

# Maintenance of Man-Hole Overflow in a Smart Way

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**Abstract**—In India, most of the rural areas as well as urban areas face the problem of man-hole overflow. The overflow of man-hole could be due to bad maintenance of pipes underground or could be due to the improper methods laid out to deploy the sewage pipes. People living in the nearby locality of the overflow man-hole facing lot of problems and in most of the cases the problem is not being fixed even after multiple requests to the concerned authority. This paper concentrates upon handling the overflow of man-hole problems in a smart way using the latest technology. Sensors would sense the overflow and the messaging system would help in complaining about the problem to the concerned authorities in time by using the latest android system with a Wi-Fi enabled internet. Since the problems caused by the overflowing man-hole system are vast like diseases which could result in dangerous virus being spread among the residents of the locality, commutation problem causing severe inconvenience to the people of the locality and foul smell.

**Keywords**- Sensor system integration, service functions and management, sensor, Wi-Fi, MQTT, cloud, Raspberry Pi,application.

## I. INTRODUCTION

The Internet of Things (stylized IoT) is the internetworking of physical devices, vehicles (also referred to as "connected devices" and "smart devices"), buildings and other items—embedded with electronics, software, sensors, actuators, and network connectivity that enable these objects to collect and exchange data. In 2013 the Global Standards Initiative on Internet of Things (IoT-GSI) defined the IoT[1][3] as "the infrastructure of the information society." (A. Laya, V. I. Bratu, and J. Markendahl et al, 2013) The IoT allows objects to be sensed and/or controlled remotely across existing network infrastructure (H. Schaffers, N. Komminos, M. Pallot, B. Trousse, M. Nilsson, and A. Oliveira et al,2011) creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit. When IoT is augmented with sensors and actuators, the technology becomes an instance of the more general class of cyber-physical systems, which also encompasses technologies such as smart grids, smart health ,smart homes, intelligent transportation and smart cities[2][4][5][12][13]. Each thing is uniquely identifiable through its embedded computing system but is able to interoperate within the existing Internet infrastructure.

However, such a heterogeneous field of application makes the identification of solutions capable of satisfying the requirements of all possible application scenarios a formidable challenge. This difficulty has led to the proliferation of different and, sometimes, incompatible proposals for the practical realization of IoT systems. Therefore, from a system perspective, the realization of an IoT network, together with the required backend network services and devices, still lacks an established best practice because of its novelty and complexity. In addition to the technical difficulties, the adoption of the IoT paradigm is also hindered by the lack of a clear and widely accepted business model that can attract investments to promote the deployment of these technologies.

India, a developing country faces the problems like overflow of man-hole in urban and rural areas. It may not be surprising to say that some of the rural areas are existing without having a drainage system completely. Considering the problems faced by the people due to overflow of sewage from man-hole system an idea has been proposed in this paper to overcome the side effects , problems being caused by overflow man-hole. The objective of the paper is to discuss about the architecture of the Smart Man-Hole System along with the blue print of the models. The following are the topics which will be covered in section II: Smart Man-Hole System Concept and Services III: Smart Man-Hole System architecture IV: Advantages of the Smart Man-Hole System V: Conclusion

## II. SMART MAN-HOLE SYSTEM CONCEPT AND SERVICES

Smart Man-Hole System is an application that helps in keeping the surroundings neat and clean which would indirectly save the people of the nation from dreadful diseases and inconvenience.

Smart Man-Hole System – At many urban locations in India the overflow of man-hole has become troublesome .It turned troublesome since most of the authorities even after reporting about the complaint hardly turn up to address the issue. Due to this negligence being shown up by the authorities the residents of the locality are facing problems like foul smell, mosquito bites and many more infectious diseases. Especially children are restricted to

