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DESIGN AND IMPLEMENTATION OF SMART TRAFFIC CONTROLLING SYSTEM

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ABSTRACT

Traffic congestion problem is a phenomenon which contributed huge impact to the transportation system in country. This causes many problems especially when there are emergency cases at traffic light intersections which are always busy with many vehicles. A traffic light controller system is designed in order to solve these problems. This system was designed to be operated when it received signal from emergency vehicles based on radio frequency (RF) transmission and used the Programmable Integrated Circuit Arduino microcontroller to change the sequence back to the normal sequence before the emergency mode was triggered. This system will reduce accidents which often happen at the traffic light intersections because of other vehicle had to huddle for given a special route to emergency vehicle. As the result, this project successful analyzing and implementing the wireless communication; the radio frequency (RF) transmission in the traffic light control system for emergency vehicles. The prototype of this project is using the frequency of 434 MHz and function with the sequence mode of traffic light when emergency vehicles passing by an intersection and changing the sequence back to the normal sequence before the emergency mode was triggered. In future, this prototype system can be improved by controlling the real traffic situation, in fact improving present traffic light system technology.

KEY WORDS:

Arduino, Traffic light, Radio Frequency

INTRODUCTION

Many countries in the world are facing the problem at traffic light intersection that causes accident between emergency vehicle and other public vehicle. The traffic control system in Malaysia specifically has not been equipped with appropriate method when emergency case occurs. This will cause the emergency vehicles such as ambulances difficult to reach the destination on time because of the traffic congestion. Moreover, the situation is getting worse when emergency vehicles have to wait for other vehicles to give way at intersections with traffic lights. This causes a delay of time and may affect the emergency case. Besides, the collisions with other vehicles from other direction might occur at intersections when emergency vehicles had to override the red traffic lights. All these difficulties faced by emergency vehicles can be avoided using this traffic light control system based on radio frequency. Due to the problem, literature review for related issue prior to undertaking research project is decisive. The literature review will provide information on the technology available and methodologies used by other research counterparts around the world on this topic.

BLOCK DIAGRAM

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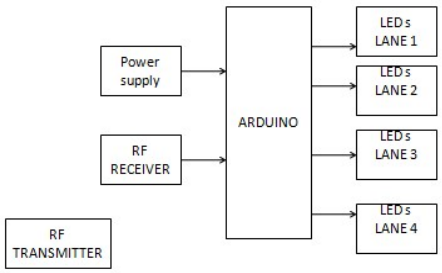

Fig.1 Block Diagram of Smart Traffic Monitoring and Controlling

WORKING METHODOLOGY

This system to be operated when it received signal from emergency vehicles based on radio frequency (RF) transmission and used the Programmable Integrated Circuit Arduino microcontroller to change the sequence back to the normal sequence before the emergency mode was triggered. This system will reduce accidents which often happen at the traffic light intersections because of other vehicle had to huddle for given a special route to emergency vehicle. As the result, this project successful analyzing and implementing the wireless communication; the radio frequency (RF) transmission in the traffic light control system for emergency vehicles. The prototype of this project is using the frequency of 434 MHz and function with the sequence mode of traffic light when emergency vehicles passing by an intersection and changing the sequence back to the normal sequence before the emergency mode was triggered.

HARDWARE DETAILES

Radio Frequency Transmission

A radio frequency (RF) signal begins as an electrical alternating current (AC) signal that is originally generated by a transmitter. This AC signal is sent via a copper conductor which usually a coaxial cable and radiated out of an antenna element in the form of an electromagnetic wave. Changes of current flow in the antenna produce changes in the electromagnetic fields around the antenna.

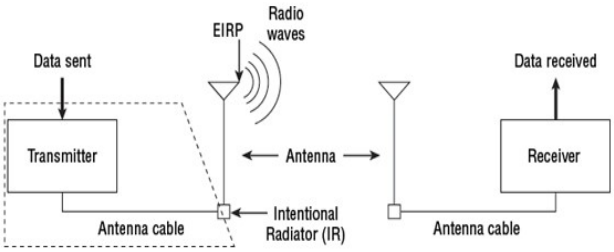

Fig 2.Radio Frequency Transmission

ARDUINO

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Arduino is a computer hardware and software company, project, and user community that designs and manufactures microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical world. The project's products are distributed as open source hardwareand software, which are licensed under the GNU Lesser General Public License (LGPL) or the GNU General Public License (GPL), permitting the manufacture of Arduino boards and software distribution by anyone. Arduino boards are available commercially in preassembled form, or as do it yourself.

