. ThereisaRTC(Real TimeClock) module to reference the time for action of the application.
The final results of his study is the house that is able to govern themselves with thehelp ofa microcontrollerthat can be think themselves. Withbroadly accesscanuse theInternetmedia, then the housewill be increasinglycontrolledbybothlong-distance.

Keywords*— *Smart House, Remote Access, Microcontroller, AVR-ATMega328, Arduino Uno

I. INTRODUCTION

Building a house equipped with all facilities in it is common that can be done by everyone. Any activity that occurs is also a common thing that is generally done by everyone in order to organize or manage all the components in it. All that must be done manually which involves the homeowner directly to regulate all activities that may occur. In contrast with these smart house, all activities of electricity in the house are controlled automatically, or in other words, the house can regulate themselves with the help of a microcontroller means to think intelligently. Control activities include the activities of the lights, doors, windows and other devices in the house.

To facilitate the control of the elements in this smart house, there are 2 (two) ways to do that is by remote control using the Internet and media are controlled via a computer network locally. While access manually, put the central control module with the help of an integrated mini LCD screen with menus that can be directly accessed by the homeowner to then properly managed.

In detail, turning the electronics devices that wanted to is done automatically based on certain times specified on the micro controller using a microcontroller that integrates with RTC (Real Time Clock) which will be referred to the time.

II. COMMONLY USED PERIPHERIAL

2.1Microcontroller

AVR microcontrollers have 8-bit RISC architecture, so that all instructions are packaged in 16-bit code (16-bits word) and most instructions execute in one clock cycle. The differences significant than the MCS-51 instruction (CISC architecture), which requires up to 12 clock cycles. ATmega328 AVR microcontroller is one of the ATmegafamily with a large enough user population. Microcontroller made by Atmel has 32K of flash memory and 32 channels input and output, and equipped with 8 channel ADC with 10-bit resolution and 4 channels PWM. A chip with a feature complete enough to support a variety of applications.

- *ATmega328 CPU architecture*

The main function of the CPU is executing instructions to make sure done correctly. Therefore, the CPU should be able to access the memory, perform calculations, control peripherals, and handle interruptions. There are 32 pieces that help the General Purpose Register ALU works. For arithmetic and logic operations, operands from two general registers and operating results are written back to register. Status and Control functions for storing arithmetic instruction just executed. This information is useful to change the program flow when executing a conditional operation. Instruction in the pick of the flash memory. Each byte of flash memory has the addresses of each. Address of the instruction to be executed always saved Program Counter. When there is an interrupt routine or regular calling, address at the Program Counter is stored beforehand in the stack. Address or interrupt routine is then written to the Program Counter, the instructions and then picked up and executed. When the CPU has finished executing an interrupt routine or regular routine, the address on the stack is read and written back to the Program Counter.

- *Memory Program*

ATmega328 has 32 kilobyte flash memory for storing instructions program.Karena width of 16 bits or 32 bits of the flash memory built-sized 16K x 16. This means that there are 16K address in flash memory that can be used starting from address 0 hex to hex 3FFF address and the address store 16 bits of each instruction.

- *SRAM Data Memori*

ATmega328 has 2 kilobyte SRAM. This memory is used to store variables. Special place in SRAM registers are always designated SP-called stack. Stack function to store the value to push into.

- *EEPROM Data memori*

ATmega328 has 1024 bytes of data EEPROM. Data in the EEPROM is not lost even if power to the system off ration. Important system parameters are stored in EEPROM. When the system first on the parameter is read and the system is initialized according to the values of these parameters.

- *Interrupt*

There are 21 unit interrupt on ATmega328. When the interrupt is enabled and an interrupt occurs the CPU instruction delay,and then jump to the address of an interrupt routine that happens. After completion of executing instruction-address instructions in the CPU interrupt routine return to continue the instruction which was delayed.

- *I/O Port*

ATmega32 has 32 pieces of pin I/O. Via pin I/O is ATmega32 interact with other systems. Each pin I/O can be configured without affecting the function of pin I/O to another. Each pin I/O has three registers namely: DDxn, PORTxn, and PINxn. Combination of value and PORTxnDDxn determine the direction of pin I/O.

