Traffic Management using Satellite Imaging and Internet of Things

Tanvi Tushar Thakur, Sheetal Vatari, Madhuri Wagholikar
[1]Lecturer, [2]Student, [3]Assistant Professor,
EXTC, Shree L.R Tiwari College of Engineering
Miraroad, Thane
thakurtanvi91@gmail.com, sona.vatari@ymail.com, jadhavmadhuri412@gmail.com

***Abstract*—**In the recent era of modern human civilization, traffic medium plays vital role in the economic development of the nation. Nowadays a control system is able to handle such situation, but not that much effectively because it requires human feedback. We need a system which must give continues satellite update so that it can handle traffic smoothly. This will be done by using Internet of things using TCP/IP protocol. A centralized server must be designed which most will look after all traffic analysis. Depending upon the intensity of the traffic, the waiting time and diversion path will be decided.

Index Terms*—Internet of things, Traffic Management.*

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I. INTRODUCTION

Internet of things is becoming a fast emerging technology, creating a ubiquitous standard in wired and wireless communication.The IOT permit people and objects to be connected Anytime, Anywhere, with anything and anyone ideally using any media and any service [1]. The IOT have created enormous opportunity in the management of urban infrastructure such as smart cities, Industrial control, Environmental monitoring and etc. Internet of thing have created a technological revolution in the future of computing and communication. IOT is creating a mix between the physical world with information world together. In future it's not going to be people communicating with people, but it's going to be about accessing machine to talk to another machine on behalf of the people. One of the biggest challenges facing by IOT is the existing infrastructure of the internet.

The rest of the paper is organized as follows. Brief Introduction of Internet of thing is explained in section II. A Different key technologies are explained in Section III, Vision of IOT is described in Section IV, Reference model is explained in Section V, Proposed project is specified in the section VI, Block diagram representation is shown in Section VII ,and Concluding remarks are given in section VIII.

II. INTERNET OF THINGS

Kevin Ashton phrased "Internet of thing" while working in 1999, but he talked about it in depth about IOT to the RFID journal.com in 2009Internet of thing can be defined as a thing having identities which can be operated using an intelligent interface to connect and communicate within smart space.IOT is expected to offer advanced connectivity of systems, devices which covers a vast variety of protocol,domain and application.

The main communication form on the internet is human-human,But in near year there will be everything i.e. the object will have a unique identification number.The communication form will expand to form human-human to human -thing and then to thing-thing. This is possible using various sensors connected through internet.Basically IOT is connecting different application devices to one another through the internet.This is possible due to use of sensor, these are able to transmit a wide variety of data, location, movement, temperature, environment etc. There are different way of connecting like person to machine, machine to machine or person to person using wired or wireless technology like RFID, NFC to digital storage (CLOUD COMPUTING).

Initially we were able to communicate via internet which require to address to identify each device.The field of internet of things is based on the standard of using the Internet protocol (IP) to all limits of the Internet and on the fact at the edge of the network,many small devices are still unable to support IP protocol stack. Internet of things host the visualization computing and ambient intelligent enhancing them by requiring a full communication and a complete computing potential among things and integrating the element of continuous handshaking, recognition and interaction[1].

We are already running out of IP address within IPV4 due to use of it in personal computing. Hence IPV6 was launched in 2012, the address under IPV6 are much longer and have a large capacity of unique IP address. The IOT market is expected to potentially grow in 2015 there are about 25 billion autonomous internet connected devices,which are about to rise to 200 Billion devices by 2020[2].

A. Internet of Things

IoT Communication Reference Model - 10T-A team decided to work on the Internet model (TCP/IP model) and its 4 layers to develop it to suit loT Environment and with OSI model as a guide. This model is not able to address the interoperability issues between heterogeneous objects; like security and quality of service etc. But this model can be layered on top of one another with our vision to form a new model

Network Interface (Physical Layer) - This is the layer where the interoperability aspect concerns the physical characteristics of the communication technologies used in the system. It is similar to the OSI. We have used DSP TM 4C 1298 NCPDT to connect across Model.

Internet Layer (Link aspect & Network and ID aspect) - In order to address the heterogeneousness of networking technologies represented in the loT field, the Link aspect requires special attention. In fact, most networks implement similar, but customized communication schemes and security solutions. ARP is used for mapping a network address to a physical address like an Ethernet Address. The Address Resolution Protocol is a request and reply protocol that runs

encapsulated by the line protocol. This interoperability aspect combines two communication aspects: networking, which provides the same functionalities as the correspondent OSI layer; and identifiers, which are provided using resolution functionalities between locators and IDs.

