

A Literature Review on: Smart Bottle using IOT

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Abstract- In this omnipresent IT world even the non-living items communicate amongst themselves and smartly react depending on dynamic situations. IOT (Internet of Things) is a technology which is highly emerging that understands and conceptualizes this nature of computing. The paper gives a brief review on water bottle using IOT technology. Water is very important part of human life. Variety of parameters effect the quality of water. The smart bottle monitors these parameters constantly in real time using input sensors, the system then processes the input data and performs necessary actions if required using actuators. This system will be helpful for health conscious human beings in today's life. This system can also be greatly utilized in healthcare domain where extra care needs to be taken in all aspects.

Keywords- Sensors, Actuators, IOT, Internet of Things, Smart Water Bottle

I. INTRODUCTION

IOT is such a small word which is capable of achieving things which were considered as miracle few decades earlier. In this fast changing world if you look at any item from any range such as television, refrigerator, watch, shoes, clothing etc., there are smart versions of these items available. All these items which were only used for a specific purpose are now used smartly to achieve a variety of benefits. IOT is the key behind making these dumb items smart. The main concept of IOT is based on extracting the data from input sensors. Processing this raw data and extracting information from them, analyzing this data and making decisions based on some algorithm or protocol rules set. Based on this decisions perform some actions using various kinds of actuators.

Currently a water bottle is just a water bottle. Human beings observe the water with their naked eyes and just judge the condition of the water depending on how clear it looks. In this a person may do a big mistake by drinking a toxic water which is not visible to human naked eyes. Not only toxic, even human beings don't know the exact proportion of water intake required in our day today life. The quantity of water also changes depending on various factors like humidity, stress, daily physical activity, work environment etc. Neglecting the importance of healthy and proper quantity intake can lead to some serious health issues which may affect the life of human being. This bottle will help in the necessary checking and also keeps track of quantity of water intake minimizing the risk of health issues using Internet of

Things as a technology. The objective of this paper is to give a brief idea about smart water bottle. Variety of water sensors are used to gather data from the water inside the water bottle, which can be displayed on a screen, using this information the person can decide whether the water is fit for drinking or not.

On completion of this introduction the remaining paper is prearranged as follows: Section II will be covering the summary of some related work that is carried out in this technological area. Section III covers the in detail explanation of architecture of smart water bottle. Section IV concludes the paper by mentioning future scope of this research.

II. RELATED WORK

For such a revolutionary and helpful technology, there is limited literature related to it. According to Mohammad Abdur Razzaque [1], in the last few years, there is such a vast development in the field of sensors and actuators. In some cases IOT can be thought of as a thing-oriented technology having used sensors and actuators. It not only makes use of a single device but it combines various devices under one roof to collect accurate data and perform actions using actuators [1]. The models efficiency is directly dependent on how accurately the collected data is analyzed. Any data coming to the controller from various input sensors must be matched and compared with the threshold values of the given parameters and analyze smartly and take decisions depending on the conditions [2].

Luca Catarinucci et al [3], in their thesis 'An IOT Aware Architecture for Smart Healthcare Systems', said that for improving the effectiveness of the health care system, a variety of sensors are attached to body of the patient which helps doctors to achieve different parameters like Blood Pressure, temperature, ECG, motion etc. These are sent via a wireless protocol (RFID) to a device. This type of system then constantly monitors patient health using those parameters, also helping the doctors to handle emergency situations more appropriately [3].

According to authors of the proposed system described in 'Internet Of Things In Smart Cities', different sensors constantly monitors various parameters like structural stress of building, noise, pollution, parking , humidity , temperature, etc. This architecture proposed by them is implemented in Padova city located in Italy [4]. Wide variety of different parameters are required for analysis of water and determining its fitness for use, these parameters have different threshold ranges. There should be a strict monitoring of these parameters by the controller that are specified in the condition. Any change in the values must be immediately displayed to the user for necessary actions [5] [6] [7].

IOT refers to internet of things in which 'Internet' is the actual link that helps to connect with the user sending the information about the parameter changes. To send the data from the sensors to the controller the ZIGBEE protocol can be used. The controller can then display the data where ever necessary. This can also be notified to some person using the internet as the medium [8]. For creating a small area network IEEE 802.15.4 has specified the use of ZigBee protocol which requires low power and low bandwidth. This protocol is basically a simpler and cheaper alternative to Bluetooth (IEEE 802.15.1) or WIFI (IEEE 802.11).

