

ZIGBEE BASED STREET LIGHT CONTROL SYSTEM

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Abstract - Street infrastructure to ensure the safety of citizens. Using this system saves energy, reduces accident rates as well and lowers system maintenance costs. Light pollution is also reduced. We used zigbee technology in our project. A zigbee transmitter and receiver are used to send signal to check the state of street lights and to take appropriate measure action in case of failure.

Key Words: Zigbee, Sensors, Microcontroller, Solar panel, Street lights.

1. INTRODUCTION

Due to the rapid growth of industries and cities, the demand for electricity is growing faster than the generation of electricity. Because the road control is currently operated manually. Because of the lightness of the operator, the light is ON for 24 hours and the energy is excessively wasted and due to this there is a more light pollution that's why we will develop a new lighting control system. What can overcome the shortcomings of the old system. We have examined and analyzed the functions of various street lightning control system. As a result, we have found that a lots of energy is wasted. With the zigbee technology we can save the wasted energy.

1.1 Proposed work

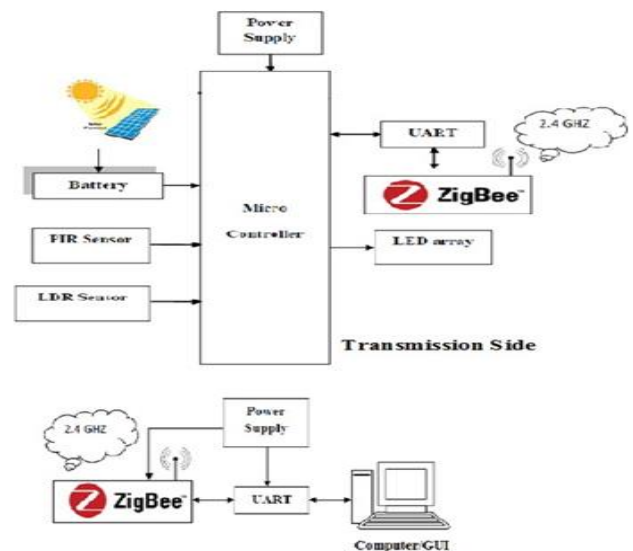
Proposed work is done by using arduino microcontroller and sensors that will control the electricity based on night and objects detection. The beauty of the proposed work is that the wastage of unused electricity can be reduced, lifetime of the street lights gets enhanced because the lights do not stay ON during the whole night and also helps to increase safety measurement.

In our project street lights are made smart by placing motion sensors on them, which enables them to detect movement zigbee technology enables the street lights to communicate with one another. When a passer-by is detected by a motion sensor, it will communicate this to neighboring street lights which will brighten so that people are always surrounded by a safe circle of light.

1.2 Future work

Further development can be done to increase the system efficiency by deploying Global System for Mobile Communications (GSM) system to send automatic text message to host at the control station, range of Zigbee communication can be increased by using RF (Radio Frequency) amplifiers. Capacity of the network can be increased by implementing higher class topologies and to have an internal database (date, time, status and location) to keep track of the street light activity for reference and maintenance purposes. Besides, a motion sensor can be installed so as to turn ON only when there is a sense of movement while the rest of time to be in OFF state in order to reduce power wastage.

2. System Architecture



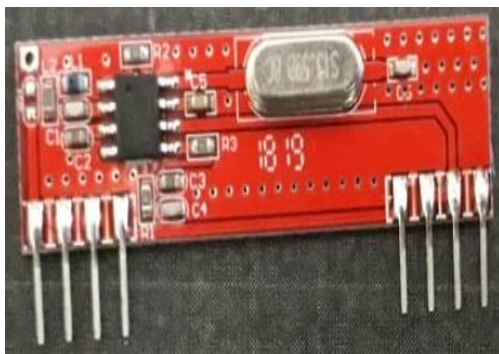
The smart system is developed using Arduino Uno microcontroller kit. Arduino is an open-source hardware kit with 8-bit Atmet AVR pre-programmed on-board microcontroller kit, with boot loader that uploads programs into microcontroller memory. They are different type of Arduino based on their features it is being categorized some of them are Arduino deicimila, Arduino Uno, Arduino Leonardo, Arduino Mega, Arduino Nano, Arduino Due, Arduino Lilypad and many more development boards. Here for this projects we are using Arduino Uno R3. The

voltage 7-12v, input voltage limit upto 20v, digital 110 pins 14, analog pins 6, Dc current 40mA, flash memory 32KB including 0.5KB used by boot loader, SRAM of 2KB, EEPROM of 1KB and clock speed of 16MHZ some of the features of Arduino Uno are power: can be USB connection or external power supply, with 7 to 12 volts recommended. The Arduino Uno provides power pins for other devices, the variants are 5v 3.3v and vin IOREF pin for optional power.