Transport layer (Transmission Control Protocol) - The Transmission Control Protocol provides a communication service at an intermediate level between an application program and the Internet Protocol. It provides host-to-host connectivity at the Transport Layer of the Internet model. An application does not need to know the particular mechanisms for sending data via a link to another host, such as the required packet fragmentation on the transmission medium. At the transport layer, the protocol handles all handshaking and transmission details and presents an abstraction of the network connection to the application.

Application Layer (Http) - HTTP functions as a request - response protocol in the client server computing model. HTTP is designed to permit intermediate network elements to improve or enable communications between clients and servers.

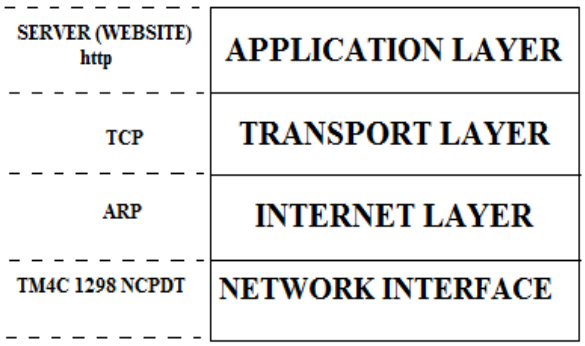

Fig 1. IOT Communication Reference Model

III. KEY TECHNOLOGIES USED IN INTERNET OF THINGS

The concept of IOT architecture is used in various scenarios like Auto-ID labs, EPC,ONS all this thing have a target to architect the IOT with a global design

2.1 RFID

RFID technology is the main factor in the embedded communication technology, which have a simple design for the purpose of wireless data communication. It can help to automatically identify the object. RFID is more like a bar code. The concept of RFID Is using Radio signal to automatically detect an object for storing and remotely retrieving data.The Component used in RFID comprises of Tags,Tags Reader,Antenna,Information managing software and storage space. Data is transferred and received by using radio waves. Tags are usually placed on the object. There are different types of tags depending based on power supplies[3].

2.2 EPC

The Aim of EPC is used as supporting device in RFID. EPC was being developed by the Auto-ID from Massachusetts institute of technology for the purpose of sharing data in real time by using a unique identifying number with the help of RFID and different wireless communication technology using internet infrastructure and platform[3].

2.3 WSN

Wireless Sensor Nodes are sensor which is used to detect various physical parameters such as temperature, pressure, etc. These autonomous sensors are distributed around the network, which will monitor following above parameters, these will pass the desired data to the centralized server.

There are several domains introduced with the emergence of the Internet of things. Depending upon Network availability coverage and its. There are several applications like Smart business, Health care, Smart home, Automation, Environmental Monitoring and Mobile communication, etc. [3].

In this paper we will be discussing about Traffic congestion and the need for traffic control. Traffic has always been a crucial aspect in urban infrastructure, in recent year there has been rapid increases in the number of vehicles and need for control in transportation.

IV. VISION OF IOT

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The IOT comprises of several interconnection of technological development which creates a bridge between virtual and physical world,

3.1 INTERCONNECTION MEDIUM:

Each and every thing connected to the internet must have the capability to connect with other thing with the help of various technologies like GSM, Wi-Fi etc. these are under development for creating a particular standard in the field of IOT.

3.2 IDENTIFICATION OBJECT:

The object must have unique identification, Such as RFID, EPC, tags, etc. and they must be able to read bar code or label and identified linked the server.

3.3 SENSORS:

The Sensor should collect the data from the object and forward it to the receiver.

3.4 PROCESSING:

Getting the data available from the sensor are used to process and controlled the output terminal accordingly.

3.5 END USER INTERFACE:

The main objective of the end terminal is to communicate with the people in an appropriate way by enabling the output.

PREVIOUS WORK:

The previous work related this topic was using CCTV, but there are several drawbacks in CCTV like the climatic condition, foggy environment can cause many disturbances within a detection of number of vehicles. The shadow of the vehicle is also detected,which makes them considered as a vehicle, hence there is error in numbers of vehicles the on road.

