Adaptive Traffic Light Control System for Emergency-Vehicle Override

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Abstract:

Microcontroller and Zigbee serves as the nucleus of the whole system. The microcontroller is programmed using embedded C language. Control buttons, zigbee module and traffic signal indicators are interfaced with thme microcontroller. Whereas, the Zigbee establishes a wireless communication between the system in the ambulance and the system at the signal point. During an emergency situation the driver can access the traffic light system by means of control buttons in the ambulance, thus the data will be received by the zigbee module present at the signal point and the data is processed by controller. Accordingly action will be done on the traffic light signal indicators.

Introduction:

In the current scenario the existing traffic light control system is static in nature and it needs further improvement for betterment. So taking it in account we need a system which is dynamic thereby, it can handle traffic effectively. In this project we are making the traffic light control system dynamic which has the ability to control the traffic as well as avoid the congestion of roads, in which PIC16F877A(tx) which is used to transmit the signal as an single character and simultaneously the receiver controller receives the signal and it decodes the signal then it is processed to get the desired output.
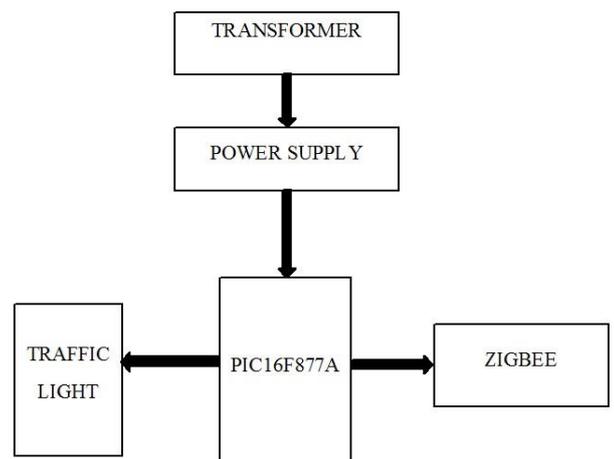
The main blocks of this project are:
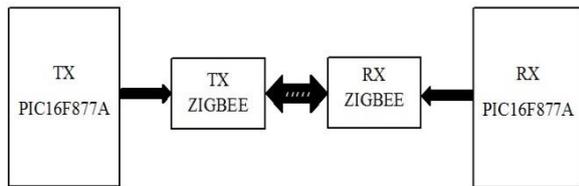
- Micro Controller
- Zigbee module
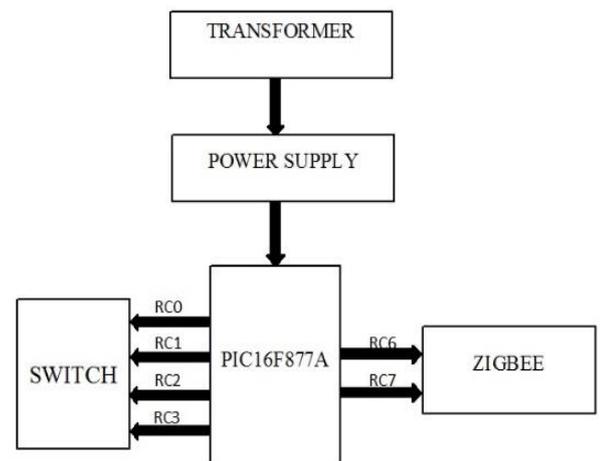
Transmitter Block:
ZIGBEE Transmitter

Receiver Block:
ZIGBEE Receiver

Receiver/Transmitter (USART) also supports synchronous operation.

USART (Universal Asynchronous / Synchronous Receiver Transmitter):

A UART's main purpose is to transmit and receive serial data.In UART communication, two UART's communicate directly with each other. The transmitting UART converts parallel data, transmits it in serial to the receiving UART, which then converts the serial data back into parallel data for the receiving device. Only two wires are needed to transmit data between two UARTs. Data flows from the Tx pin of the transmitting UART to the Rx pin of the receiving UART.A universal asynchronous receiver/transmitter (UART), is a computer hardware device for asynchronous serial communication in which the data format and transmission speeds are configurable. The electric signaling levels and methods are handled by a driver circuit external to the UART. UARTs are commonly used in conjunction with communication standards such as TIA (formerly EIA) RS-232, RS-422 or RS-485. A UART is usually an individual integrated circuit (IC) used for serial communications over a computer or peripheral device serial port. UARTs are now commonly included in microcontrollers. A dual UART, or DUART, combines two UARTs into a single chip. Similarly, a quadruple UART or QUART, combines four UARTs into one package, such as the NXP 28L194. An octal UART or OCTART combines eight UARTs into one package, such as the Exar XR16L788 or the NXP SCC2698. A related device, the Universal Synchronous/Asynchronous

ZIGBEE Module:

ZigBee is an open global standard for wireless technology designed to use low-power digital radio signals for personal area networks. ZigBee operates on the IEEE 802.15.4 specification and is used to create networks that require a low data transfer rate, energy efficiency and secure networking. It is employed in a number of applications such as building automation systems, heating and cooling control and in medical devices. ZigBee is designed to be simpler and less expensive than other personal are network technologies such as Bluetooth. ZigBee is a cost- and energy-efficient wireless network standard. It employs mesh network topology, allowing it provide high reliability and a reasonable range.One of ZigBee's defining features is the secure communications it is able to provide. This is accomplished through the use of 128-bit cryptographic keys. This system is based on symmetric keys, which means that both the recipient and originator of a transaction need to share the same key. These keys are either pre-installed, transported by a "trust center" designated within the network or established between the trust center and a device without being transported. Security in a personal area network is most crucial when ZigBee is used in corporate or manufacturing networks.

Microcontroller Overview:

Here 16F877A micro controller used. The 40 pins make it easier to use the peripherals as the functions are spread out over the pins. This makes it easier to decide what external devices to attach without worrying too much if there are enough pins to do the job. One of the possible advantage is that each pin is only shared between two or three functions so it's easier to decide what the pin function.In fact a PIC microcontroller is an amazingly powerful fully featured processor with internal RAM, EEROM FLASH memory and pheripherals.The architectural decisions are directed at the

maximization of speed to cost ratio. This architecture in which instruction and data come from separate sources, simplifier timing and microcircuit design greatly and this benefits clock, speed, price and power consumption One of the smallest ones occupies the space of a 555 timer but has a 10 bit ADC, 1k of memory, 2 timers, and high current I/O Ports. The PIC architecture was among the first scalar CPU design and is still among the simplest and cheapest.

Applications:

- This system can be practically implemented in real time ambulence.by this we can save many lives in emergency condition using wireless zigbee technology.
- It can be employed to other emergency purposes like fire service.

Future Enhancement:

- We can use GSM for further long distance transmission and reception of signal
- By including sensor the signal can be made to remain in green until the vehicle is within the zigbee range.

Conclusion:

This paper presents an architecture that can be used as a means of interaction between vehicle and Traffic Light system for the purpose of reducing traffic congestion using zigbee module. All the process involved are analyzed and justified where possible. The project has examined the possibility of making use of similar approaches/techniques (GSM Module) for extended applications and already there are some applications that have adapted this strategy. This Project has been defined; it will

form as a foundation for future work within this area, which includes implementing a navigation system for vehicle to find shortest path to reach the destination in a traffic-free manner and retaining the signal in green until the vehicle remains in the range of zigbee.

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