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Smart Traffic Control Approach For Emergency Vehicles

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ABSTRACT

Traffic congestion problem is a phenomenon which contributed huge impact to the transportation system in our 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 assistance 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 Arduino Atmega 328 microcontroller to controls the LEDs used in the traffic signals. The use of hazard LED in the system which helps the emergency vehicles to pass the traffic easily. This system will reduce accidents which often happen at the traffic light intersections because of another vehicle had to huddle for given a special route to emergency vehicle. As the result, this project successful analyzing and implementing the traffic assistance system for emergency vehicles.

Keywords: Traffic Control, Arduino, Traffic Congestion

I. INTRODUCTION

India is the second most populous country in the world and is a fast growing economy. Because of more population the growth in the number of vehicles is increasing exponentially day by day. But the infrastructure growth is slow due to space and cost constraints [1]. As a result, India is facing terrible road congestion problems in its cities. Also, Indian traffic is non-lane based and disordered. There are many issues related to increasing traffic such as accidents, numerous types of pollutions, time wastage and health related problems. The major reasons for traffic problems are increase in the number of vehicles, violation in the traffic rules, various construction works and increase in the number of accidents. This is turn has an adverse effect on the economy of the country as well as the loss of lives due to ambulances getting stuck in traffic jams. Due to all these problems the increase in We have come up with few improved implementations in these above projects. This can be done by the following two ways:

The project is designed to develop traffic signal system having remote override facilities. During normal time the signal timing changes automatically on sensing the traffic density at the junction but in the event of any emergency vehicle like ambulance, fire brigade etc. requiring priority are built in with smart system at junction. Which involved the RF receiver, IR sensor network and traffic lights.

Traffic congestion is a severe problem in many major cities across the world thus it is felt imperative to provide such facilities to important vehicles. Further the project can be enhanced by synchronizing all the traffic junctions in the city by establishing a network among them. The network can be wired or wireless. This synchronization will greatly help in reducing traffic congestion.

II. LITERATURE SURVEY

Traffic Congestion is a major issue. Because of this congestion problem, time taken for travelling will be increased. A design was developed using wireless technology with PIC microcontroller, IR sensor and XBEE. IR sensor was used to decided traffic density and timing for the traffic light. XBee was used to provide Green path

for emergency vehicle. But this design was implemented only for automatic mode of operation [1]. An algorithm was also designed so that more number of vehicles are passed in signal. Priority number would be given to different category of vehicles. Emergency vehicles like ambulance, fire trucks etc. would have first priority. Next priority is given to VIP's. Next to ordinary Vehicles. Priority was also given depending upon vehicle density in one side of road in traffic junction. The road which had higher vehicle number would get highest priority [2]. RFID is mainly used to track the objects. RFID readers and tags are used in showrooms so that no one takes off any object or material without paying the bill. This RFID is also used to track the lost vehicles. When the unique ID of RFID tag of lost vehicle is detected then it's location where it is found is obtained [3]. Green path for emergency vehicles was also designed before which use to provide Green signal to all sides of signal in traffic junction so that ambulance will get path to move [4]. But the disadvantage of this was all vehicles from all side will starting moving which will create even more traffic jam for ambulance

III. PROPOSED METHODOLOGY

From present situation, an efficient solution to the problem is not yet obtained. Hence in order to provide effective solution this prototype is designed. The block diagram of the system is as shown below

In this proposed methodology we will provide solution to congestion, traffic clearance to ambulance and other emergency vehicles and tracking of stolen vehicles is also done. And one major plus point of the system is we have designed the system in automatic mode and manual mode. In automatic mode depending upon sensors output the decision is taken. But in manual mode we can have control on traffic, this is done by authorized person in control room. The Arduino mega is used in system takes controls on all. IR sensors are used to identify the density of traffic. And to identify the entry of ambulance and lost automobiles RF is used. If emergency case divider acts as a road for only for emergency vehicle, for that operation we are using servo motor, By seeing this pic authorized person in control room will take decision in manual mode of operation.