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I. REFERENCE MODEL FOR INTERNET OF THINGS

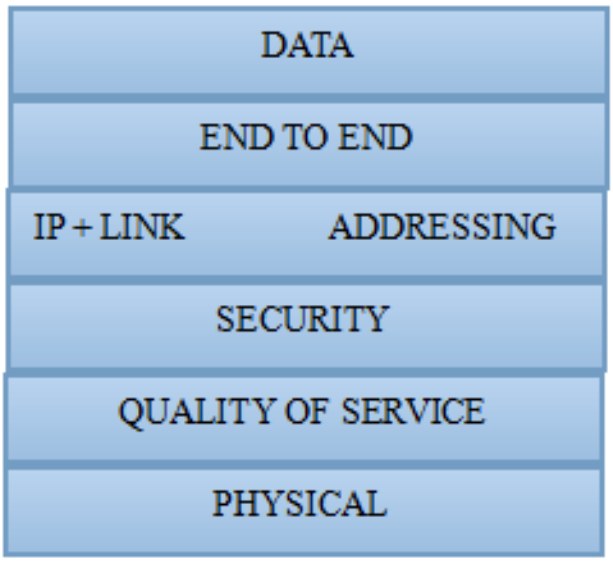

Fig 1. Reference model for IOT

An Internet of things, the device connected to the server needs to be addressed, hence we are using Internet protocol (IP) are well suited for networking devices. According to it of concept, the data will be self addressable and self routable. IP is a data exchange protocol, used in IOT to uniquely identify the things, but also controls the devices through internet. Internet requires two types of address (like IPV4 or MAC) to achieve the process of communication between the source and destination object.

Nowadays we are going to transition for a new generation of (IP) address IPV6 for IOT. IPv4 is an address for a location and carries in data packets to help routing table in routers to route the data to its final destination.The System must be designed to help source object data to reach its final destination through these addresses.

We need to determine the best possible math depending upon the final destination address. Like other system, TCP/IP-based service, we will be using TES (Traffic Engineer, System) is a protocol that works on the server. There are different types of servers like
1. Internet Routers
2. 2. DNS (Domain name server)
3. NEW servers

Depending the types of application the server will be varied. TES server provides the source object with the full internet best path to the final destination; instead of source data continue to ask Internet Routers along the trip about it.

The Following are steps to be carried to find the best possible route,
1. The source server will send a unicast query containing IP to the destination object through TES server
2. The source will eventually receive any reply, which includes the full best path for the destination object through the internet.

TES is a distributed database implemented in the hierarchy of TES server and TCP/IP protocol that allows the source object in IOT to get the best possible route to the final destination object.

In this Communication reference model the link and IP/Id layer is combined to single layer.

There are various restrictions in IOT that devices do not support this feature for security reason,but this same issue was solved in a previous paper with security layer in the IOT communication reference model [5]

II. PROPOSED PROJECT

According to my proposed work, The data related traffic analysis will be captured. This data will be taken with respect to satellite image,the reason behind using satellite image is there is error because of the climatic condition which is normally observed in CCTV footage, there are no shadow of car detected which make it easy to analyze the actual number of vehicle in certain area.There is more advantage of taking satellite image is that it gives us the larger view of the area, whereas in CCTV will give us much more specific view.This project will only show the static reading of certain area.Because to make the dynamic view it require continuous view of satellite image which are accessible only to government. To make it work in real time it may require continuous accessing and processing in real time.

After getting a brief view related traffic,total No.of vehicles is aarea will be calculated on the server.Depending upon the density of traffic the traffic will be controlled via serve. If it will be showing heavy traffic or accident occurred,the traffic will be diverted to the next path.

IMAGE PROCESSING

As we are capturing the satellite image,

IMAGE ACQUISITION

First stage image will be acquired after that,various method of processing will be carried out on the image to perform many different tasks.

However, if the image has not been acquired properly, then the expected tasks may not be achievable, even with the aid of some form of image enhancement. Here we will read the satellite image in Matlab to detect the vehicle.