III. SYSTEM ARCHITECTURE

In this section we will discuss the details of the architecture for smart water bottle system as shown in fig. 1. Different sensors are installed on the water bottle to sense different parameters. The logic written inside the controller is used to process the sensed data and perform actions according to varying conditions.

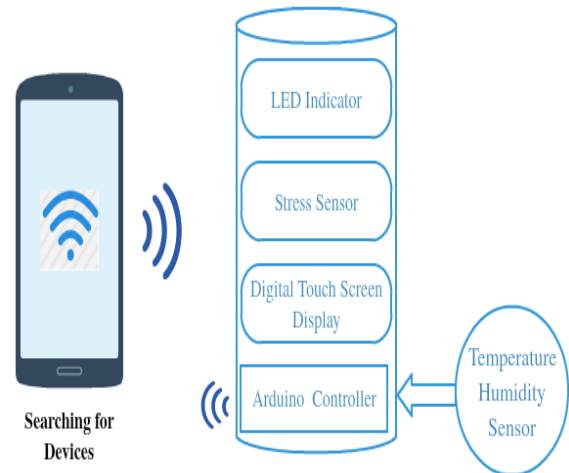


Figure 1. System Architecture

The main parameters that needs to be monitored are surrounding temperature, humidity, stress, minerals, vitamins, chlorine. These values are captured as parameters by the sensors. Digital touch screen is initially used to feed the persons daily active status in terms of very active, active, less active and least active. The temperature and humidity sensor collects the readings for temperature and humidity and sends it to the controller. Depending on the value of the humidity and temperature and the activeness of the person the controller then calculates the intake of water that is necessary for human body and displays it on the screen. The stress level sensor when touched while drinking or holding the bottle detects the level of stress on a person. This level value is sent to the controller. If the stress level value crosses the maximum threshold the user can be indicated to drink water using the display screen and the LED lights. For making the bottle more smart we can added some sensors which detect the amount of minerals and vitamins in the water. The values of these parameters are sent to the controller. The controller on real time checks the value with the preset and predefined threshold value. If there is an unacceptable value of any parameter then the controller immediately alerts the user through the digital display and by glowing red color LED. All this information will be logged and the user can view the changing parameters and the intake of water throughout the day.

The arduino controller can be programmed in such a way that a timer can be set to periodically remind the user to drink water. The LED can be kept blinking in order to indicate that it's time to drink water. If the water level goes below 1/4th level, the LED strip will glow a blue color indicating that the water bottle needs to be refilled. The system can be used to view a daily basis report on the mobile phone using a user-friendly UI.

IV. TESTING

Threshold values for testing are shown in below table:

Table 1. Threshold values for water parameters

Parameters	Minimum Value	Maximum Value
Chloride	0	250
Ammonia	0	1.5
Nitrate	0	0
Fluoride	0	0.4-0.6
pH	6.5	9.0

The values of the parameters that are captured from the sensors will be sent to the controller. The controller then uses these values in its conditions and on the real time constantly keeps on monitoring for any change in its values. If any value changes any time the changed value is compared against its mapped value. If it crosses its threshold value notification is triggered immediately. The warning will be displayed in the bottles digital touch screen, the color of LED on the bottle neck will change and also the user can be additionally notified on his smart phone.

V. RESULTS AND DISCUSSION

The priority goal behind this paper was to give a brief review on how can we transform a water bottle from a simple water container to a much more proactive and intelligent water bottle. Focusing on the goal with IOT in mind the paper describes about model which consists of various sensors, standards and protocols, and a user interface with which different input parameters are collected. The processing of this input data is done and information is generated. This information is then compared with the threshold values and depending on the result of comparison result can be displayed to the user. This will be very helpful to the user who cannot view the exact problem with his naked eyes by just having a look at the water, that too in an understandable way. With the help of the information the user can then do the required action in order to live a healthier life. Also with the help of this smart bottle the critical dangers can be prevented and handled in a sensible and efficient way.

VI. CONCLUSION AND FUTURE SCOPE

This bottle will assist with the required inspection and also keep track of the amount of water intake to minimize the risk of health problems using the Internet of Things as a technology. Future enhancement for this proposed system can be to design an architecture for not only monitoring but also for purifying the water if some bad agents are found in the water.

Also instead of just notifying the user the smart bottle can also give solutions and can instruct the user that what needs to be done in order to make water more healthy and safe for drinking.

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