- *Clear Timer On Compare Match (CTC)*

CTC is one of the Timer/Counter1 mode, but it is Normal mode, FastPWM mode, Phase Correct PWM mode. At the CTC mode the value of TCNT1 becomes zero if the value was equal to TCNT1 OCR1A or ICR1. If the top and set OCR1A Compare Match interrupt is enabled for the current value of A equal to the value of TCNT1 OCR1A interruptions occur. CPU interrupt is served and the value of TCNT1 becomes zero.

- *USART*

In addition to general I / O, pin PD1 and PD0 ATmega32 function to send and receive bits serially. Conversion is made by changing the value of some of the serial register. To emphasize this function, called PD1 pin TxD and RxD pin PD0 is called. UBRR value will bedetermine the system clock rate of the sender and the receiver serial bit.

2.2 Arduino Uno

Arduino is a company located in Italy. The company is engaged in the development of prototyping using the basic microcontroller. Some of the microcontroller while it was developed by the Arduino is a microcontroller made by AVR and Microchips.

ArduinoUNO is a product of Arduinothat using ATMega328 AVR microcontroller. Until this paper was written, microcontroller was developed to version 3, or commonly known as the Arduino UNO R3.

Fig 1.Arduino UNO prototyping board

2.3 Ethernet Shield

Ethernet Shield uses a chip WIZnet W5100 Ethernet chip, which can give you easy to make an application online (connected to the internet). Shield has been supported by the Arduino library. WIZnet W5100 supports up to four simultaneous socket connections. To be able to connect to the network, this module can be connected directly using RJ45 connectors and cable networks. In addition to an Ethernet network connection feature Shield also comes with an SD Card socket, which means that the module can also be added to the storage media. There are several LEDs are used as indicators on the Ethernet Shield :

- PWR : indicate the presence or absence of a supply voltage shield
- LINK : indicates a network connection, and flashes when data traffic
- FULLD : indicates that the network connection is full duplex
- 100M : indicates a network connection 100 Mb /s
- RX : flashes when the shield receives data
- TX : flashes when the shield sends data
- COLL : flashes when network collisions are detected

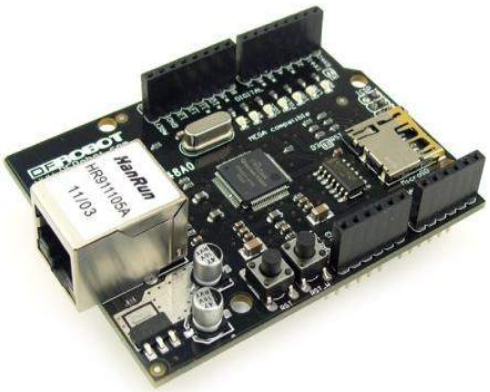

Fig 2.Ethernet Shield

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2.3 Smart RTC (Real Time Clock)

Smart RTC (Real Time Clock) is an electronic circuit that provides timing information in accordance with international standards (1 second = 1 second sharp). The use of RTC is commonly used for the calculation time basis in accordance with the international time standard.

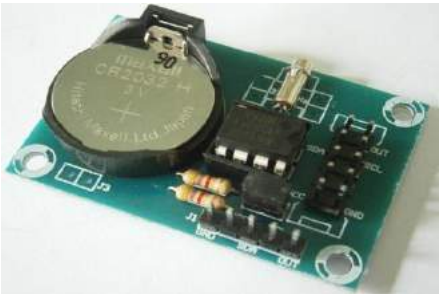

Fig. 3. Smart RTC board

These features of this board are:

- Time features: seconds, minutes, hours, date, month, year and day
- Using the I2C as a line of communication
- Has a square wave output which can be programmed

2.4 LCD

Mini LCD display text-based mode is required in the construction of the smart house system. Use of this LCD for controlling smart devices in homes to be built with manual control.

Menu control of electronic devices installed in the microcontroller can be accessed with this LCD module. Schedule to turn on the lights or turning off lights that are prepared in accordance hours.

Fig. 4. Smart RTC board

This LCD devices are connected directly to the Arduino board is connected also with the Uno and keypad used to enter data.

III. Design Approach

Integrated control either remotely using the internet or local computer jaringkan become an important part in this study. A microcontroller-based media controller that connects to all the household appliances a starring role in controlling the function of household appliances.

