



Research Article

RASPBERRY PI AND IMAGE PROCESSING BASED ROAD TRAFFIC ENHANCEMENT AND WASTE MANAGEMENT

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ABSTRACT

Now a day the traffic congestion is the main issues in the urban cities. Due to heavy traffic congestion pollution also increases. Due to unavailability of the parking areas and drivers don't know such areas it will increases the traffic on road .In such conditions sometimes accident will be take place. To overcome this raspberry pie based camera module used. Which gives the LIVE updates on the road as well as available parking area on the data base also the android app. Waste management is the primary issue. The use of intelligent waste containers, which detect the level of load and allow for an optimization of the collector trucks rout, can reduce the cost of waste collection and improve the quality of reception. To realize such a smart waste management service, the system connect the end devices, i.e. intelligent waste containers, to control center where optimization software processes the data and determine the optimal management of the collector truck fleet.

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INTRODUCTION

Here this system based on raspberry pi and image processing. The system implements various ideas and applications. All those various ideas and application built in single app. This app is useful for every citizens and government authority. This purpose system mobile app is maintaining all data. Here this system utilizes the technique named GSM because all the problems associated with the wired techniques. There are a lot of problems related with the wired techniques such as installation problem, complexity and cost also matters in the case of long distance[1][2]

The proposed system design by using Raspberry pi, image processing, sensors, GSM and android app. Raspberry pi is a heart of a system. Which interfacing between sensors and data base. Raspberry pi camera module to take high definition video as well as stills photography. The camera module will capture the snap of LIVE situation update to data base (image processing). In database management systems are in charge of storing the large amount of information produced by peripheral nodes such as sensors[2][3][5]. This system divided into main 3 sections as follows:

INPUT: In which all the sensors are present and senses the appropriate value .This sensed value is then passed to the main processing unit i.e. Raspberry pi.

MAIN PROCESSING UNIT: Which includes Raspberry pi.Raspberry pi having the more rang of memory. It also having extra on board features on board. It's a mini computer.

OUPUT: In this section two part consist are

1. DATA BASE
2. MOBILE ANDROID APP

Proposed Methodology

Motivation

Population increasing day to day due to increasing population creates many problems like air pollutions, water pollution, traffic congestion, continuous use of non-renewable energy sources (Petrol, LPG gas).

The main objective of the system is to save the environment. To reduce above problems and to save the environment describes the specific characteristics of smart road. Such that the system manages traffic congestion, water management, air pollution, waste management. The proposed system develop by using Raspberry Pi, Image Processing, VB, sensors. In traffic congestion system will observe LIVE road situation, pit detection, traffic monitoring, accident detection, and CO₂ level in air, Garbage levels and display the message to citizen and government authority. In water management system will observed flood situation in rainy season and it gives alert to the citizens and government authority as well as rain water harvesting.[3][5][6]

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Goals

The main aim of the purposed system is save the environment. Insystem implements various ideas and applications. All those various ideas and application built in single app. This app is useful for every citizens and government authority. It is maintain all data like water level, air pollution, traffic congestion, road conditions for the specific area.

Waste Management: Waste management is a primary issue in many modern cities. The use of intelligent waste containers, which detect the level of load and allow for an optimization of the collector trucks route, can reduce the cost of waste collection and improve the quality of recycling. To realize such a smart waste management service, which connect the end devices, i.e., intelligent waste containers, to a control center where optimization software processes the data and determines the optimal management of the collector truck fleet. [6] [7]

Traffic Congestion: It consists in monitoring the traffic congestion in the city. Even though camera based traffic monitoring systems are available. Traffic monitoring may be realized by using the sensing capabilities and GPS installed on modern vehicles and also adopting a combination of air quality and acoustic sensors along a given road. This information is of great importance for city authorities and citizen[3][5] [8]

Air Quality: It can provide means to monitor the quality of the air in crowded areas, parks, or fitness trails. The realization of such a service requires that air quality and pollution sensors be deployed across the city and that the sensor data be made publicly available to citizens. This is helpful for increase in the use of renewable.[2]

Innovativeness and Usefulness

The project is based on smart use of technology. The various ideas and applications we can used very smarty on only single app. everyone has an updates of data. It's useful because of single water level can provide no of services. Water is very essential thing for human. Due to water level controller we can manage the water supply, like when water level above the critical level system will alert to block the road and suggest the other way to travel. Similarly we can use this application in underground water pipe line, when the pipe line is over flow or damage the system will give message to stop the water supply. Because of this we can save the water as well as overcome unpredictable conditions generated in rainy season.

The IR Sensors are used in parking areas .When the parking area is full then its causes the traffic congestion so IR sensors gives the output as parking is empty or full. Such systems are useful in heavy traffic areas. Which are helps to improve the parking area, overcome the issue of traffic and driver can easily find the parking areas. [4][5]

Camera module is used to give the live updates to main system and citizens their single application. It is useful for accident detection. Due to live updates traffic monitoring possible. When traffic are jam on single road pollution also increase that time pollution sensor give the update to system and again suggest the other free way to travel.

- a. The stored data is useful for defense or police departmental to grab the thief.
- b. Temperature sensor gives updates of temperature in environment.

