

A Survey on the Modern Technologies used in Public Toilets

V. Sudha, N. Jeba, R. Akiladevi

Abstract: *In a country like India, where 60% of the world population do open defecation public toilets play a vital role. Though now-a-days open defecation is reducing by the open toilets constructed by the government, the maintenance of these toilets in hygienic manner is still an issue. The usage of the public toilets is reduced due to the improper maintenance of the toilets and foul smell from it. Moreover, the peoples started using the open places which leads to many health problems. One of the health issue caused is the diarrhoea. In India, this disease kills one child per minute. Hence, the issue of maintenance of the public toilet has to be dealt seriously. In this paper, we survey on the technologies proposed for modern public toilet facilities.*

Index Terms: *Open Defecation, Open Toilets, Water, And Maintenance.*

I. INTRODUCTION

Sanitation plays an important role in a country's development. That too in a developing country like India sanitation has to be taken care seriously as it may affect the future growth of it. But India has failed in implementing the techniques for maintaining proper sanitation. The major reason for the above is, most of the Indian population does not have toilet facilities and they do open defecation. Based on the survey made by the World Health Organisation (WHO), 58% of the Indian population do open defecation. Open defecation is the exercise of removal of human waste (stools and urine) in public without accessing the toilets. The important problem with open defecation is, the E.Coli present in the human stool may enter the digestive track of the human that may lead to diarrhoea [5]. In countries like India, any health problem has to be dealt seriously as this may affect the future growth of the country. In the survey made by the United Nations, Millennium Development Goals Report 2014, 66% of the Indian population in rural area do open defecation [10]. In order to make India, an open defecation free country, the defence ministry has taken steps to make each state an open defecation free state. As a first step to achieve this, the important cities present in a state are encouraged to become an open defecation free city. Now-a-days, though many of the cities claim that they are open defecation free, really that is not the fact. Also, when a city wants to become an open defecation free city, it needs to concentrate on the development and maintenance of the public toilets. These public toilets are utilized not only by the visitors in other cities but also used by the peoples who does not have own toilets. In this regard,

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*Correspondence Author(s)

V. Sudha, Assistant Professor, Computer Science and Engineering, Kumaraguru College of Technology Coimbatore, Tamil Nadu, India,
N. Jeba, Assistant Professor, Computer Science and Engineering, Kumaraguru College of Technology Coimbatore, Tamil Nadu, India,
R. Akiladevi, Assistant Professor, Computer Science and Engineering, Rajalakshmi Engineering College, Thandalam, Chennai, Tamil Nadu, India.

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cleanliness of the public toilets is very important as the usage of these toilets can be improved only if it is maintained properly. In addition to this, public toilets must also address the specially challenged peoples.

In literature, various methods and technologies are proposed for maintaining public toilets in an efficient manner. In this paper, we survey on the techniques used for maintaining the public toilets and technologies used for facilitating the physically challenged peoples. Each of the following section describes the different techniques used to overcome the above discussed issues. Also the advantages and disadvantages in the proposed techniques are discussed.

II. EXISTING METHODOLOGIES

In this section, the methodologies used for maintaining the cleanliness of the open toilets and facilities proposed for the specially challenged peoples are discussed.

One of the best and possible method to avoid open defecation is first to provide the infrastructure facilities where ever necessary. Mostly in northern side of India open defecation is not considered as a different. There mostly men prefer open defecation [11]. Next is maintaining the infrastructure so that it can be used efficiently and effectively by the visitors. There are n number of issues to be dealt to maintain the open toilets properly. The first and the foremost thing is proper and frequent cleaning of the open toilets. Though municipality has taken many steps to improve the maintenance of the open toilets, still it is not maintained as expected. Now, they have even started using many technologies to achieve this. Though the workers are available or they attempt to do the duties properly, the most important difficulties they face in many places are availability of sufficient water for cleaning the toilets. In section A, various techniques for efficiently using the water for cleaning toilets are discussed. When talking about the usage of technologies in toilet system, we must also consider the efficient usage of it i.e. interaction of the system and product must be studied [6].

Always, all peoples who visits the public toilets are not healthier and physically well. Sometimes, physically challenged peoples may be visiting the toilets. So the public toilets that we construct must contain the facilities that make the physically challenged peoples. In section B and C the facilities proposed for the physically challenged peoples and peoples with health issues are discussed.