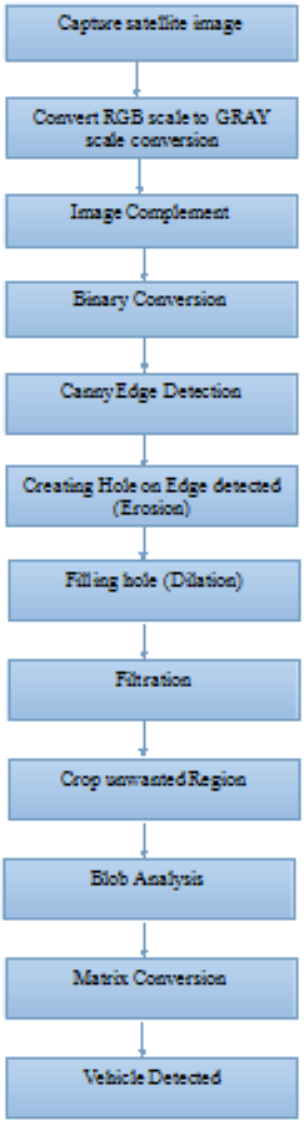

Fig 2. Vehicle detection using satellite image processing

RGB TO GRAY SCALE CONVERSION

In this paper the algorithm described is not depend on the type of colors in the images and confide mainly on the gray level of an image processing and extracting the required information. Color components like Red, Green and Blue value are not used value are not used throughout this algorithm. So, if the input image is a colored image represented by 3-dimensional array in MATLAB, it is converted

IMAGE COMPLEMENTED

As it is known that in the complement of a binary image, zeros become ones and ones become zeros; so in image complement black and white are reversed. In the complement of an intensity or RGB image, each pixel value is subtracted from the maximum pixel value supported by the class (or 1.0 for double-precision images) and the difference is used as the pixel value in the output image. In the output image, dark areas become lighter and light areas become darker

BINARY CONVERSION

Binary conversion is differentiated into two types white or else black for each pixel. The color used in any image is foreground and background. According to the image they are diversified

CANNY EDGE DETECTION

Edge detection, especially step edge detection has been mostly applied in various different computer vision systems,
Which is an important technique to extract useful structural information from various vision objects and fiercely reduce the amount of data to be processed. It has found that, the requirements for the application of edge detection on diverse vision systems are relatively the same. Thus, a development of edgedetection solution to address these requirements can be implemented in a wide range of situations.

FILLING HOLES

Here we will fill the holes which were created on the canny edge detection to detect the vehicles. This is the major step of vehicle detection. This is the main part of the Morphological operations.

FILTERATION

A high pass filter is the basis for most sharpening methods. An image is sharpened when contrast is enhanced between adjoining areas with little variation in brightness or darkness. Here we got those pixels which are greater than the value of 20. Those pixels whose values are lesser than the 20 pixels are suppressed.

CROPPING THE AREA

Here we will crop that area where numbers of vehicles are maximum using imcrop command.

BLOB ANALYSIS

Blob Analysis is a common technique of machine vision which is based on analysis of logical image regions. As such, it is a tool of choice for applications in which the objects being checked are clearly appreciable from the background. Diverse Set of Blob Analysis methods allows creating tailored solutions for a wide range of visual inspection problems.

III. BLOCK DIAGRAM OF TRAFFIC CONTROLLING USING INTERNET OF THING

Fig 3. Block Diagram of Traffic Control & Monitoring

Data Acquisition:

Using Image Satellite image as a input,the intensity of traffic can be determined using different method.

Data Processing:

The image available will be processed using morphological transformation, the unwanted image will be crop using a segmentation process, the vehicle will be detected using the dilation and erosion process.

Traffic Analyze:
According to the intensity of traffic it will be differentiated high or low intensity,if the traffic intensity is low the waiting time is reduced where as when traffic is high the diversion path will be shown on previous path

Communication reference model:
All these controlling will be done on the internet, using the IPv6 protocol and will be accessible to the server through the website.It will merge two addresses layer of the model in one new layer. Address layer will merge layer IP/ID and Link.The major function of Addressing layer is to provide object in IOT with the best path to reach final destination.

IV. CONCLUSION:

This paper comprises of a method of capturing the data from satellite image.More importantly, it will overcome the shadow of the vehicle using different Morphological transform. As we are using satellite image the climate deformities will be overcome. TES is a system which will use IOT communication reference model and TCP/IP protocol will allow the source data to be reliable and it will be able to get best path to the final destination. For the analysis the processor will be used to recognize the traffic intensity depending upon the image input. In the end this paper is facing various challenges. It requires a lot of trial and troubleshooting as to evaluate the final result.

V. REFERENCE:

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