Block Diagram

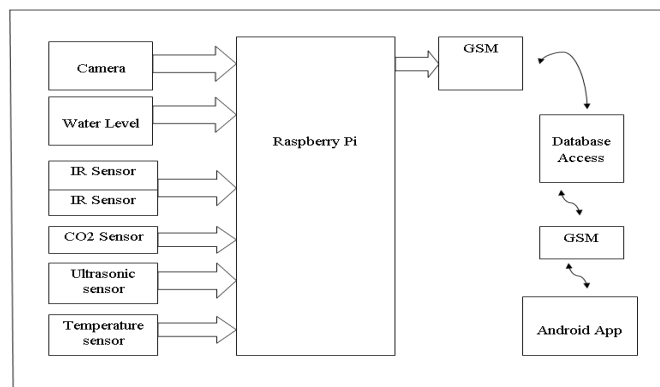


Fig 1 Block diagram of Road Traffic Enhancement based on Image Processing and Raspberry Pie

System Operation

The proposed system implement by using Raspberry Pi, Image Processing, sensors, GSM, SQL Server and VB software. Raspberry Pi is a heart of a system, which interface between sensors and database. Raspberry Pi camera module is to take high definition video as well as stills photography. The camera module will capture the snap of LIVE situation of road and update to database (Image Processing).The Temperature Sensors (LM35), CO₂ Sensors (MG811), Ultrasonic Sensors (HC-SRO4), IRSensors (LM393) these sensors are placed on the signal areas and it gives updates of temperature, CO₂ level, Garbage level, parking slots status to database through the GSM. The Raspberry Pi gives this information to the mobile app and data base through GSM (SIM900).In database management systems are in charge of storing the large amount of information produced by peripheral nodes such as sensors.

Camera

In camera will capture the snap of recent conditions of congestion and pits on the street. Then camera send captured snap to Raspberry Pi for further operation.

Temperature Sensor

We will use LM35 as temperature sensor. Its ranges from -0.5°C to +0.5°C. Temperature sensor will sense the temperature of water on the street. If the temperature goes below +0.5°C then it will inform to Raspberry Pi for further operation.

Water Level Sensor

We will use two conductor pipes as a water level sensor .In this we will place one conductor at lower side and another at higher side of street. When water level goes above the higher side of conductor then it will generate some amount of electricity due to this conductor acts as a switch and it will inform to =Raspberry Pi. Due to this flood will control.

Garbage Level Sensors

The Ultrasonic transmitter transmits an ultrasonic wave, this wave travels in air and when it gets objected by any material it gets reflected back toward the sensor this reflected wave is observed by the Ultrasonic receiver module. We placed these sensors on the top of dustbin which helps to measure the garbage level.

IR Sensor

An IR sensor consists of an IR LED and an IR Photodiode; together they are called as Photo – Coupler or Opto-coupler. When the IR transmitter emits radiation, it reaches the object and some of the radiation reflects back to the IR receiver. Based on the intensity of the reception by the IR receiver, the output of the sensor is defined.

Raspberry Pi

The Raspberry Pi is a basic embedded system having a credit card-sized single board computers developed in the UK by the Raspberry Pi Foundation. The Raspberry Pi is based on the Broadcom BCM2835 system on a chip (SOC) which includes an ARM1176JZF-S Core (ARM V6K)700 MHz CPU processor, Broadcom Video Core IV GPU having 17 pins, 3.5W of power, and 512 MB of RAM memory.

Display

LCD (Liquid Crystal Display) screen is an electronic display model and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this project display is used to show the current condition of road to peoples who present there.

GSM

GSM is a mobile communication modem it is stands for Global System for Mobile Communication (GSM). It is widely used mobile communication system in the world. GSM is an open and digital cellular technology used for transmitting mobile voice and data services operates at the 850MHz, 900MHz, 1800MHz and 1900MHz frequency bands. GSM system was developed as a digital system using Time Division Multiple Access (TDMA) technique for communication purpose. In this project GSM is used to communicate wirelessly with the VB server of computer.

VB based Server

The server has the all the data related to air pollution and traffic condition with time and area information. The Server can be used to store all the information as well as reply to the enquiry done by the user.

Android Mobile Node

Here we are developing an Android APP. This is a user node which is used to upload as well as download the data from server. The user can upload information such as Traffic density (High/ Low/ Medium), Road Blocked, Traffic Congestions etc. along with time and his name and Area name via SMS. The Server has Visual Basic software with an Access Database. The VB software will update the database sent by the user via Android APP. When someone sends an enquiry SMS he just has to type the area name and he will get the info uploaded to the SERVER.

