

## ARTICLE

# INTERNET OF THINGS (IOT) BASED TRAFFIC INFORMATION SYSTEM

Robin Swamy<sup>1</sup>, Vidushi Mangal<sup>1</sup>, Anupriya Jain<sup>1\*</sup>, Sonia Duggal<sup>1</sup>, Prasenjit Banerjee<sup>2</sup>

<sup>1</sup>Dept of Computer Application, Manav Rachna International Institute of Research and Studies, Faridabad, INDIA

<sup>2</sup>Accendere Knowledge Management Services, CL Educate Ltd, New Delhi, India

## ABSTRACT

One of the catch phrase in the Information Technology these days is Internet of Things (IoT). The future of technology can be termed as Internet of Things, which will convert the real world objects into smart virtual objects. The intent of IoT is to unite everything in our world under a widespread infrastructure, giving us not only control of things surrounding, but also update us about the state of the things. In the light of all these observations this paper provides a general idea of (IoT) by highlighting on traffic control system. The current revolution in Internet, mobile industry, and machine-to-machine (M2M) technologies could be seen as the beginning phase of the IoT. IoT is expected to unite different technologies to enable new applications by bridging physical objects together in support of intelligent decision making. IoT is facilitated by the latest developments in radio frequency identification (RFID), intelligent sensors, communication technologies, and Internet protocols. The basic objective is to have traffic sensitization directly without human intervention. This paper will propose a method for traffic management system which can ease out the human being's life. This paper starts by the introduction to the IoT. Then, we give an overview of some technical problems of current traffic system which is followed by the solution to the current system using IOT. Finally it gives some future recommendation for effective implementation.

## INTRODUCTION

### KEY WORDS

IoT, RFID, Meta Data, GPS

There could be no perfect definition to describe IoT however it has set new standards to revolutionize the human life. The various groups customize the definition of IoT as per their requirements. "Kevin Ashton is known first for coining the term the Internet of Things". IoT can be applied whenever there is network connectivity to practical world via multiple sensors. Few other definitions are given as:

IOT can be termed as "Meta-Data" where Meta word could be replaced by smart machine. It means is a combination of various intelligent machines which are based on each other while the time comes to collect the data or gathering of the information [1].

"An open and comprehensive network of intelligent objects that have the capacity to auto-organize, share information, data and resources, reacting and acting in face of situations and changes in the environment" [2].

It is a method which uses communication technology through smart sensing via big data to provide a complete package for a product. In this way it provides better control without human intervention which can be applied in any application areas. It can suit in any kind of environment. They enhance the collection of data, methods of automation, diverse operations, and much more with the help of smart devices and powerful technologies. IOT enhances the possibilities to apply in different walks of life and also improves its efficiency. IoT is an extended version of the previous and the new generation technologies for sensors, networks and artificial intelligence.

IoT accomplish latest innovations in technology. It also helps in reducing hardware prices as represented in Fig. 1. The best output of IoT is that it revolutionized the way people think about technology. This modern and emerging approach brings considerable development in the end release of services. It impacts people in social as well as economic manner. Even we could see the political impact of these technological changes as depicted in Fig. 2.

## KEY FEATURES OF INTERNET OF THINGS

The term "Internet of Things" abbreviated as IoT is derived from two different words "Internet" and "Things". In short in simple way it can be defined how internet can be applied in practical things. Internet is a superset of networks where every computer system in the world can be connected in communicate through networks. The key features of IoT may include artificial intelligence, connectivity among machines, communication networks, sensors, active engagement, and the use of small devices. They could be better explained through some definitions as given below:

**Artificial intelligence-** IoT essentially makes everything smart virtually. IOT make use of every area of life with the power of diverse data collection, algorithms of artificial intelligence, and data communication networks. Data could be as simple as the functioning of car seat belt or as complex as analysis of the data generated by the airplanes.

Received: 29 Mar 2019  
Accepted: 10 May 2019  
Published: 26 May 2019

\*Corresponding Author

Email:  
anupriya.fca@mriu.edu.in  
Tel.: +91 9911293897

**Communication network-** Communication networks are the platform of up-to-date automation systems. It is a technology that refers to exchanging of data between diverse smart devices within a system. Communication networks provide a number of advantages in terms of local and global connectivity.

**Connectivity-** It means various different types of machines are connected together to work as a single device. The networking now means they are not reserved for major ISPs whereas they are diversified to every nook and corners in the world. IoT creates large networks through the connectivity of various small networks through the networking devices.

**Sensors-** Sensors are used to sense a situation which is not behaving normal for example suddenly the sound pollution on a road increases from 5 percent to 50 percent. It then reports it to the other machines connected to it. The sensors are integral and vital component of IoT. The sensors convert a static network into a smart network which has the capability of applying it to the live scenarios.



