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Real Time Industrial Network by Energy Efficient Ethernet

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Abstract:
This paper presents a design and prototype implementation of new home automation system that uses Wi-Fi technology as a network infrastructure connecting its parts. The proposed system consists of two main components the first part is the server (web server), which presents system core that manages, controls, and monitors users' home. Users and system administrator can locally (LAN) or remotely (internet) manages and control system code. Second part is hardware interface module, which provides appropriate interface to sensors and actuator of home automation system.

Introduction:
Today the technological world's centralized principle is to automate each conceivable thing for simplicity in life, providing security, saving electricity and time. In that home automation is one of the major things to automatically on and off the home appliances. Home automation can be characterized as a method for doing something without human inclusion. It may incorporate brought together to control of lighting, heating, ventilation, air-conditioning, machines, and security door locking and different systems, to provide Improved convenience, comfort, energy efficiency and security. The idea of automate each appliances in home is done from many years ago, it started with connecting two electric wires to the battery and close the circuit by connecting load as a light. Later it can be developed by different organizations, creates its own automation systems with different devices like sensors, controllers, actuators, buses, and interfaces. There are few methods for controlling home automation systems. These can be separated into two main structures:

i) Wireless systems and
ii) Hardwired systems.

Wireless systems: With wireless routines, you can utilize distinctive media, like Bluetooth, infrared, or radio frequencies, to control the automation system. Hardwired systems: With hardwired routines, you can utilize Ethernet links, like fiber optic links, electrical wirings, telephone lines, and even coaxial links are normally utilized as a part of home security system. In present days most of the automation systems utilizes the combination of hardwired and wireless systems for control the appliances. It should have both equipment and programming set up for proficient systems.

Existing system:
One of wireless communication system is Bluetooth communication system. This is not only used in industry but also used in Domestic Purpose as home appliances controlling using Bluetooth remote, some persons who are unable to walk to switch board such type of persons need this type of project and also elder people can control the speed of the fan with remote, without moving away from their place. Remote operation is achieved by any smart-phone/Tablet etc., with Android OS, upon a GUI (Graphical User Interface) based touch screen operation.

This project is based on the android application, android application send command through Bluetooth. In this project we have an electrical load i.e fan. In extension to the project in some Industries we have different types of loads at different locations. We can control all loads at a time from one place (control room) without connecting any physical wire between loads and control room. In this project we are using Bluetooth module for communication Android phone as our remote, controller, and some discrete components.

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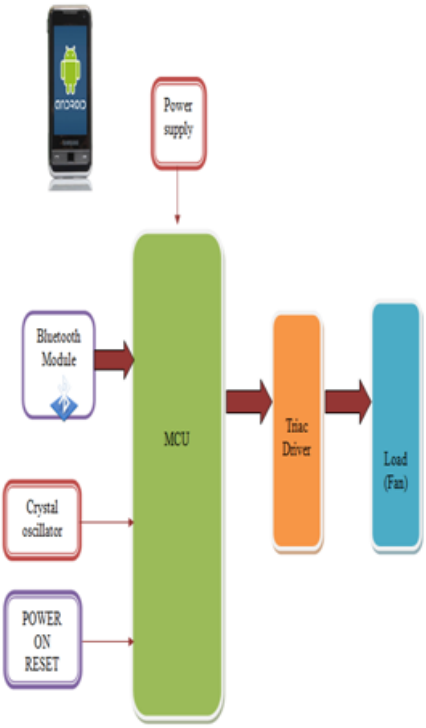
BLOCK DIAGRAM:



Drawback:

Bluetooth can be implemented with only shorter distance.

Proposed System:

Unlike most of available home automation system in the market the proposed system is scalable that one server can manage many hardware interface modules as long as it exists on Wi-Fi network coverage. System supports a wide range of home automation devices like power management components, and security components. The proposed system is better from the scalability and flexibility point of view than the commercially available home automation systems. In this project we have ONE load (bulb, AC, motors, heaters, and power controlling systems). In Industry we have different types of loads at different locations. We can control all loads at a time from one place (control room) without connecting any physical wire between loads and control room. In this project we are using WI-FI module, BCM2836 microcontroller, and some discrete components.