go out and play due to the foul smell and mosquito bites which may lead them to bed ridden. At the same time working men, women find it difficult to commute to their work location due to the overflow of sewage from man-hole. Children face the trouble to commute to school; elderly people too struggle to go out for a walk or to shop. The issue of overflow of man-hole is majorly seen during the rainy season and this problem is becoming tough day-to-day due to the following reasons: 1) even after a complaint being lodged by the locality of the people the concerned authority is not addressing the issue in-time. 2) Proper tracking of the issue is missing since the locality may come under municipality or gram panchayat limits. Nowadays municipal corporations are equipped with an online grievance cell for all the issues being faced by the people living in municipality areas. Hence as and when the resident belonging to a municipality area raises a complaint it's been tracked and addressed by the concerned assigned authority in-time. But in the case of the areas which are being considered under gram panchayat limits, till now there is no online grievance application existing. Due to which the people living in the areas pertaining to gram panchayat are not getting their issues being addressed by the authorities' in-time. The only mode of contacting the authorities is to ring up them, meet them personally, submit a request letter about the issue and ask for the status of the issue. Similar is the case of people living in the rural areas with drainage system facility. In order to have a smooth way of addressing the issue being faced especially by the people living in the gram panchayat localities or much below, there should be an online grievance application to be developed. The people also should be educated by the same. Hence the overflow of the man-hole issues can be resolved quickly as follows :- 1) All the man-hole systems should be equipped with a sensor which would detect the overflow of the sewage water from the man-hole [6][7][8]. 2) As and when the sensor detects an overflow a message should be sent to the concerned authorities of that particular locality about the overflow along with the GPS location of the source point. The message should be sent with an interval of 1 hour since it's a human tendency to forget if the concerned authority is working on another issue. Hence the message will be sent to the concerned authorities with an interval gap of 1 hour till the problem is resolved. The problem resolution too can be detected by the sensor since the sensor stops sending the message when the overflow from the man-hole stops. 3) The application plays a vital role in this reporting structure. The sensor detects the overflow of the man-hole and opens an issue in the grievance online form by logging in with the user id and password as the location name which would be detected by the GPS. The description would be auto populated with the explanation as "overflow of man-hole". Depending upon on the location name and using GPS the circle, pin code, city, state, and ward would be auto populated in the respective fields in the online application. The issue gets submitted automatically and an issue id will be generated. The issue id along with the concerned authority name and contact information would be sent as a message to the people in the locality. Along with this message there would be another message sent to the concerned authority to which the issue is raised with the issue id and details about the issue. Now it's the job of the authority to look into the issue and fix at the earliest. If the same isn't being fixed within 3 days then in the application a field name "delay" will be auto checked and now the message will be sent to the politically elected leader belonging to that ward including the municipal commissioner or the nagar panchayat commissioner. If the issue is not resolved then the concerned authority has to give the reason for the delay. Once the issue is resolved which is detected by the sensor due to the stoppage of the overflow from the man-hole then the issue status will be changed from open to fix. Later on of the same issue is reported from the same man-hole then the fixed status of the issue will be changed to re-open and the same reporting process continues. In order to develop a healthy competition among the employees, performance points would be credited into the concerned profile accounts and their salary increments would be linked to the number of points scored by each employee. It is very much necessary for the concerned authority to address the issue since if the issue isn't fixed in-time then the people of the locality may have to suffer with the dreadful diseases that are going to be spread due to mosquito bites and unhygienic surroundings which may even lead to death.

The below depicts the causes of health and ecosystem being affected due to sewage

Table 1: Sewage affecting the health and ecosystem

Category	Examples	Sources
<b>1. Affecting health</b>		
Infectious agents	Bacteria, viruses and parasites	Sewage, human and animal excreta
Organic chemicals	Pesticides, plastics, detergents, oil	Agricultural, industrial and domestic wastes
Inorganic chemicals	Acids, caustics, salts, metals	Industrial and domestic effluents
Radioactive materials	Uranium, thorium, radon, etc.	Mining, power plants, natural sources
<b>2. Affecting ecosystem</b>		
Plant nutrients	Nitrates, phosphates, etc	Chemical fertilisers, sewage, manure
Sediments	Silt, soil	Soil erosion
Thermal	Heat	Industries, power plants
Oxygen demanding	Agricultural wastes, manure	Sewage, agricultural runoff

The above tabular form shows that the infectious agents which are the bacteria, virus and parasites originated from sewage, human and animal excreta. So whenever the sewage is over flown from man-hole then the health of the locality residents will be affected due to the increase of bacteria, virus there after the mosquitoes. At the same time the ecosystem too will be impacted due to the sewage which may get in to the plants.

The below figure explains about the statistical report about the death cases reported due to mosquito bites.

