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# Design of Intelligent Traffic Control System Based on ARM

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**ABSTRACT:** Nowadays congestion in traffic is a serious issue. The traffic congestion can also be caused by long Red light delays, etc. The delay of respective light is hard coded in the traffic light and it is not dependent on traffic. Therefore for simulating and optimising traffic control to better accommodate this increasing demand is arises. In this project we discussed the optimisation of traffic light controller in a Metropolitan City using micro-controller and Digital Display. The system tries to reduce possibilities of traffic jams, caused by traffic lights, to an extent and give ease to drivers to avoid congested path. The system is based on micro- controller, GPRS module, IR sensors and Digital Display. Micro- controller also store vehicles count in its memory. Based on different vehicles count, the microcontroller takes decision and updates the traffic light delays as a result. The traffic light will decide itself the timing based on the current traffic density. This system is monitored in a monitoring station via cloud. All the information that is stored in the ARM7 is transmitter to the cloud via the GPRS module that is being installed.

**KEYWORDS:** ARM7, Infrared(IR) sensor, GPRS.

## I. INTRODUCTION

Traffic research has the goal to optimise traffic flow of people and goods. As the number of road users constantly increases, and resources provided by current infrastructures are limited, intelligent control of traffic will become a very important issue in the future. However, some limitations to the usage of intelligent traffic control exist. Avoiding traffic jams for example is thought to be beneficial to both environment and economy, but improved traffic-flow may also lead to an increase in demand. There are several models for traffic simulation. In our research we focus on optimisation of traffic light controllers in a city using IR sensor and control traffic using ARM micro-controller.

The traffic control system based on vehicle density calculation tries to reduce possibilities of traffic jams, caused by traffic lights. The system contains three IR transmitter and IR receiver for traffic density measurement which are mounted on the either sides of roads respectively. The IR system gets activated whenever any vehicle passes on road between IR sensors. When one sensor will be ON at that time density will be less when two sensors will be ON at that traffic density is medium when all 3 sensor will be ON at that time density will be high. Micro-controller controls the IR system and counts number of vehicles passing on road. Based on vehicle density calculation, the micro-controller takes decision and updates the traffic light delays as a result. The traffic light is situated at a certain distance from the IR system. Thus based on vehicle density calculation, micro-controller defines different ranges for traffic light delays and update.

Also we use GPS technology to give accidental information about the vehicle. When traffic accidents occur, the system immediately notifies the location of accident to emergency personnel like ambulance by use of GPS technology. Also the system have facility to emergency vehicle detection system like ambulance, police etc. When an emergency car comes on the signal and number of vehicles will be available in front of the emergency vehicle. In this situation, the system will detect the emergency car, and then signal falls RED to GREEN to pass the car by sending signal from emergency vehicle to traffic light sensor system and the signal will be RED for other vehicles, so number of possibility of accident reduces.

## II. RELATED WORK

Several works on mobile sensor for traffic monitoring have been carried out in recent years. Most of them have focused on highways or freeways, where a traffic light delay is not an issue in these circumstances. On the contrary, the situation is different from an urban area, where there are traffic light delays. The author Zhang Yuye et.al.[1] system use AT89C51 and CAN BUS controller which leads to complicated design and cost of the system more because of CAN BUS controller. Using AT89C51 power requirement will be more but the proposed ARM7 based traffic control system will use low power Atmega16 microcontroller. So reduce the power required. The author Manoj Kanta Mainali et.al. [2] system used genetic algorithm approach to estimate the traffic volume in road sections without the traffic information on road sections. The system can estimate the

unknown traffic volume using only the known traffic volumes. So, proposed ARM7 based traffic control system use the advantage of [1][2] to design very efficient system that use the combination of ARM and AVR.