WORKING

In this project, we have used one Arduino MEGA where all the 12 LEDs (as signals) and one servo motors (for emergency vehicle passing) acts as divider connected to it to handle the traffic in a road junction and Arduino mega board where all the six IR Sensor are connected to it. Let us consider a four number of roads (R1, R2, R3 and R4) to form a road junction. Now, for road R1, R2, there will be two sensors for R1 &R2 for density indication. Remaining R3, R4 normal signal, this is applicable to all the remaining roads, i. e., R2, R3 and R4. When the signal for road R1 becomes green, the signals for roads R2, R3 and R4 becomes red and so that no vehicles can break the signal and also it will help to reduce traffic congestion and number of accidents. Now, after a particular time, the signal of road R1 turns yellow and then red so that again no vehicles can break the signal. Also, signal for road R2 becomes green and the road will be opened. This operation will be continued for all the remaining roads. If high density case which road is more traffic that road vehicle allows to move, in this system R1, R2 roads are detects density for each road two sensors are placed at minimum distance for vehicle identification.

Now, for example, if any emergency vehicle comes on the road R3 (which has the red signal) and if suppose the road R1 has green signal, then the RF signal on road R3 detects the signal which is placed in the emergency vehicle (saved in the program) which turns the signal for road R1 to red and R3 to green and divider become road for emergency vehicle (barricades will be opened), so that the emergency vehicle will be passed without any obstacle. This operation will be performed for all the roads, from where the emergency vehicle is coming from.

III. SYSTEM OVERVIEW

The fig.1 shows block diagram which gives you the overview of the proposed system. The brief description given bellow.

3.1. BLOCK DIAGRAM DESCRIPTION:

TRAFFIC SIGNAL JUNCTION:

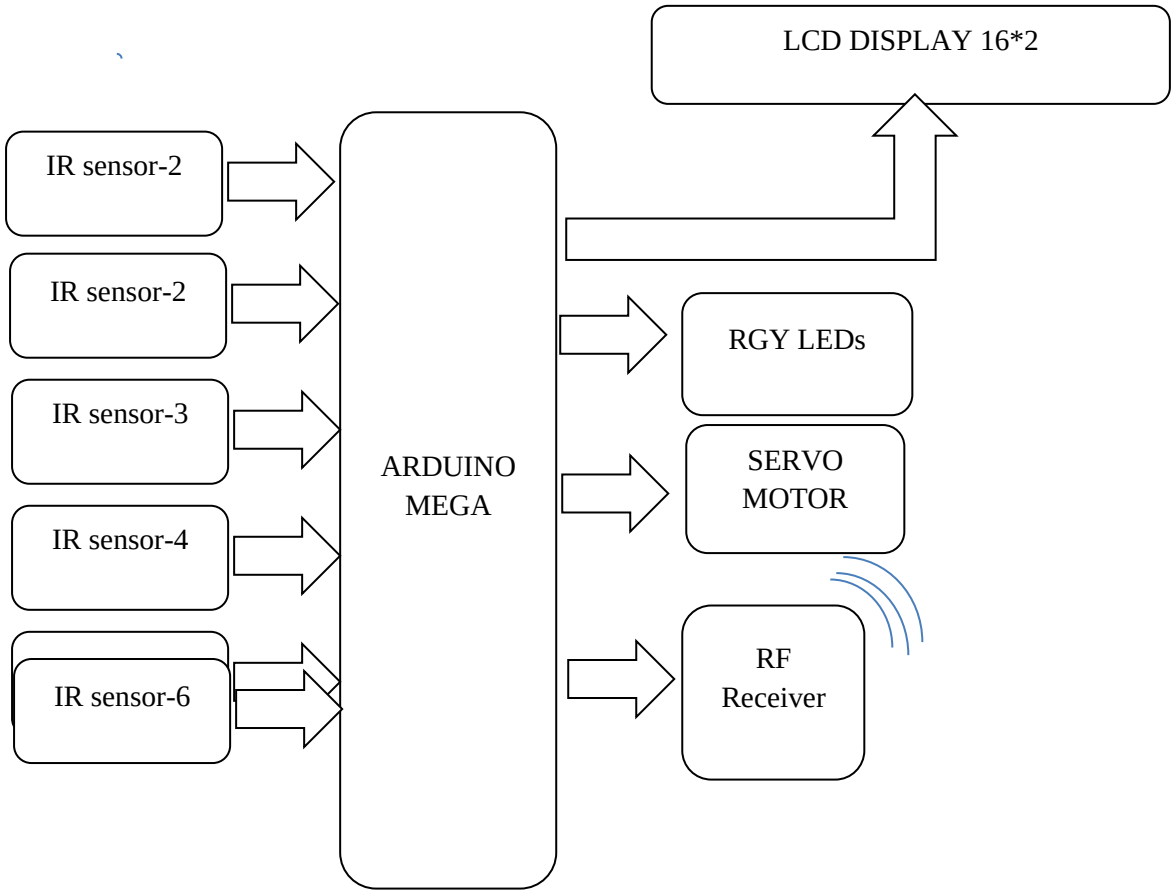

Fig.1 shows block diagram which is traffic signal part

AMBULANCE:

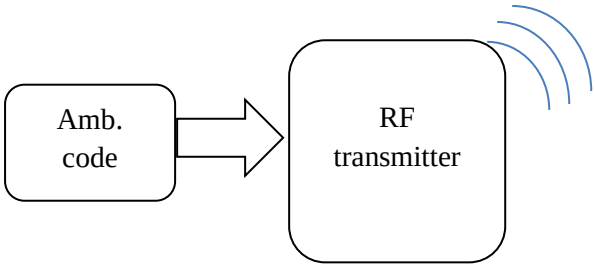

Fig-2 shows block diagram which is Ambulance part

CHAPTER-4

SENSOR & COMPARTOR

Sensors are sophisticated devices that are frequently used to detect and respond to electrical or optical signals. A Sensor converts the physical parameter (for example: temperature, blood pressure, humidity, speed, etc.) into a signal which can be measured electrically.

Criteria to choose a Sensor

There are certain features which have to be considered when we choose a sensor. They are as given below:

1. Accuracy
2. Environmental condition - usually has limits for temperature/ humidity
3. Range - Measurement limit of sensor

4. Calibration - Essential for most of the measuring devices as the readings changes with time
5. Resolution - Smallest increment detected by the sensor
6. Cost
7. Repeatability-The reading that varies is repeatedly measured under the same environment

IR SENSOR

Infrared Sensors or IR Sensors

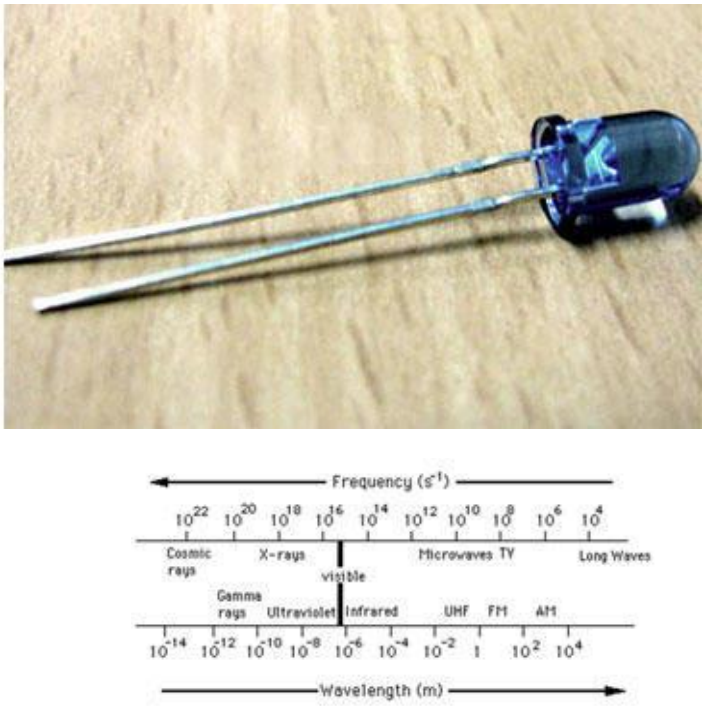

Fig-3 IR Sensor

OPTICAL COMPONENTS.