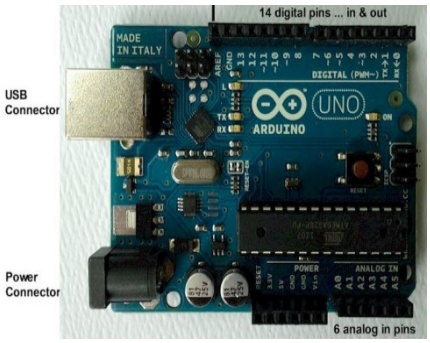

Fig 3.Diagram of Arduino Uno SMD R3

ARDUINO UNO R3 MICROCONTROLLER

The Arduino Uno R3 is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

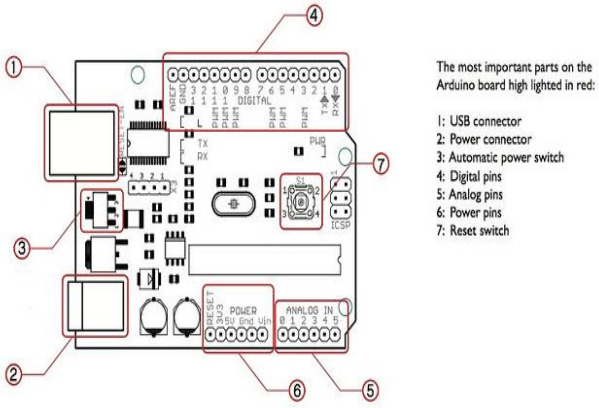

Fig 4.Arudino UNO R3 Microcontroller

(SDA) and (SCL)

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Support I2C (TWI) communication using the Wire library. There are a couple of other pins on the board: AREF is the reference voltage for the analog inputs. Bring this line LOW to reset the microcontroller. Typically used to add a reset button to shields which block the one on the board.

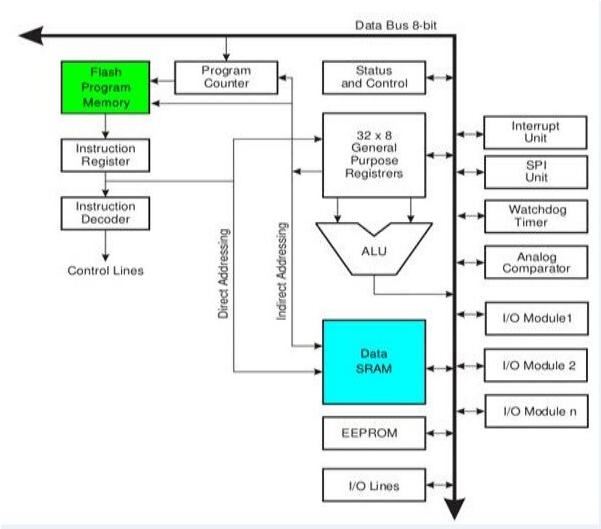

Fig 5.(SDA) and (SCL).

POWER SUPPLIES

The present chapter introduces the operation of power supply circuits built using filters, rectifiers, and then voltage regulators. Starting with an ac voltage, a steady dc voltage is obtained by rectifying the ac voltage, then filtering to a dc level, and finally, regulating to obtain a desired fixed dc voltage. The regulation is usually obtained from an IC voltage regulator unit, which takes a dc voltage and provides a somewhat lower dc voltage, which remains the same even if the input dc voltage varies, or the output load connected to the dc voltage changes.

