



Research Article



## Web enabled light using Arduino

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### ABSTRACT

Web enabled light is the PHP web based application which controls the home appliances like light fan etc. The main aim of this paper refers to the use of computer and information technology to control home appliances and features (such as windows or lighting). Systems can range from simple remote control of lighting through to complex computer/micro-controller based networks with varying degrees of intelligence and automation. Home automation is adopted for reasons of ease, security and energy efficiency.

**Keywords:** PHP, Arduino, Microcontroller, Home automation.

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## WEB ENABLED LIGHT USING ARDUINO

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### ABSTRACT

Web enabled light is the PHP web based application which controls the home appliances like light fan etc. The main aim of this paper refers to the use of computer and information technology to control home appliances and features (such as windows or lighting). Systems can range from simple remote control of lighting through to complex computer/micro-controller based networks with varying degrees of intelligence and automation. Home automation is adopted for reasons of ease, security and energy efficiency.

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### 1. INTRODUCTION

Imagine being able to control all the electrical appliances of your home from virtually any place you are in the world! For example, say one cold winter day, you are stuck in traffic on the motorway after a long day at work. By pressing a few keystrokes on your mobile phone, you activate a macro which turns on the heating, prepares your Jacuzzi, and switches on your electrical fireplace and lava-lamps at your premises.

Using the cybernetic concept of action space, we in fact extend the action space of the human with the computer, enabling the subscriber to talk to another subscriber and thus exchange information, issue or receive commands.

The system specification shows the description of the function and the performance of system and the user. The scope of our project “Web enabled light” is immense. The future implications of the project

are very great considering the amount of time and resources it saves. The project we have undertaken can be used as a reference or as a base for realizing a scheme to be implemented in other projects of greater level such as weather forecasting, temperature updates, device synchronization, etc. The project itself can be modified to achieve a complete Home Automation system which will then create a platform for the user to interface between himself and the household.

The project “Web Enabled Light” at the title suggests is aimed to construct a control system that enables the complete control of the interface on which it is based. General objectives are, to coordinate appliances and other devices through computer.

To eliminate the need of being physically present in any location for tasks involving the operation of

appliances within a household / office. Minimize power and time wastage. The control system will include two separate units: the computer or a laptop and the control unit. There will therefore be two operating environments. Computer or laptop will operate indoors and outdoors whereas the control unit will operate indoors within the temperature and humidity limits for proper operation of the hardware.

This system is aimed toward all the average users who wish to control their household/office appliances remotely from their computer or laptop that the appliances are electrically controllable. Example of feasible appliances and applications under consideration include; enable/disable security systems, fans, lights, kitchen appliances, and adjusting the temperatures settings of a heating/ventilation/air conditioning system.

Certain assumptions have to be made in order to implement our project. The list of assumptions for our project is

- The user and control unit will establish communication using computer.
- The computer and processing software will support enabling light commands.
- The user is familiar with the web page buttons for controlling light on their computer.
- The controlled appliances can and will have to have an electrical interface in order to be controlled by the microcontroller.

## 2. METHODS

The following is a list of constraint Considerations

1. The controlled appliances will need an electrical control interface. This system is only capable of controlling electrical devices.
2. The control module will need to be shielded against electrostatic discharges. This will increase the reliability of the system.
3. Battery backup for controlling unit can be implemented in case of power disruption.

The considerations for this system will include a choice of networks, communication protocols and interfaces.

- LAN Networks: The widely available networks are based on LAN for maintain the connections with the Processing software. This network provides local area coverage and can be utilized effectively for this project.
- Softwares: The available software that we have used is Processing 2.0. This software is the most efficient because this project requires a communication and limited data to be sent.
- I/O interfaces between microcontroller and devices: Serial I/O is considered as options for connection between the computer and the microcontroller. Using the microcontroller, a control circuit will be implemented to control the electrical appliances.

### PHP (HYPERTEXT PREPROCESSOR):

PHP is a script language and interpreter that is freely available and used primarily on Linux Web servers. PHP originally derived from Personal Home Page Tools, now stands for PHP: Hypertext Pre-processor.