Often optical components are required to converge or focus infrared radiations, to limit spectral response, etc. To converge/focus radiations, optical lenses made of quartz, CaF2, Ge and Si, polyethylene Fresnel lenses, and mirrors made of Al, Au or a similar material are used. For limiting spectral responses, bandpass filters are used. Choppers are used to pass/ interrupt the IR beams.

Infrared detectors.

Various types of detectors are used in IR sensors. Important specifications of detectors are:

Photosensitivity or Responsivity is the Output Voltage/Current per watt of incident energy. Higher the better.

Noise Equivalent Power (NEP)NEP represents detection ability of a detector and is the amount of incident light equal to intrinsic noise level of a detector.

Detectivity (D*: D-star) D* is the photosensitivity per unit area of a detector. It is a measure of S/N ratio of a detector. D* is inversely proportional to NEP. Larger D* indicates better sensing element.

In addition, wavelength region or temperature to be measured, response time, cooling mechanism, active area, no of elements, package, linearity, stability, temperature characteristics, etc. are important parameters which need attention while selecting IR detectors.

Signal Processing

Since detector outputs are typically very small, preamplifiers with associated circuitry are used to further process the received signals.

4.4 COMPARATOR CIRCUIT

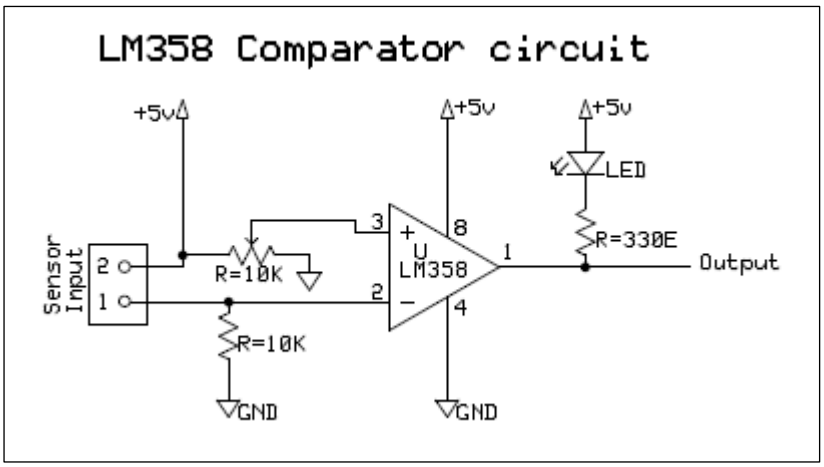

Figure 4: Comparator circuit diagram

CHAPTER-5

COMMUNICATION

Communication is the activity of conveying information through the exchange of messages, or information. The system which is to displays the next station information. To establish the communication between the station and Train we using RF communication system.