Memory: it as 2KB of SRAM and 1KB of EEPROM. Input and output pins: there are 14 digital pins with serial transfer and external interrupts and PWM pins as well and 6 analog pins. Communication: the Atmega 328 provides UART TTL serial communication which is available on 0 and 1 digital pins, the 16U2 firmware uses the standard USB COM drivers, and no external driver is needed. A Software Serial library allows for serial communication on any of the uno's digital pins. Automatic reset is provided using software running on computer with Arduino uno board connected to that computer. The Arduino provides an IDE for programming the Arduino uno board, this Arduino IDE can be downloaded from the Arduino official website and its free. This IDE is supported for every product of Arduino components. In this project we are using two sensors and wireless device module to accomplish the objective of projects. Some of the sensors and its descriptions given below.

PIR sensor is a motion sensor, is used to identify the passage of vehicle and pedestrian, giving an input to turn street light or street lights ON/DIM/OFF. LDR sensor is a light sensor, will detect intensity of sunlight. Depending on it, street light will be ready to turn ON/DIM/OFF. Zigbee module is a wireless communication medium, used to send/receive information from/to street lights and control unit. Also, helps in identifying faulty lights and control it.

ZIGBEE MODEM:



The first zigbee radios were introduced under the Max Stream brand in 2005 and were based on the IEEE 802.15.4-2003 standard designed for point to point and star communication at over-the-air baud rates of 250kbit/s.

Two models were initially introduced a lower cost 1MW zigbee and the higher power 100MW zigbee pro. Since the initial introduction, a number of new zigbee radios have

been introduced and an ecosystem of wireless modules, gateways, adaptors and software has evolved.

The zigbee radios can all be used with a minimum number of connections power (3.3v), ground, data in and data out(UART), with other recommended lines being reset and sleep. Additionally most zigbee families have some other flow control, input/output (I/O), analog-digital converter (A/D) and indicator lines built in. A version called the programmable zigbee has an additional processor for user's code. The programmable zigbee and a surface-mount version of the zigbee radios were both introduced in 2010.



PIR SENSORS: (model:SEN92355P)

A passive infrared sensor (PIR sensor) is an electronic sensor that measures infrared (IR) light radiating from objects in its field of view. They are most often used in PIR-based motion detectors. PIR sensors are commonly used in security alarms and automatic lighting applications. PIR sensors detect general movement, but they do not give information on who or what moved. For that purpose, an active IR sensor is required.

PIR sensors are commonly called "PIR", or sometimes "PID", for "passive infrared detector". The term passive refers to the fact that PIR devices do not radiate energy for detection purposes. They work entirely by detecting infrared radiation (radiant heat) emitted by or reflected from objects.

LEDs: (Light Emitting Diodes)

LEDs emit light when an electric current passes through them

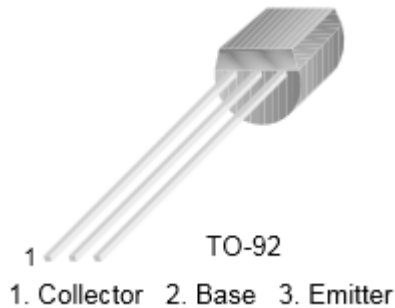
Colours of LEDs:

LEDs are available in red, orange, amber, yellow, green, blue and white. Blue and white LEDs are much more expensive than other colours.

The colour of an LED is determined by the semiconductor material, not by the colouring of the 'package' (the plastic body). LEDs of all colours are available in uncoloured packages which may be diffused (milky) or clear (often

described 'water clear'). The coloured packages are also available as diffused (the standard type) or transparent.