### PROCESSING 2.0, SOFTWARE:

Processing is an open source programming language and integrated development environment (IDE) built for the electronic arts, new media art, and visual design communities with the purpose of teaching the fundamentals of computer programming in a visual context, and to serve as the foundation for electronic sketchbooks. The project was initiated in 2001 by Casey Reas and Benjamin Fry, both formerly of the Aesthetics and Computation Group at the MIT Media Lab. One of the stated aims of Processing is to act as a tool to get non-programmers started with programming, through the instant gratification of visual feedback. The language builds on the Java language, but uses a simplified syntax and graphics programming model.

### **Arduino UNO:**

Arduino is a single-board microcontroller, intended to make the application of interactive objects or environments more accessible. The hardware consists of an open-source hardware board designed around an 8-bit Atmel AVR microcontroller, or a 32-bit Atmel ARM. Pre-programmed into the on-board microcontroller chip is a boot loader that allows uploading programs into the microcontroller memory without needing a chip (device) programmer.

### **ATmega328**

The ATmega328 microcontroller is the current top of the line in the 28-pin ATmega x8 series. The ATmega328 has 32kB flash memory, 2kB RAM, and 1kB EEPROM. The ATmega328 can be considered a step up from the ATmega8.

#### *Pin Description*

VCC: Digital supply voltage.

GND: Ground.

### **Port B (PB7:0) XTAL1/XTAL2/TOSC1/TOSC2:**

Port B is an 8-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The Port B output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, Port B pins that are externally pulled low will source current if the pull-up resistors are activated. The Port B pins are tri-stated when a reset condition becomes active, even if the clock is not running.

Depending on the clock selection fuse settings, PB6 can be used as input to the inverting oscillator amplifier and input to the internal clock operating circuit.

Depending on the clock selection fuse settings, PB7 can be used as output from the inverting Oscillator amplifier

If the Internal Calibrated RC Oscillator is used as chip clock source, PB7...6 is used as TOSC2...1 input

for the Asynchronous Timer/Counter2 if the AS2 bit in ASSR is set

### **Port C (PC5:0):**

Port C is a 7-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The PC5...0 output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, Port C pins that are externally pulled low will source current if the pull-up resistors are activated. The Port C pins are tri-stated when a reset condition becomes active, even if the clock is not running.

### **PC6/RESET:**

If the RSTDISBL Fuse is programmed, PC6 is used as an I/O pin. Note that the electrical characteristics of PC6 differ from those of the other pins of Port C. If the RSTDISBL Fuse is unprogrammed, PC6 is used as a Reset input. A low level on this pin for longer than the minimum pulse length will generate a Reset, even if the clock is not running.

### **Port D (PD7:0):**

Port D is an 8-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The Port D output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, Port D pins that are externally pulled low will source current if the pull-up resistors are activated. The Port D pins are tri-stated when a reset condition becomes active, even if the clock is not running.

### **AVCC:**

AVCC is the supply voltage pin for the A/D Converter, PC3:0, and ADC7:6. It should be externally connected to VCC, even if the ADC is not used. If the ADC is used, it should be connected to VCC through a low-pass filter. Note that PC6...4 use digital supply voltage, VCC.

### **AREF:**

AREF is the analog reference pin for the A/D Converter  
ADC7:6 (TQFP and QFN/MLF Package Only):

In the TQFP and QFN/MLF package, ADC7:6 serve as analog inputs to the A/D converter. These pins are powered from the analog supply and serve as 10-bit ADC channels.

**Features:**

High Performance, Low Power Atmel®AVR® 8-Bit Microcontroller Family, Advanced RISC Architecture, 131 Powerful Instructions – Most Single Clock Cycle Execution, 32 x 8 General Purpose Working Registers, Fully Static Operation, Up to 20 MIPS Throughput at 20MHz

On-chip 2-cycle Multiplier, Atmel® QTouch® library support, capacitive touch buttons, sliders and wheels, QTouch and QMatrix® acquisition Up to 64 sense channels.

**Peripheral Features:**

Two 8-bit Timer/Counters with Separate Prescaler and Compare Mode, One 16-bit Timer/Counter with Separate Prescaler, Compare Mode, and Capture Mode, Real Time Counter with Separate Oscillator, Six PWM Channels 8-channel 10-bit ADC in TQFP and QFN/MLF package.