4.1 Block diagram of Communication System

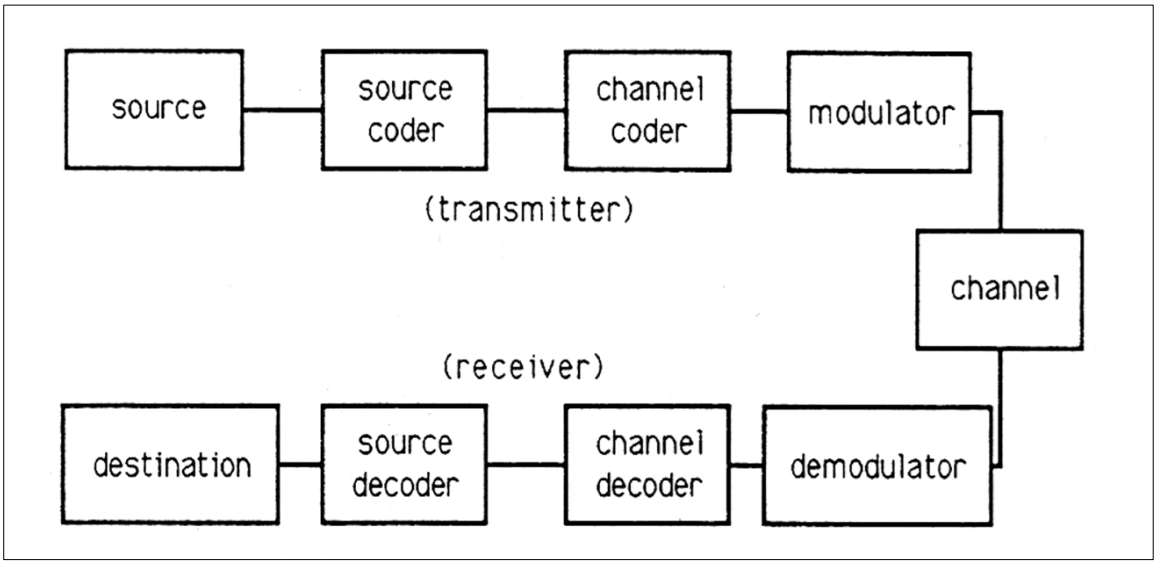

Fig-5 shows communication channel

RF Modules Pin description

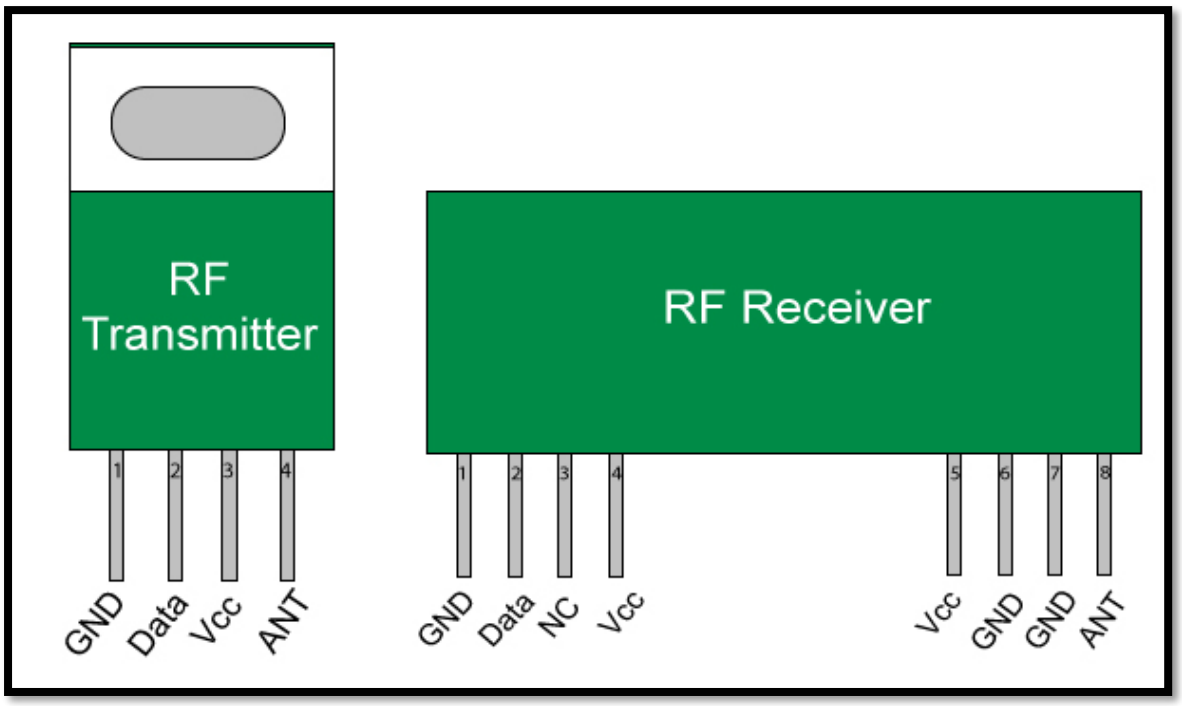

Fig-6 Pin Description

CHAPTER-6

HARDWARE IMPLIMANTATION

5.1 Regulated Power Supply Unit

Definition:

A power supply (sometimes known as a regulated power supply unit or RPSU) is a device or system that supplies electrical or other types of energy to an output load or group of loads. The term is most commonly applied to electrical energy supplies, less often to mechanical ones, and rarely to others.