Fig. 1: Representation of Internet of Things [3].

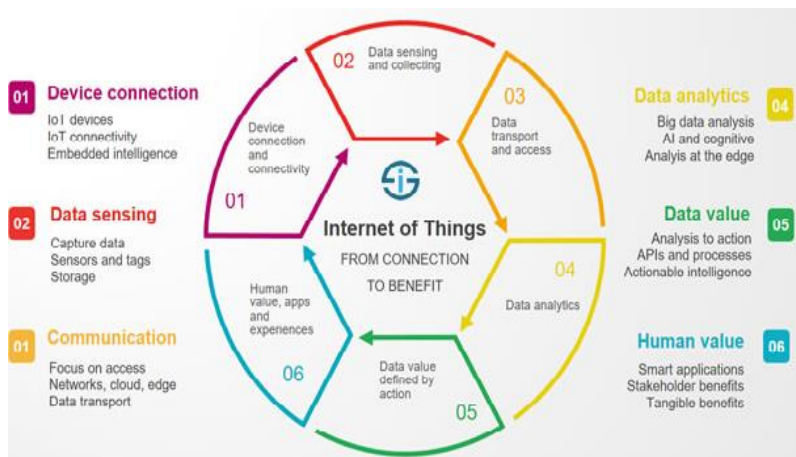


Fig. 2: From connecting devices to human value [4].

**Real world interaction-** In the conventional methods the communications with networks occurs only through static mode. But in case of IoT every machine connected to each other search for an abnormal condition surrounding it. And for this reason all connected machine has to be active all the time. IoT introduces all together a new concept through which we can have real time interaction in terms of content, product and services.

**Miniscule components-** With the emergent technologies the innovative devices have reduced size, cost and increased efficiency. The motive of IoT is to create small devices to for one or more purposes which can deliver its precision, scalability, and adaptability.

**Advantages of IoT:** IoT has affected the life of human in all aspects. The best part of IoT is that it can be applied in a very simple or in a complex situation of real world. Some of the advantages that IoT are as follows-

**Improvement in customer engagement:** Current analysis of data suffers from hidden areas and considerable loss in accuracy; and as explained, engagement remains inactive. IoT works in such a way that it provides better and more effective solutions.

**Smart technology utilization:** Better you know, better you use. If you have experience of a technology you can utilize it up to great extent. IoT helps in unfolding the use of diverse devices in the different areas of Human life.

**Effective management:** IoT gives clear picture of areas which needs or have a scope of improvement. Current technologies give us surface data, but IoT provides deep data in all the directions which leads to better management of resources.

**Big data analysis:** Conventional approach has the drawbacks that it is designed only for the passive use. IoT utilizes the big data and apply it in the day to day life and gives the transparency and understanding of its functioning.

**Limitations of iot:** As compare to limitations IoT has lot many advantages. IoT faced a number of depicted challenges which are listed below:

**Security:** IoT forms network of different types of devices connecting with each other. Because of it the system offers comparatively less control despite of different security measures. This could make a room for various kind of violation of security and privacy.

**Privacy:** There is a flow of all kind of user/device information without the active participation of user which can breach the privacy of user.

**Complexity:** IoT connects different type of hardware and algorithms to connect different type of machines so it becomes difficult to outline, and deploy. Even its maintenance becomes a cumbersome task as it includes devices of diverse category.

**Flexibility:** Due to the complex nature of hardware and algorithms used in IOT flexibility becomes as major concern of IoT. It is difficult to find a device with several conflicting or locked systems.

**Compliance:** As it applies in any real world situation, it has to follow certain set of regulations which pose a challenge to it.

**Hardware** - The component used in IoT comprises of devices for a remote system for controlling the system. It includes devices like routers, bridge and sensors to connect the different network. The cost of maintaining all these devices is quite high.

## LITERATURE SURVEY

There were a number of researchers who worked with the traffic issues and its controlling. As a result of their hard work a number of different approaches have been invented. Pang et al. [3] proposed a traffic flow prediction mechanism based on a fuzzy neural network model in chaotic traffic flow time series. Bhadra et al. [12] applied agent-based fuzzy logic technology for traffic control situations involving multiple approaches and vehicle movements. In [13] the authors developed strategies to integrate different dynamic data into Intelligent Transportation Systems. Patrik et al. [14] proposed a service-oriented architecture (SOA) for an effective integration of IoT in enterprise services. Singh et al. [15] presents a discussion on Internet oriented applications, services, visual aspect and challenges for Internet of things using RFID, 6lowpan and sensor networks. Gourav Misra et al. [16] Mentioned the visions, concepts, technologies, various challenges, some innovation directions, and various applications of Internet of Things.