TRANSISTORS:



Transistors amplify current, for example they can be used to amplify the small output current from a logic chip so that it can operate a lamp, relay or other high current device. In many circuits a resistor is used to convert the changing current to a changing voltage, so the transistor is being used to amplify voltage.

A transistor may be used as a switch (either fully on with maximum current, or fully off with no current) and as an amplifier (always partly on). The amount of current amplification is called the current gain, symbol hFE.

TYPES OF TRANSISTOR:

There are two types of standard transistors, NPN and PNP, with different circuit symbols. The letters refer to the layers of semiconductor material used to make the transistor. Most transistors used today are NPN because this is the easiest type to make from silicon. If you are new to electronics it is best to start by learning how to use NPN transistors.

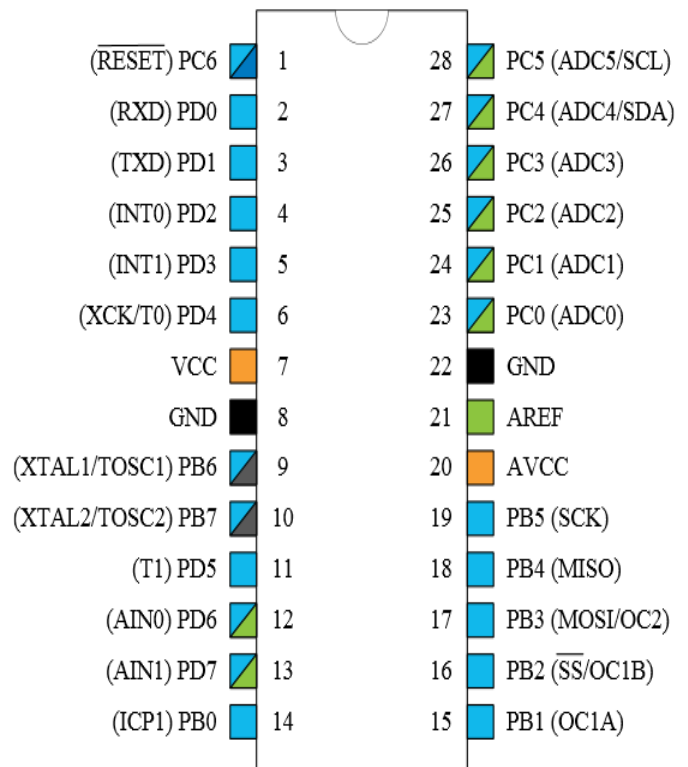
The leads are labeled base (B), collector(C) and emitter (E). These terms refer to the internal operation of a transistor but they are not much help in understanding how a transistor is used, so just treat them as labels.

MICROCONTROLLER Atmega8A



The AVR core combines a rich instruction set with 32 general purpose working registers. All the 32 registers are directly connected to the Arithmetic Logic Unit(ALU) allowing two independent registers to be accessed in one single instruction executed in one clock cycle. The resulting architecture is more code efficient while achieving throughputs up to ten times faster than conventional CISC microcontroller.

Pin Configuration



The Atmega8A provides the following features:8KB of In-System Programmable flash with Read While-Write capabilities,512B of EEPROM, 1KB of SPAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counter with modes, internal and external interrupts, a serial programmable USART, one byte oriented two-wire serial interface, a 6- channel ADC with 10-bit accuracy, a programmable Watchdog timer with internal oscillator, an SPI serial port, and five software selectable power saving modes. The Idle continue functioning. The Power-down mode saves the register contents but freezes the oscillator, disabling all other clip functions until the next Interrupt or Hardware Reset. In Power-save mode, the asynchronous timer continues to run, allowing the user to maintain a timer base while the rest of device is sleeping. The ADC Noise Reduction mode stops the CPU and all I/P modules except asynchronous timer and ADC, to minimize switching noise during ADC conversions. In standby mode, the crystal/resonator oscillators is running while the rest of the device is sleeping. This allows very fast start-up combined with low power consumption.



BIOGRAPHIES



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3. CONCLUSION

This system provides an efficient and smart automatic streetlight control system with the zigbee technology. The system can reduce energy consumption and maintenance cost and also helps to reduce crime activities up to certain limit. This streetlight control system helps in energy savings, detection of faulty lights and maintenance time and increase in life span of system.

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