5.1.1 Block diagram

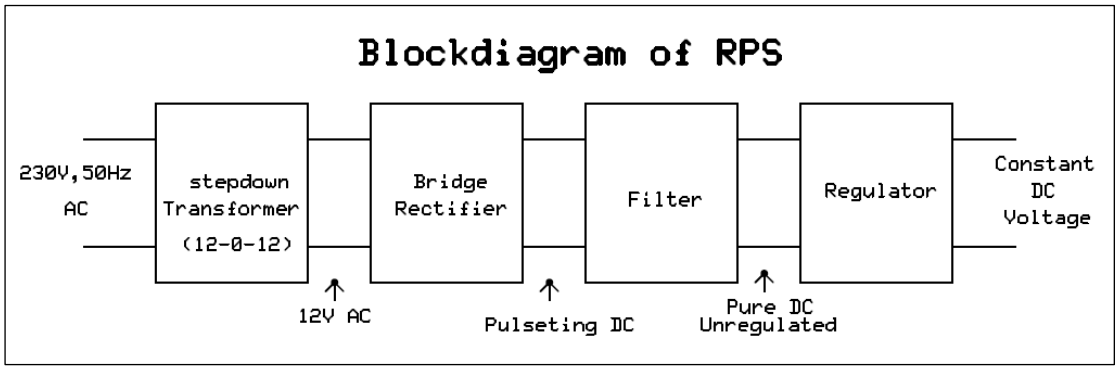

Figure 7: Block diagram of Regulated Power supply Unit

- The first section is the transformer. The transformer steps up or steps down the input line voltage and isolates the power supply from the power line.
- The rectifier section converts the alternating current input signal to a pulsating direct current. However, as you proceed in this chapter you will learn that pulsating dc is not desirable.
- For this reason a filter section is used to convert pulsating dc to a purer, more desirable form of dc voltage.
- 78xx chip family gives different output voltage as regulator. The last numbers in the chip code tells the output voltage.