## PROBLEM DEFINITION

Struggling with the cost of rupee, inflation and political havoc, there seems to be no narrowing of crises in India. According to a recent study conducted by the Transport Corporation of India and IIM (Kolkata), "India faces a loss of Rs 600bn (\$10.8bn) a year" [10] due to congestion, slow speed of freight and waiting time at toll plazas. Toronto is facing a similar situation where \$3.3 billion are lost every year. A report published by the Organization for Economic Co-operation and Development (OECD) in 2009 revealed that billions of dollars are lost every year [4].

The continuous boost in the traffic congestion level on public roads, especially at busy hours, becomes a serious issue in the world. It has become a foremost concern for the traffic management analyst and the decision makers. The conventional approach for traffic management, control and surveillance are not equipped in terms of its efficiency, economy, and the efforts needed for the implementation. India is the second most populous country in the World and is a fast growing economy as well. It does have dreadful

road congestion problems in its urban areas and rural areas as well as they are also growing at a considerable pace. The rate at which Infrastructure grows is comparatively inadequate as compared to the increasing number of automobiles on road, due to spatial and cost issues.

Moreover, Indian traffic is non-lane based, chaotic and not as discipline as in other countries. It requires a traffic control system, which is more phenomenal from the developed Countries. Intelligent and smart management of traffic flow can decrease the negative impact of traffic congestion at a considerable rate.

Traffic congestion is at its alarming situation in developing Countries like India. Growth in urban and rural population is contributing significantly to the increasing number of automobiles in the cities and villages. Congestion on roads results in slow moving traffic, which increases the time of travel. This gridlock can have a tremendous effect on different perspectives of our life. It can lead to road rage, wastage of fuel, increase in air pollution, impact on our personal life, career, future and even our safety.

## EXISTING SYSTEM

Traffic congestion is one of the major troubles in metro cities; it not only leads people to inconvenience travel, but also spoil the urban environment. The urban road traffic control system usually includes signal control machines, traffic lights, Variable Message Signs (VMS) and other detectors.

In last few years, wireless networks are extensively used in the road transport management as they provide better cost effective options. Technologies like ZigBee, Bluetooth, Wi-Fi, (Radio Frequency Identification) RFID and Global System for Mobile communications (GSM) can be used in traffic control to provide money spinning solutions but with the ever increasing speed of vehicle on road we required a better solution for the problem. Moreover, these devices are not capable of handling the situation in case of traffic jams, gridlocks etc.

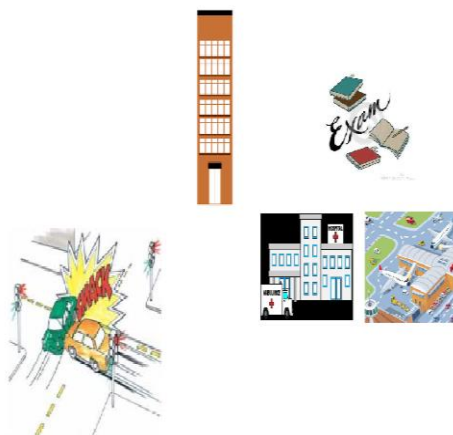
## PROBLEM DEFINITION

Whenever people plan to go out, they prefer a route which is less congested. Getting stuck in a traffic jam is a nightmare. For this, people prefer to take the advantages of technologies like Google maps to update the information about the most preferred routes. But the basic limitation of Google maps is that they predict the traffic condition on the basis of number of android mobile phone not on the number of vehicles on the road. This information may or may not be convincing because there may be a situation that in a single multi wheeler, there are more than one passenger and each is carrying an android device or there may be a situation where there are a number of vehicles on the roads but no person is carrying the android mobile phone. In such scenarios, the output cannot match the real time scenario.

But getting the real time information of traffic situation is a dire need as it could have cascading effects on lives of human being. A person can miss a flight, train, and exam, interview etc. & the list is endless. The situation could be so dreadful that a person may lose his/her life.

## PROPOSED SYSTEM

In this work the concept of IOT is applied in the transportation sector. Here the cameras are placed on the major traffic sensitive areas and the real time information of traffic is filtered. The abnormal traffic condition is stored in the cloud where it is extracted by the traffic control system (TCS). The traffic control system is responsible for disseminating the information to all the areas where this time bound information is required like hospitals, Airports, Railway station etc. which could further be used for the convenience of the human as shown in Fig. 3.