The author Xu Li et.al. [3] carried out a performance evaluation study by utilising the existing vehicle-based sensors in taxies for traffic monitoring. A performance evaluation has been carried out in Shanghai, China. ARM based traffic control system based on vehicle density calculation to reduce traffic congestion carried out in India. The author Promila Sinhmar et.al. [4] the system use Image processing to traffic light control and monitoring system. The microcontroller is connected to a computer through a serial communication cable so hardware cost is more. Thus I propose Arm based traffic control system to control the traffic and monitoring system uses Global Positioning System.

## III. PROBLEM DESCRIPTION

In typical conventional traffic light controller, there are so many problems occurs which are mentioned below:
**A. Heavy Traffic Jams:** With increasing number of vehicles on the road, the heavy traffic congestion problem increased in cities. This usually happened in the morning, and in the evening. Due to this, people spend unnecessary time on the road. By developing the program which different setting delays for different junctions, we can solve these problems.

**B. No traffic, but still need to wait:** At certain junctions, the traffic is clear means there is no traffic but people have to wait until the green light. If people want to go in the red light, they have to pay fine. Our system proposed a solution to this problem which detects traffic flow on each road and set timings of signals accordingly.

**C. Emergency car stuck in a traffic jam:** At the traffic light junction, a road user waiting for the traffic light turns to green. During a traffic jam, the emergency vehicles such as ambulance, fire brigade, police, etc. will be stuck in a traffic jam. It can cause the emergency case become complicated. This is a very critical problem. The proposed traffic control system solves this problem in the most effective way. When an emergency car came and number of vehicles are present in front of emergency car then the system give green signal to pass the emergency car and RED for other vehicle which lead to traffic conjunction problem and also leads to accidents, so only emergency cars will pass the signal for a particular time period.

## IV. BLOCK DIAGRAM

The block diagram for the proposed project is as shown in Fig1 .

1. **ARM7 based transmission station.**

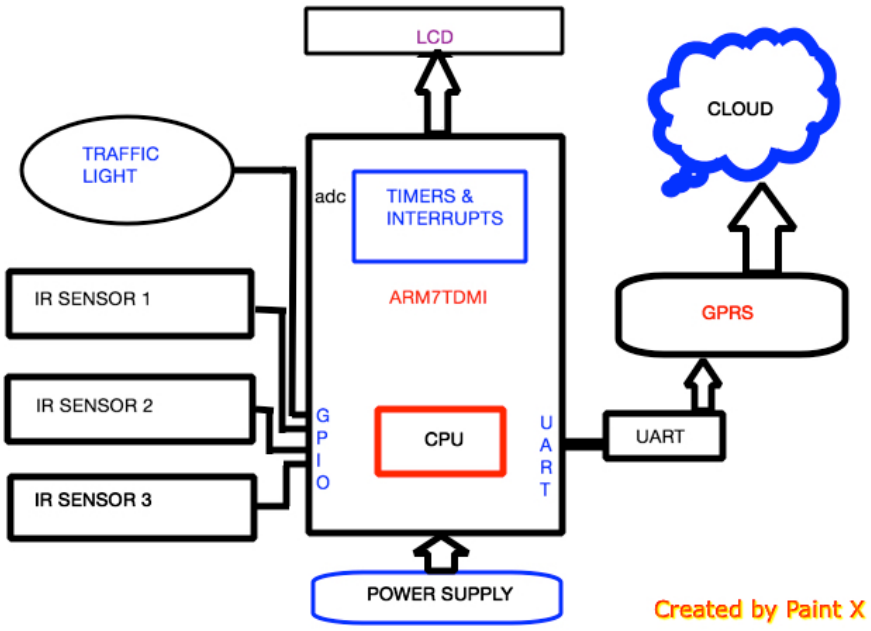


Fig1: Transmission station

The IR sensors are used to sense the number of vehicles on the road. According to the IR count, micro-controller takes appropriate decisions as to which road is to be given the highest priority and the longest time delay for the corresponding traffic light.