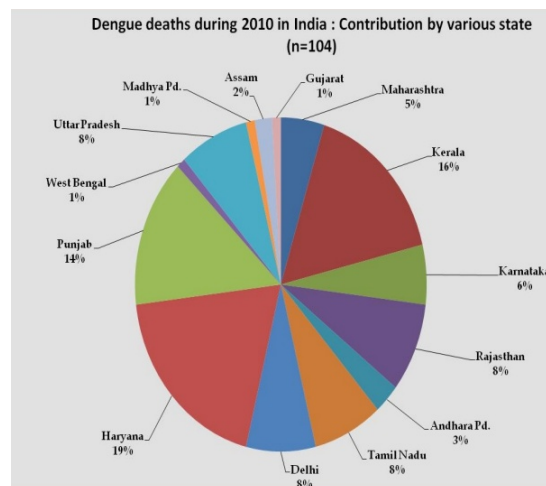
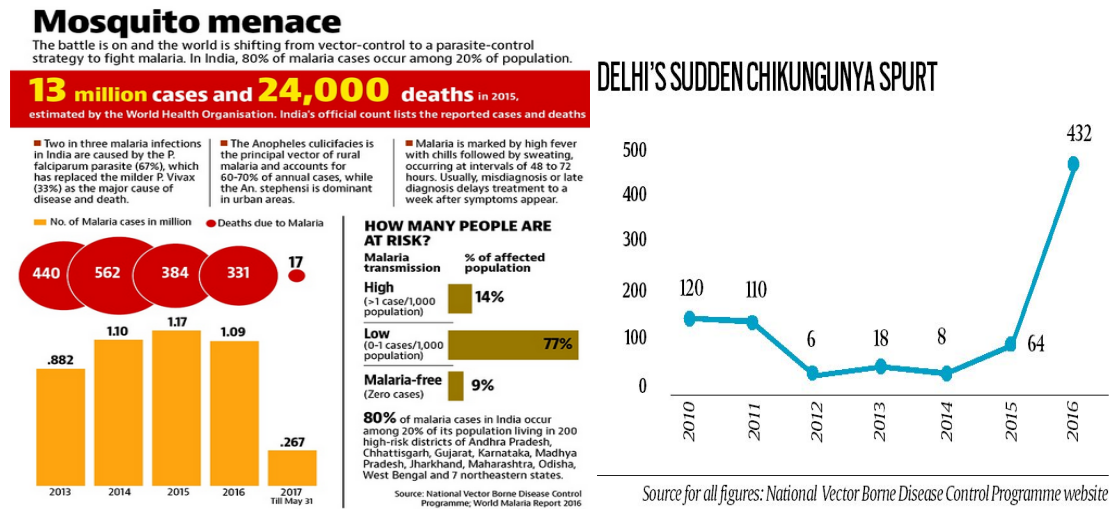


Figure 1: Statistics about the mosquito bites and death cases due to the same

### III. SMART MAN-HOLE MAINTENACE SYSTEM ARCHITECTURE

Smart Man-Hole Maintenance System: The below figure Fig.2 depicts the architecture of the Smart Man-Hole Maintenance System. The sewage over flow from the man-hole is detected by a sensor which would raise an issue in the online application with the location name as the user id and password along with the city name, circle, ward, pin code, state with the help of GPS system. The issue description in the online application would be auto populated as the overflow of the sewage from the man-hole and the request would be auto submitted. The unique issue number would be generated for each issue that was raised. Thereafter the issue would be assigned to the concerned authority that is related to the same circle and ward. A message would be sent to the locality of the people along with the unique issue number including the contact details of the concerned authority to which the issue is assigned. A remainder message should be sent to the concerned authority for every hour from the time the issue is allocated to that person. The status of the issue would be modified from open to fix only after the problem is fixed. If incase the problem has repeated again instead of opening a new issue number the old issue would be changed to reopen status. The employees working in this section of job will be appraised and their salaries will be incremented depending on the number of issues they fixed, since each issue once fixed will add certain points to their profile. The employees of the same peer group could be judged and their performance also could be assessed easily based on the number of issues fixed. This kind of competitiveness will definitely keep the city clean and green. The database will be monitored by an administrator who will never be manipulated. The sensor should send data to the cloud using MQTT over Wi-Fi through Raspberry Pi [1][9][10][11][12][13] by using the logic present in the python script through Ethernet medium. The data present in the cloud can be shared through Amazon AWS

IoT using Dynamo DB. This data is further sent to various devices using Android .As and when the sensor senses the overflow from the man-hole the application is filled and submitted and the message will be sent to all the android users including the concerned authority via the cloud.