A. Reducing the Usage of Water

Water Scarcity particularly in summer exists in many places. When we talk about the cleanliness of the open toilet, we need to consider the amount of usage of the clean water used for cleaning the toilets.



In [7], it is identified that flushing a toilet for 2.5 seconds is enough for cleaning a western toilet. Many of the water saving products can be found in [12]. Various technologies used for reducing the water used for flushing the toilet is proposed in [2]. Some of the techniques proposed these are discussed here. One of the proposed technique is dual flush toilets. Here, the user has the option of choosing the type of flush they want i.e they can either choose short flush or long flush. The other technique is high-efficiency power-assist toilet systems. Here small quantity of water will be pushed with high pressure so that the same flushing task can be achieved with small quantity of water. The pressure required by the pipeline is also minimal here. Also, they have proposed that water can be saved by segregating urine and solid waste as flushing of urine requires less water. Another solution that is useful for house hold is vacuum tubes, but it is little bit expensive when compared to other solutions. Few other solutions are waterless urine and dry toilet.

B. Visually Challenged Peoples

Also, visually challenged people may be visiting the public toilets. To facilitate the blind people in using the public toilets, loud step was introduced by Istanbul Technical University (ITU). Also, in [4] light weight glass system with audio aid is introduced for visually impaired people. This proposed prototype can act as window for the visually impaired people to see the world. It can even predict the external signs and inform the person who is wearing the glass. The flow of the proposed system is illustrated in Figure 1.

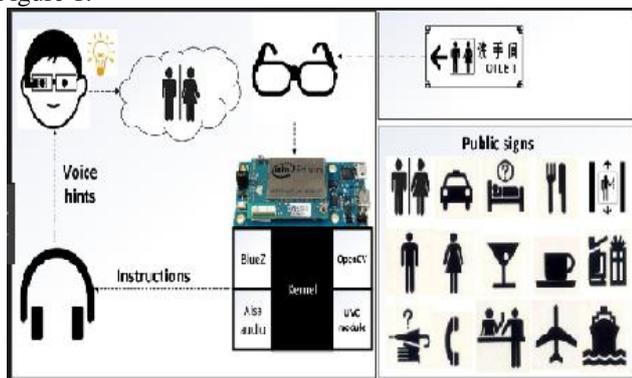


Figure 1. Working of Light Weight Glass System

In [9], adjustable toilets for visually and physically challenged peoples are developed. The proposed adjustable toilets consists of a control unit that control the other sub units present in the system. It contains sensors that senses the various positions of the user. Depending upon the information obtained from the sensors, the sub parts of the proposed system will be adjusted.

Even the sensors used in [8] for detecting fires can be implemented in toilets for preventing natural disasters caused by fires.

C. Health Monitoring using Smart Toilet Equipment

In [3], by using the smart toilet equipment's, the parameters necessary for identifying the health issues are measured and the needed information's such as ECG, body weight and body fat ratio are derived. To measure these parameters an electrode is mounted on the toilet seat. Google has also developed a patent for monitoring the health parameters of a patient by fixing sensors in the toilets and bathrooms [13]. In literature, intelligent toilet system is proposed. The parameters that are measured using the

intelligent toilet system will be sent to the respective physicians. The intelligent toilet system in shown in Figure 2. Communication among the sensors employed for constructing modern toilets can be improved using the methods described in [].

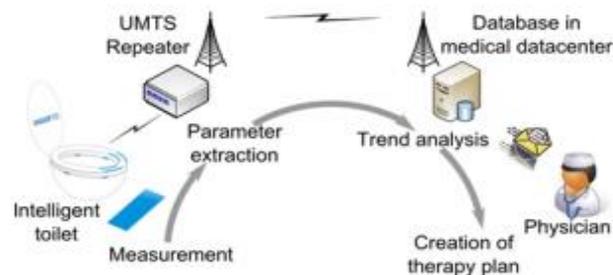


Figure 2. Intelligent Toilet System

III. CONCLUSION

To avoid the health issues created by open defecation, open toilets can be constructed at the public places where more peoples visit. Though in many places government have taken steps to construct open toilets it is not maintained as expected. Now-a-days they have started using apps for maintaining the open toilets. Using these apps, complaints can be registered to the higher officials about the cleanliness of the open toilets. In this paper, we have done a survey about the techniques proposed in the literature for efficiently maintaining the open toilets.

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