In this project we should notes one think that is AC loads should not directly connected to microcontroller however AC may be entire into controller due to this your controller may be destroyed, To avoid such type of drawback we need some drivers, In this project we are using TRAIC as load controller (as a switch) so we need TRAIC drivers. We have so many Traic drivers one of them is MOC 3021 used as a Traic driver in between Microcontroller to AC loads.

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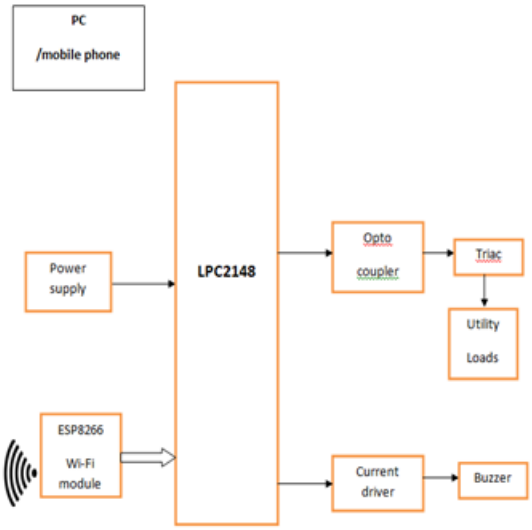

I. ARM7 LPC2148

Key features

- 16-bit/32-bit ARM7TDMI-S microcontroller in a tiny LQFP64 package.
- 8 kB to 40 kB of on-chip static RAM and 32 kB to 512 kB of on-chip flash memory.
- 128-bit wide interface/accelerator enables high-speed 60 MHz operation.
- In-System Programming/In-Application Programming (ISP/IAP) via on-chip boot loader
- Software. Single flash sector or full chip erase in 400 ms and programming of
- 256 bytes in 1 ms.
- EmbeddedICE RT and Embedded Trace interfaces offer real-time debugging with the

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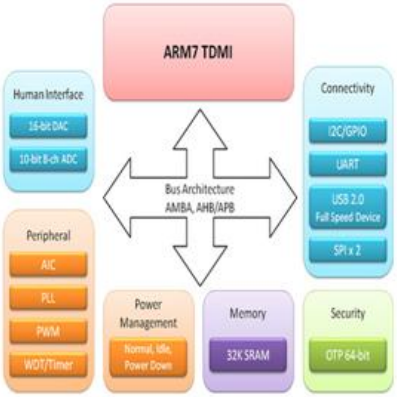
- On-chip RealMonitor software and high-speed tracing of instruction execution.
- USB 2.0 Full-speed compliant device controller with 2 kB of endpoint RAM.
- In addition, the LPC2146/48 provides 8 kB of on-chip RAM accessible to USB by DMA.
- One or two (LPC2141/42 vs. LPC2144/46/48) 10-bit ADCs provide a total of 6/14
- analog inputs, with conversion times as low as 2.44 µs per channel.
- Single 10-bit DAC provides variable analog output (LPC2142/44/46/48 only).
- Two 32-bit timers/external event counters (with four capture and four compare
- Channels each), PWM unit (six outputs) and watchdog.
- Low power Real-Time Clock (RTC) with independent power and 32 kHz clock input
- Multiple serial interfaces including two UARTs (16C550), two Fast I2C-bus (400 kbit/s),
- SPI and SSP with buffering and variable data length capabilities.
- Vectored Interrupt Controller (VIC) with configurable priorities and vector addresses.
- Up to 45 of 5 V tolerant fast general purpose I/O pins in a tiny LQFP64 package.
- Up to 21 external interrupt pins available.
- 60 MHz maximum CPU clock available from programmable on-chip PLL with settling
- Time of 100 µs.
- On-chip integrated oscillator operates with an external crystal from 1 MHz to 25 MHz.
- Power saving modes include Idle and Power-down.
- Individual enable/disable of peripheral functions as well as peripheral clock scaling for
- Additional power optimization.
- Processor wake-up from Power-down mode via external interrupt or BOD.
- Single power supply chip with POR and BOD circuits:
- CPU operating voltage range of 3.0 V to 3.6 V (3.3 V ± 10 %) with 5 V tolerant I/o.