Smart home (smart house) is a home that is able to control himself, including all the devices in it. It also can be controlled directly by the homeowner either close or remote (remotely).

In this case, setting the house lights are normally controlled manually now controlled automatically by setting a specified time through an integrated program command with RTC (Real Time Clock), which served mebaca the current time. With this module, the lamp can be turned on and off at certain hours automatically without having to involve the people directly. Similarly, the doors and windows that can be controlled automatically when it is closed and open, as well as other devices in the home.

In general, the main controller on the construction of smart homes is AVR-ATmega328 microcontroller that will receive data from a variety of connected devices. To control the house lights will be used modules RTC (Real Time Clock) which will set the time for turning on and off the light that gives a chance at a certain hour through the program. In the construction of smart homes are RTC module used is DI-Smart RTC.1307 which has features of time: seconds, minutes, hours, date, month, year and day. This device will always adjust the running time at that point although the device did not get electricity supply.

Control remotely using the internet or a local computer network using an Ethernet module ShieldV2 ForArduino. In this module is equipped with an RJ45 jack for attaching a connector cable. Through this jack Ethernet Shield module can be connected directly to the modem which then connects to the Internet network or local computer networks, so that is widely accessible. Control of home appliances is done by sending commands through the Internet which is then received by the module, then translated by a microcontroller based on the data transmitted serially. In addition to the Ethernet Shield module is also equipped with a socket for SD Card storage media. Use of the SD Card is prepared to store log for all data sent or received by this device.

Then, as the network connected to the computer, the settings can also be performed manually. There is a menu setting on the LCD Keypad Shield are used. On this device there are several settings menu prepared them for the house lights, doors, windows, fans, televisions and other home appliances to be controlled manually based microcontroller. It is also fitted with a keypad similar to calculator keys to the other manual settings.

In general, the connectivity of smart house control devices can be seen in figure 5.

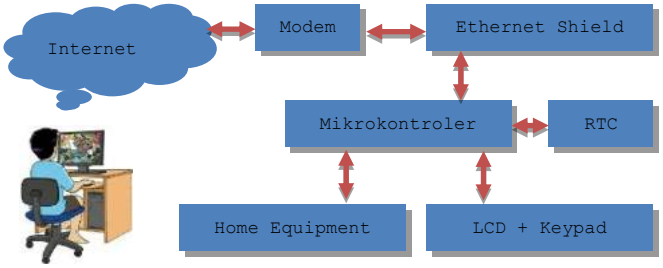

Fig. 5.The Smart House System

Microcontroller becoming the main control center. Serial Ethernet Shield pin is connected to a microcontroller that will be a medium to connect into the network. Data transmitted over the internet will go into the modem and then forwarded to the Ethernet Shield that the data subsequently transmitted to the microcontroller for processing. While the RTC module is used to read time and data will also be sent to the microcontroller. From the data received by the microcontroller is then processed to determine the activities to be performed on household appliances that are also connected into the microcontroller.

Household appliances are connected through several series and of course the unusual design. As well as doors and windows that are designed using a motor drive that will be controlled by a microcontroller.

Control lights at certain hours specified in the program can be viewed in detail on the following Table 1.

TABLE I
HANDLING OF HOUSE LAMP

Hour	Activity in House Lamp
18.00	Front house lamp, Rear house lamp, Guest Room, Living Room turning on
05.30	Guest Room lamp turning off
06.00	Living Roomlamp turning off
06.30	Front House lampdanRear house lamp turning off

Settings can be performed manually using a menu setting is displayed on the mini LCD screen ditelah orders made in the form of program code. The purpose of this is when the LCD screen will control the house without going through the internet network will instead just do it manually using the key combination.

The final results of this study is the house that is able to govern themselves with the help of a microcontroller to think for themselves with smart. Control that can be done using the internet to make the house can be widely controlled remotely.

IV. CONCLUSIONS

Developingthis smart home is just used for homeowners who wish to have automated home electronic devices. Automation is happening include schedule control lights turning on or the lights go out. This device can also control other electronic devices if desired, simply connect electronic devices with a microcontroller, the device will eventually be controlled based on the desired time.

Devices are made based on this microcontroller connected to the network media. When connected to the Internet network, the device can be accessed remotely. In addition to ease of control, the device is also built in the hope of securing the house when left behind, because automation is happening there seem occupants in the house.

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