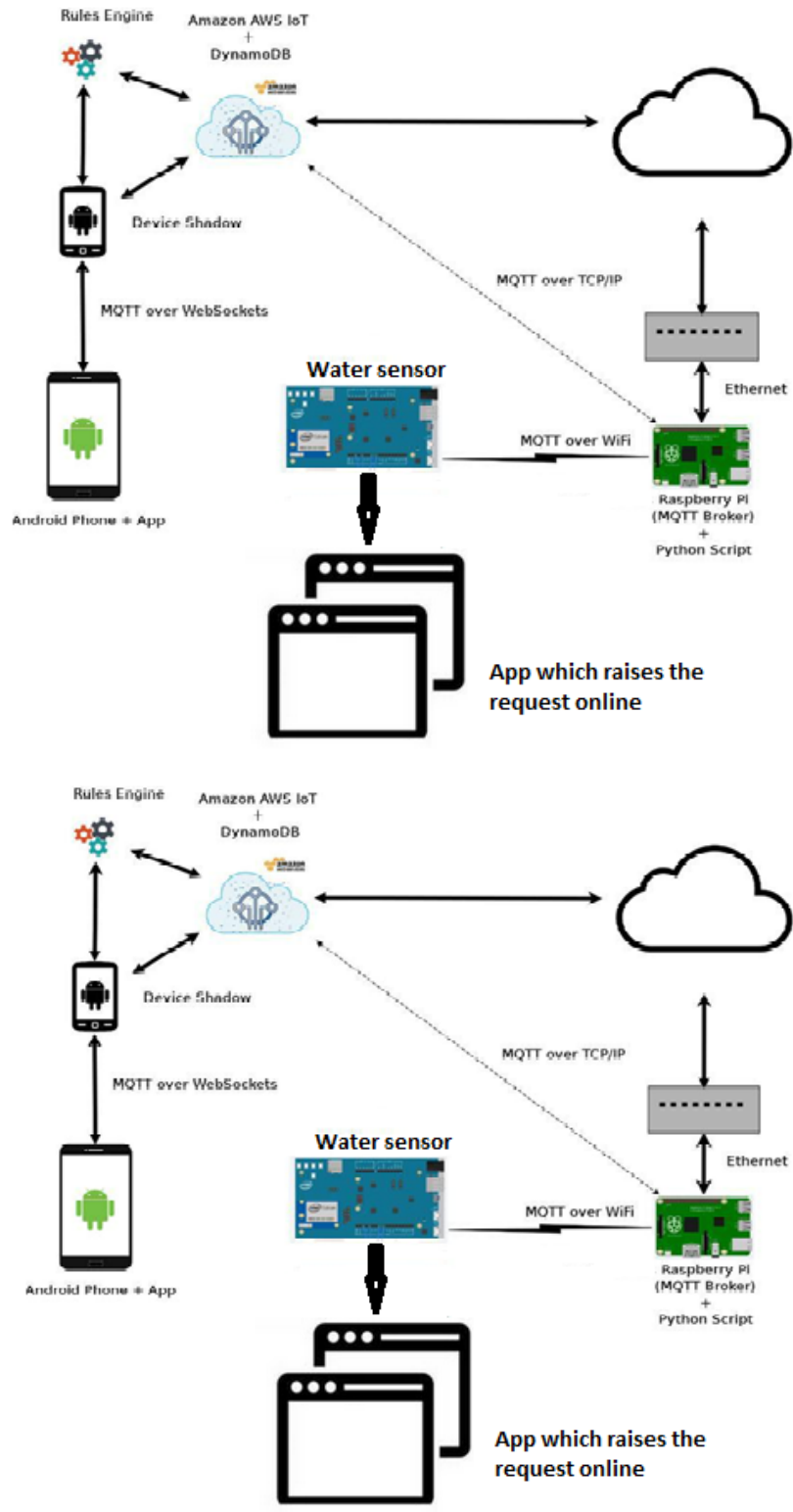


Fig 2: Smart Man-Hole Maintenance System Architecture

#### IV. CONCLUSION

This application would definitely lend a helping hand to the society by keeping the surroundings neat and clean. At the same time avoid unnecessary virus, bacteria and other infectious diseases from spreading out, thus by reducing death toll rate.

The Internet of Things which emerged in this latest advanced technology is definitely making surroundings manage in a smart way. In present scenario of managing both work and life one will always opt for leading a smart life with smart devices which are making the surrounding smarter. The idea present in the paper which was drafted needs to be implemented which would be the future scope of this paper.

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Revathi Lavanya Baggam, BTech and MTech in Computer Science and Engineering from Jawaharlal Nehru Technological University, worked for Infosys Ltd for 8 years as Team Lead on Core Banking Solutions called Finacle for banks like URALSIB which is a bank in Russia, banks in Cairo, Egypt, South Africa and many Indian banks like SBI, ICICI etc. Currently working as Assistant Professor for CVR College of Engineering, Hyderabad, Telangana, India.