Internet of things (ESP8266EX)

- The Internet of Things (IoT) is the network of physical objects or "things" embedded with electronics, software, sensors, and network connectivity, which enables these objects to collect and exchange data.

Different Modules

- ESP8266(ESPRESSIF)
- ESP8089
- ESP6203

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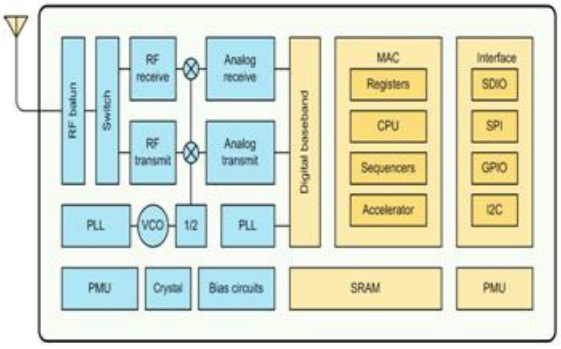
Wi-Fi Module:

ESP8266EX offers a complete and self-contained WiFi networking solution; it can be used to host the application or to offload WiFi networking functions from another application processor. When ESP8266EX hosts the application, it boots up directly from an external flash. In has integrated cache to improve the performance of the system in such applications. Alternately, serving as a WiFi adapter, wireless internet access can be added to any micro controller-based design with simple connectivity (SPI/SDIO or I2C/UART interface). ESP8266EX is among the most integrated WiFi chip in the industry; it integrates the antenna switches, RF balun, power amplifier, low noise receive amplifier, filters, power management modules, it requires minimal external circuitry, and the entire solution, including front-end module, is designed to occupy minimal PCB area. ESP8266EX also integrates an enhanced version of Tensilica's L106 Diamond series 32-bit processor, with on-chip SRAM, besides the WiFi functionalities. ESP8266EX is often integrated with external sensors and other application specific devices through its GPIOs; sample codes for such applications are provided in the software development kit (SDK).



TRIAC:

A TRIAC ("Triode for Alternating Current) is an electronic component approximately equivalent to two silicon-controlled rectifiers (SCRs/thyristors) joined in inverse parallel (paralleled but with the polarity reversed) and with their gates connected together. The formal name for a TRIAC is bidirectional triode thyristor. This results in a bidirectional electronic switch, which can conduct current in either direction when it is triggered (turned on) and thus doesn't have any polarity. It can be triggered by either a positive or a negative voltage being applied to its *gate* electrode (with respect to A1, otherwise known as MT1). Once triggered, the device continues to conduct until the current through it drops below a certain threshold value, the holding current, such as at the end of a half-cycle of alternating current (AC) mains power. This makes the TRIAC a very convenient switch for AC circuits, allowing the control of very large power flows with milliampere-scale control currents. In addition, applying a trigger pulse at a controllable point in an AC cycle allows one to control the percentage of current that flows through the TRIAC to the load (phase control).

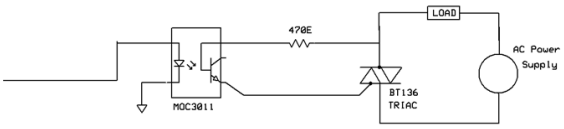


Fig: TRIAC circuit diagram

SOFTWARE DETAILS

Keil compiler

Keil compiler is a software used where the machine language code is written and compiled. After compilation, the machine source code is converted into hex code which is to be dumped into the microcontroller for further processing. Keil compiler also supports C language code.

Advantages:

- Highly-flexible
- Fit & Forget System
- No need of human effort

Applications:

- Domestic
- Industrial

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Conclusion:

Hence we have implemented a project through which we can controlling the loads wirelessly from mobile or PC using a technology called Internet of Things.

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