5.1.2 Circuit description

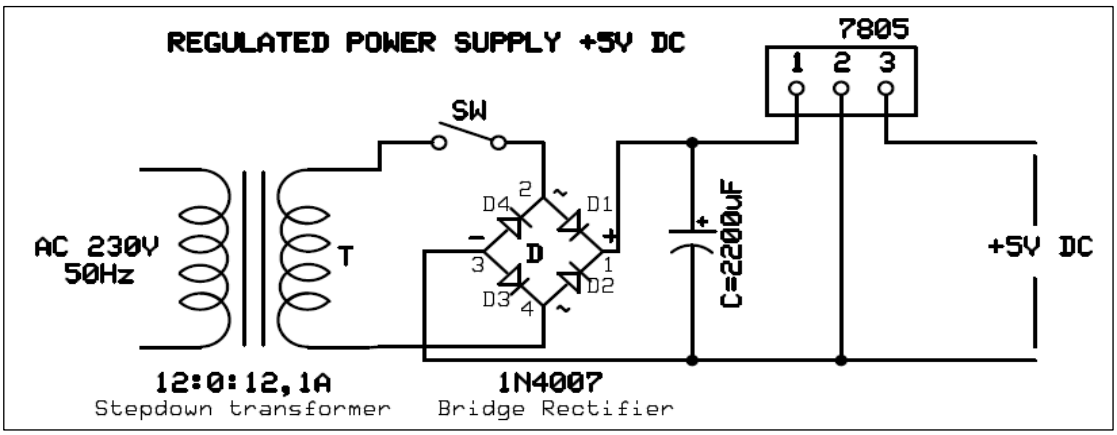

Figure 8: Schematic/Circuit diagram of +5V RPS

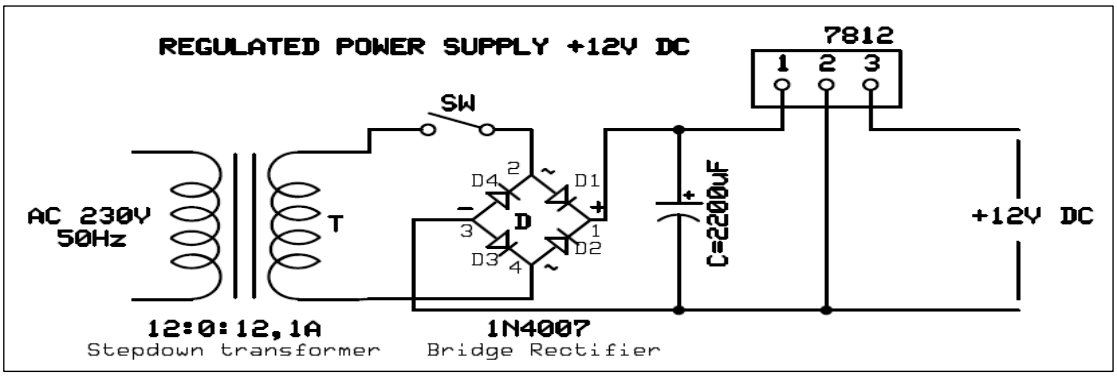

Figure 9: Schematic/Circuit diagram of +12V RPS

CHAPTER-7

SOFTWARE DEVELOPMENT

SOFTWARE INSTALLATION

Installing ARDUINO IDE

To install the Arduino IDE for Windows, follow these instructions:

1. Download .exe file from website: http://arduino.cc/en/Main/Software/
2. Once the download is complete, double-click the file, and extract it. (Usually the file is downloaded in .zip format)
3. The extracted “Arduino” named folder is to be copy and paste it into C-Drive, and Open the folder, if you wish create the shortcut of Arduino.exe file on your desktop.

Installing DRIVERS

The next task is to install the drivers for your Arduino board’s USB interface.

1. Connect your Arduino to your PC with the USB cable. After a few moments an error message will be displayed, which will say something like "Device driver software not successfully installed." Just close that dialog or balloon.
2. Navigate to the Windows Control Panel. Open the Device Manager and scroll down until you see the ports or Arduino,
3. Right-click *Arduino Uno* under Other Devices and select Update Driver Software. Then, select browse option and update the drivers.

The Command Area

The command area includes the title bar, menu items, and icons. The title bar displays the sketch's filename. Below this is a series of menu items (File, Edit, Sketch, Tools, and Help) and icons.

The Icons

Below the menu toolbar are six icons. Mouse over each icon to display its name. The icons, from left to right, are as follows:

1. **Verify:** Click this to check that the Arduino sketch is valid and doesn't contain any programming mistakes.
2. **Upload:** Click this to verify and then upload your sketch to the Arduino board.
3. **New:** Click this to open a new blank sketch in a new window.
4. **Open:** Click this to open a saved sketch. Save Click this to save the open sketch.
5. **Serial Monitor:** Click this to open a new window for use in sending and receiving data between your Arduino and the IDE.

The Text Area

The actual code is written in this block.

The Message Window Area

APPLICATIONS

- Avoids wastage of time due to the traffic
- Fully automatic
- Low power consumption
- It provides the easy access in the traffic light.
- Low cost to design the circuit, maintenance of the circuit is good
- Easy convenience to handle 29

4. ADVANTAGE

- Emergency vehicles can reach the destination on time.

- Many lives can be saved that are being lost due traffic jams.

- Traffic signals can be controlled remotely.

5. DISADVANTAGE

- If network fails, then traffic lights can't be controlled.

- Severity of accident can't be known.

RESULT & DISCUSSION

Implementation and working of proposed "Intelligent Traffic Control System for Emergency Vehicle Using RF Technology" is analyzed and evaluated with on-board display. In the proposed system, the traffic light control is controlled by the ATmega328P microcontroller. The RF system identifies the emergency vehicles and sends message to the microcontroller. Upon receiving the message, the microcontroller operates the green light for the emergency vehicle. The receiving of message in the microcontroller and operation of different working modes are observed and are as follows:

CONCLUSION AND ENHANCEMENTS

The proposed system results is as we expected. By this proposed system time management for signal lights is done which will reduce the traffic congestion problem. And the system has automatic and manual operation. When lost vehicle is identified a email will be dropped. Tracking of stolen automobile is done successfully and is fast. Clearance of traffic for emergency automobile is successfully implemented. Hence, many precious life would be saved. Further the same prototype can be added with accident message alert. And at present we have implemented the design for only one road of junction. This can be extended to more number of junctions. An 'app' can be designed which uses traffic status at different location from the control station database to display so that it helps normal people.

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