- Temperature Measurement
- 6-channel 10-bit ADC in PDIP Package
- Temperature Measurement
- Programmable Serial USART
- Master/Slave SPI Serial Interface
- Byte-oriented 2-wire Serial Interface (Philips I2 C compatible)
- Programmable Watchdog Timer with Separate On-chip Oscillator
- On-chip Analog Comparator
- Interrupt and Wake-up on Pin Change
- Special Microcontroller Features

Power-on Reset and Programmable Brown-out Detection, Internal Calibrated Oscillator, External and Internal Interrupt Sources  
Six Sleep Modes: Idle, ADC Noise Reduction, Power-save, Power-down, Standby, and Extended Standby

- I/O and Packages

23 Programmable I/O Lines

28-pin PDIP, 32-lead TQFP, 28-pad QFN/MLF and 32-pad QFN/MLF

- Operating Voltage:

1.8 - 5.5V

- Temperature Range:

-40°C to 85°C

- Power Consumption at 1MHz, 1.8V, 25°C

- Active Mode: 0.2mA
- Power-down Mode: 0.1µA

**Relay:**

The relay driver is used to isolate both the controlling and the controlled device. The relay is an electromagnetic device, which consists of solenoid, moving contacts (switch) and restoring spring and consumes comparatively large amount of power. Hence it is possible for the interface IC to drive the relay satisfactorily. To enable this, a driver circuitry, which will act as a buffer circuit, is to be incorporated between them. The driver circuitry senses the presence of a “high” level at the input and drives the relay from another voltage source. Hence the relay is used to switch the electrical supply to the appliances.

NO: - Normally Open

COM: - Common

NC:- Normally Closed



**2, 5 - Relay Coil connection**

**1 - Common**

**3 - NO 4 - NC**

From the figure when we connect the rated voltage across the coil the back emf opposes the current flow but after the short time the supplied voltage will overcome the back emf and the current flow through the coil increase. When the current is equal to the activating current of relay the core is magnetized and it attracts the moving contacts.

Now the moving contact leaves from its initial position denoted "(N/C)" normally closed terminal which is a fixed terminal. The common contact or moving contact establishes the connection with a new terminal which is indicated as a normally open terminal "(N/O)".

Whenever, the supply coil is withdrawn the magnetizing force is vanished. Now, the spring pulls the moving contact back to initial position, where it makes a connection makes with N/C terminal. However, it is also to be noted that at this time also a back emf is produced. The withdrawal time may be in microsecond, the back emf may be in the range of few kilovolts and in opposite polarity with the supplied terminals the voltage is known as surge voltage. It must be neutralized or else it may damage the system.

#### Sample algorithm for processing software:

Serial port;

Serial. List () prints all serial ports connected with the microcontroller.

First we should identify all the ports have connected with microcontroller by calling the above method.

Load the text file which stores the status of button. It may be either 1 or 0. And these values for either first bulb or second bulb or fan and so on.

If the user wants turn on first light he has to choose light number from the text file and either 1 or 0.

If the status is 1 his/her intention is to turn on the light, so 1 will be written on to arduino microcontroller.

If the status is 0 his/her intention is to turn off the light, so 0 will be written on to arduino microcontroller.

#### Algorithm for Arduino:

Any one of the pin that the LED is attached to - change this if you have a separate LED connected to another pin

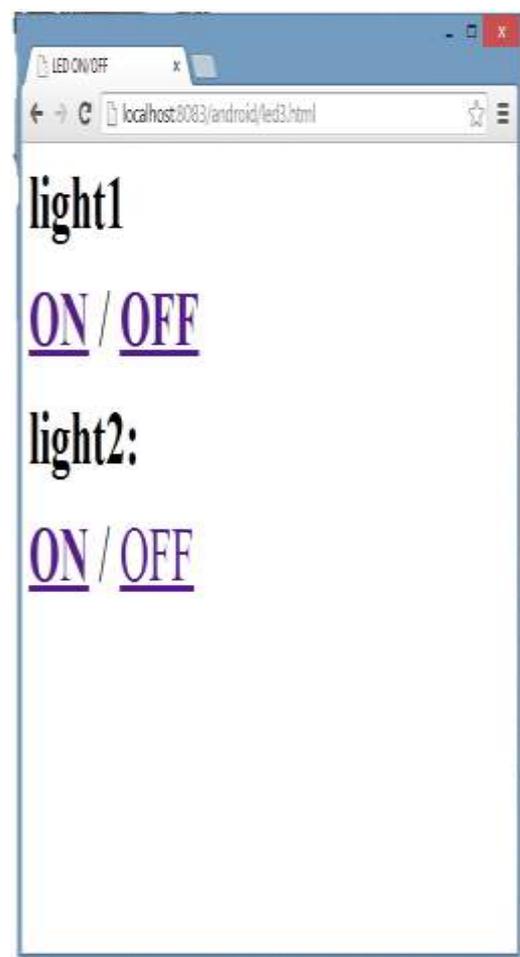
Make the pins to OUTPUT mode.