PIT Detection

Here we are using Image Processing to detect the road condition. As soon as the software is detects any pits system will provide the SMS.[8]

Flowchart

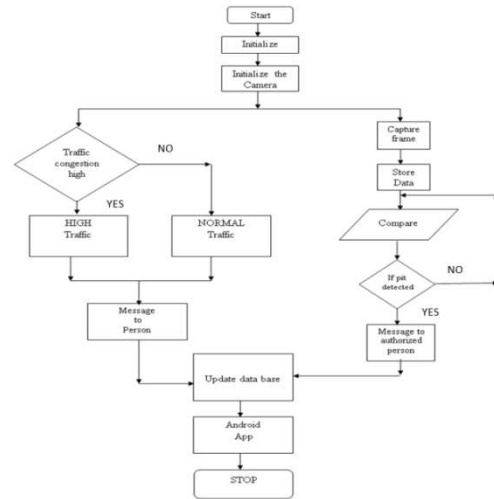


Fig 2 Camera update to data base flow graph

In above Fig.2 Camera module is used to give the live updates to main system and citizens and their single application. It is useful for accident detection. Due to live updates traffic monitoring possible. When traffic are jam on single road pollution also increase that time pollution sensor give the update to system and again suggest the other free way to travel. Camera takes the snap on the regular road save images into the database. When after some days road will damages due to the condition road will damage. These two captured images are stored into the database and then compared with each other. When pit will detected then this will inform to the authorized person like municipal officer, respective area engineer supervisor and respective area representative, which will able to take action to recover the problem. This stored images on the road, which will also useful for the police to find the thief's and other respective search. The stored data is useful for defense or police departmental to grab the thief. The system will available to the citizens to check the all-LIVE situation on the road .The camera module is placed on the road that will detect the traffic on the road and gives updates. The android app is designed for the citizens. When they will request to information like "GET STATUES" the all information is on their mobile app .When traffic is very high on the road they will find shows the message to find another way to travel.

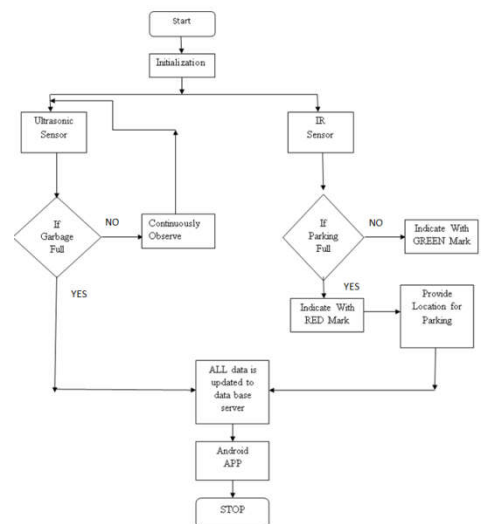


Fig 3 Parking and Garbage Alert Flow Chart

Fig.3 and Fig.4 shows the flow graph of the sensors. The sensors at the input side will sense the temperature, water, CO₂ and camera module take the snap on the roads. This all collected data will store in the VB database. The camera will take the LIVE snaps on the road that is very useful for the LIVE updates for the citizens and the traffic police. Due to this helpful app we can manage the traffic on the road. This all data is easily available on the single mobile android app. when we requesting we get the all updates.

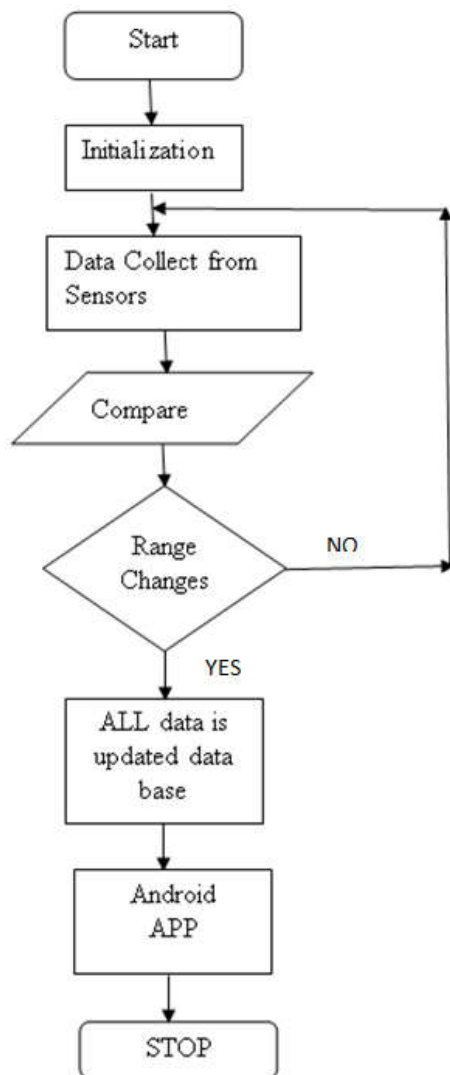


Fig 4 sensors changes value flow graph

CONCLUSION

The market springs from the synergic interconnection of key industry and service sectors, such as smart governance, smart mobility, smart utilities, smart buildings and smart environments. The services provided like water level controller, temperature sensors, pollution sensors, Image Processing these services have number of application. We can used data very smartly on only single app. everyone has an updates of data. We proposed to design the system which gives the reliable system to everyone. The In this paper, we analyzed the solutions currently available for the implementation of urban cities. The discussed technologies are close to being standardized. The system gives the all data on the data base and updates the data continuously .When the citizen's request using the Android App for the data it is easily available

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