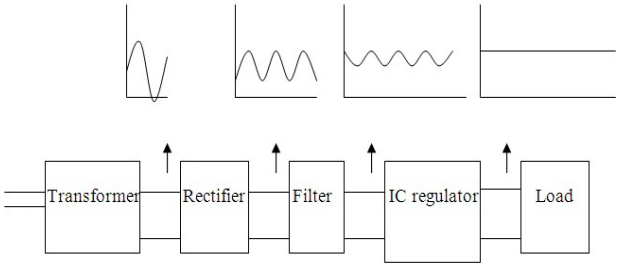

Fig 6.Waveform

Fixed Positive Voltage Regulators

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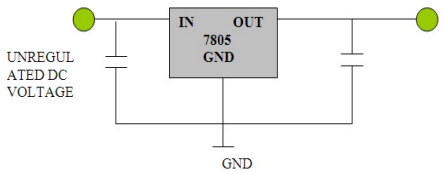

Fig 7.Fixed Positive Voltage Regulators

While the input voltage may vary over some permissible voltage range, and the output load may vary over some acceptable range, the output voltage remains constant within specified voltage variation limits. These limitations are spelled out in the manufacturer's specification sheets.

Embedded systems are programmed using different type of language

- Machine Code
- Low level language, i.e., assembly
- High level language like C, C++, Java, Ada, etc.
- Application level language like Visual Basic, scripts, Access, etc.

RESULTS AND DISCUSION

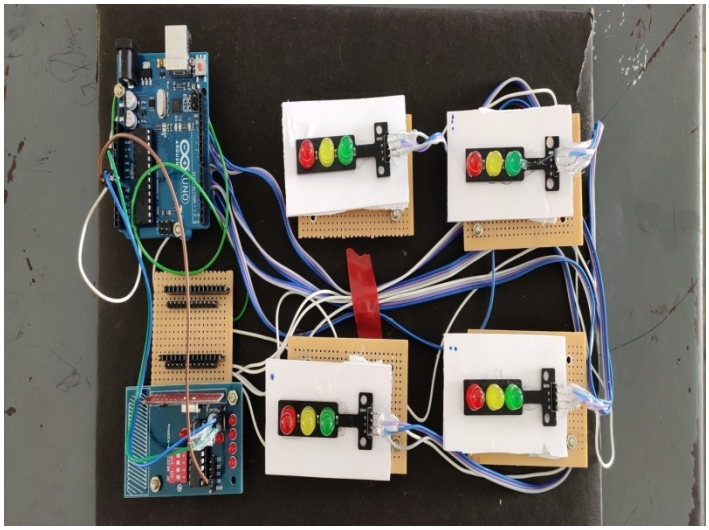

Fig 8.Hardware Results

The traffic congestion problem and provided an emergency path for the emergency vehicle where the radio transmitter and antenna placed on the emergency vehicle. The radio will transmit the signal to the other vehicle that

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nearby. The radio receiver had been placed at four junction traffic light will receive the emergency signal from emergency vehicle that passed by the junction. The first signal code contains a frequency for emergency vehicle while the second signal code contains a frequency for other vehicle. The transmitted signals provide miscellaneous traffic light pole in normal condition or emergency. When the receiver received the signal from emergency vehicle transmitter, traffic light system for emergency vehicle will be activated. As part of the invention, the traffic light control system will inform the emergency vehicle which it has received the transmitted signal. The stored preset traffic patterns may in one representation is responsive to manual intervention from a dispatching centre or to time-of-day conditions. The traffic light control apparatus may be operated under control of data or voice transmitted from the emergency vehicle's regular two-way voice communications system to a central control station. But now this system was designed to be operated when it received signal from emergency vehicles based on radio frequency (RF) transmission and used the Programmable Integrated Circuit Arduino microcontroller to change the sequence back to the normal sequence before the emergency mode was triggered. This system will reduce accidents which often happen at the traffic light intersections because of other vehicle had to huddle for given a special route to emergency vehicle. As the result, this project successful analyzing and implementing the wireless communication; the radio frequency (RF) transmission in the traffic light control system for emergency vehicles.

CONCLUSION

As a conclusion, this project have achieved the main objective stated earlier which is analyzing and implementing the wireless communication; the radio frequency (RF) transmission in the traffic light control system for emergency vehicles. The prototype of this project is using the frequency of 434 MHz compared to the range of about 3 kHz to 300 GHz of frequency which have been reserved for the RF theoretically. Besides, the functionality of this project proved that the other objectives have been successfully attained which are designing an emergency sequence mode of traffic light when emergency vehicles passing by an intersection and changing the sequence back to the normal sequence before the emergency mode was triggered. The sequences for this project have been developed using the programming in the microcontroller PIC 16F877A. In future, this prototype system can be improved by controlling the real traffic situation and the study can be done by investigating the length, reception and transmission issue for the system to be operated with this traffic light system.

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