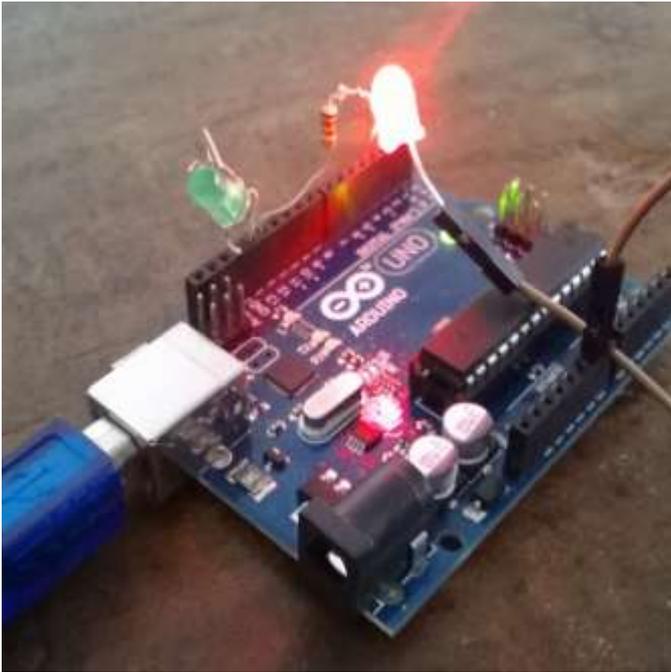
Read the response from web page, and according to the response appliances can controlled.

If the response is 1 light will turn On, and if the response is 0 light will turn Off.

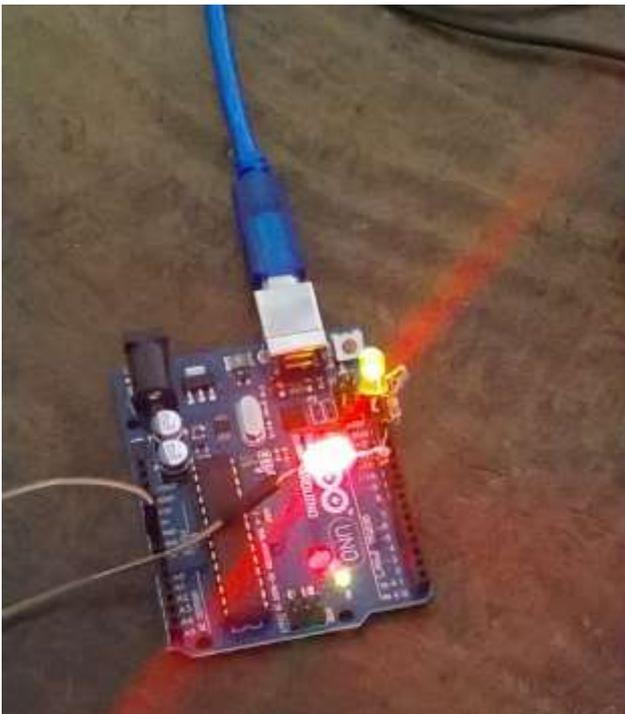
### 3. RESULTS

Web page





Enabling light1 to turn ON



Enabling two lights to turn ON.

#### 4. CONCLUSIONS

The home automation system has been experimentally proven to work satisfactorily by connecting sample appliances to it and the appliances were successfully controlled from a wireless mobile device. The Bluetooth client was successfully tested on a multitude of different mobile phones from different manufacturers, thus proving its portability and wide compatibility. Thus a low-cost home automation system was successfully designed, implemented and tested.

#### 5. FUTURESCOPE

A useful feature would be to add support for remotely controlling an infrared transmitter. This transmitter can be placed within range of an infrared enabled appliance such as an air conditioner. The user would then be able to control more advanced features of the appliance such as temperature control, fan speed, etc.

The project itself can be modified to achieve a complete Home Automation System which will then create a platform for the user to interface between himself and his household

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