**2. Control station**

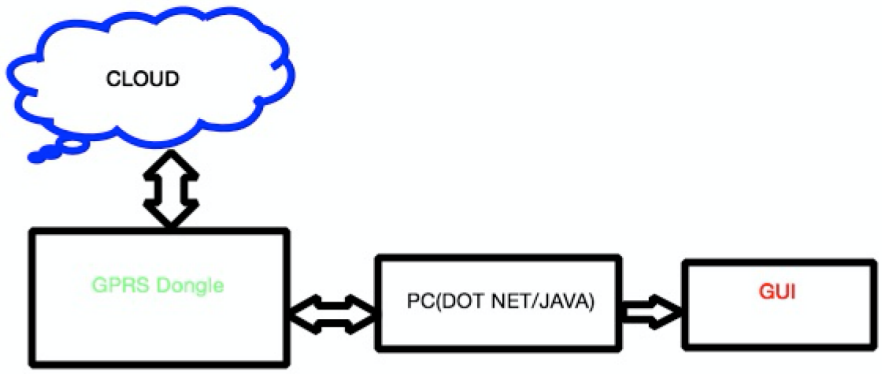


Fig2: control station.

Here the data from the cloud is accessed using a GPRS model and the corresponding data is plotted in the graph using GUI.

## V. DESIGN SCHEME AND SYSTEMS STRUCTURE

### A. ARM7 Microprocessor:

ARM7 processor in our model due to its advanced features described below. 32-bit ARM processor is the contemporary general purpose microprocessor on the embedded market used in industrial level applications. ARM7 consists of a number of peripherals interfaced to it. We use keypad matrix, LCD display, UARTS, GPIO and I2C protocol. ARM7 processor is a link between GPS and GSM modules for communication. The description of ARM7 is discussed in further sections

**Features:**

- 16/32-bit ARM7TDMI-S micro-controller is a 64 or 144 pin package.
- 16 KB on-chip Static RAM.
- 128/256 KB on-chip Flash Program Memory. 128-bit wide interface/accelerator enables high speed 60MHz operation.
- In-System Programming (ISP) and In-Application Programming via on-chip boot-loader software, flash programming takes 1ms per 512 byte line. Single sector or full chip erase takes 400 ms.
- B Two 32-bit timers (with 4 capture and 4 compare channels), PWM unit (6 outputs), Real Time Clock and Watchdog.
- Multiple serial interfaces including two UARTs (16C550), Fast I2C (400 Kbits/s) and two SPIs60 MHz maximum CPU clock available from programmable on-chip Phase-Locked Loop.
- On-chip crystal oscillator with an operating range of 1 MHz to 30 MHz
- Two low power modes Idle and Power-down.
- Processor wake-up from Power-down mode via external interrupt.

## VI. RESULT

The results include the successful operation of the traffic control and monitoring system. The system contains three IR transmitters and IR receiver for traffic density measurement which are mounted either on the sides of roads respectively. The IR system gets activated whenever any vehicle passes on the road between IR sensors. When one sensor was ON at that time density will be less when two sensors will be ON at that traffic density is medium when all 3 sensors will be ON at that time density will be high. Microcontroller controls the IR system and counts the number of vehicles passing on the road. Based on different vehicles density calculation, the microcontroller takes decision and updates the traffic light delays. The traffic light is situated at a certain distance from the IR system. Thus based on vehicle density calculation, microcontroller defines different ranges.

## VII. CONCLUSION

In this paper we have studied the optimization of traffic light controllers in a City using ARM7 and microcontroller. The ARM7 based traffic control system works on traffic related problems such as traffic jam; unreasonable latency time of stoppage of vehicle, emergency vehicles or forcibly passing, etc. can be solved. The system has several benefits such as simple structure, high reliability, low costs, good real-time, easy installation and maintenance and so on. Figure1 and Figure2 show the basic block diagram of the system. By using this system configuration we try to reduce the possibilities of traffic jams, caused by traffic lights. The number of passing vehicle in the fixed time slot on the road decide the density range of traffics and on the basis of vehicle density calculation, microcontroller decide the traffic light delays.

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