**Fig. 3:** Information passing through IoT connected devices.

## FUTURE SCOPE

In the proposed system the current traffic information is propagated only to its respective traffic control system. So this method is restricted or limited only to its traffic control system what if, if the system fails. The future scope of this method should be to sensitize the traffic control system and also to broadcast the information to the entire location specific individual so that they can choose the alternate route. This system can also be improved if we restrict further vehicle to the traffic sensitive area. This IOT can also be linked to the satellite radio so as to transmit the information within real time.

## CONCLUSION

The research was focused on reducing the traffic to ease out the life of human being. The method proposed by us has taken the advantage provided by IoT by giving real time data of traffic conditions of traffic sensitive areas. This method would cater to all the sections of the society satisfying their varying needs. IoT would take care of the real time condition which will outperform to the existing GPS, RFID systems. Consumer would benefit because it not only gives the actual traffic condition but it also facilitate the user by disseminating the information to all the areas where this time bound information is required like hospitals, Airports, Railway station etc. which could further be used for the convenience of the human.

## CONFLICT OF INTEREST

There is no conflict of interest.

## ACKNOWLEDGEMENTS

The authors are grateful to Dr. Prasenjit Banerjee, Accendere Knowledge Management Services for his valuable guidance. However, the mistakes are all ours. It will not hamper his reputation.

## FINANCIAL DISCLOSURE

None.

## REFERENCES

- [1] Internet of Things (IoT Tutorial): Available at: [https://www.tutorialspoint.com/internet\\_of\\_things/index.htm](https://www.tutorialspoint.com/internet_of_things/index.htm) [Last accessed 22nd March 2019].
- [2] Madakam S, Ramaswamy R, Tripathi S. [2015] Internet of Things (IoT): A Literature Review, Journal of Computer and Communications 3:164-173.
- [3] Pang M, Zhao X. [2008] Traffic Flow Prediction of Chaos Time Series by Using Subtractive Clustering for Fuzzy Neural Network Modelling, Proceedings 2nd International Symposium Information Technology Application, Washington – DC. 23-27.
- [4] What is the Internet of Things? Internet of Things definitions: Available at: <https://www.i-scoop.eu/internet-of-things/> [Last accessed on 22nd March 2019].
- [5] Internet of Things, Arshdeep Bagga, Vijay Mediseti Available at: <https://books.google.co.in/books?id=JPKGBAAQBAJ&lpg=PA1&pg=PA1#v=onepage&q&f=false> {Last Access on 22nd July 2019}.
- [6] Norman, D. (2013). The design of everyday things: Revised and expanded edition. Basic books.
- [7] Intelligent Traffic Control System: Available at: <https://electronicsmaker.com/intelligent-traffic-control-system> [Last accessed on 22nd March 2019].
- [8] How does Google Maps Show Traffic Updates: Available at: <http://techwelkin.com/how-does-google-maps-show-traffic-updates> [Last accessed on 22nd March 2019].
- [9] COVER STORY: FABs IN THE INTERNET OF THINGS ERA: Available at: <http://www.appliedmaterials.com/nanochip/nanochip-fab-solutions/december-2013/cover-story-fabs-in-the-internet-of-things-era> [Last accessed on 22nd July 2019].
- [10] India loses \$10.8bn annually due to traffic congestion – study: Available at: <https://arabiangazette.com/india-traffic-congestion-losses/> [Last accessed on 22nd March 2019]
- [11] M. Pang and X. Zhao, –Traffic Flow Prediction of Chaos Time Series by Using Subtractive Clustering for Fuzzy Neural Network Modelling,” Proceedings 2nd International Symposium Information Technology Application, Washington – DC, 2008, pp. 23-27.
- [12] Bhadra S, Kundu A, Guha SK. [2014] An Agent based Efficient Traffic Framework using Fuzzyl, Fourth International Conference on Advanced Computing & Communication Technologies.
- [13] Katiyar V, Kumar P, Chand N. [2011] An Intelligent Transportation System Architecture using Wireless Sensor Network, International Journal Computer Applications. 14:22-26.
- [14] Spiess P, Karnouskos S, Guinard D, Savio D, et al. [2009] SOA-based integration of the internet of things in enterprise services, In: Proceedings of IEEE ICWS, Los Angeles. 1–8.
- [15] Dhananjay Singh, Gaurav Tripathi, Antonio J, Jara. [2014] A survey of Internet-of-Things: Future Vision, Architecture, Challenges and Services, IEEE World Forum on Internet of Things (WF-IoT).
- [16] Misra G, Kumar V, Agarwal A, Agarwal K. [2016] Internet of Things (IoT) – A Technological Analysis and Survey on Vision, Concepts, Challenges, Innovation Directions, Technologies, and Applications (An Upcoming or Future Generation Computer Communication System Technology, American Journal of Electrical and Electronic. 4(1):23-32.