A SMART ROBOTIC BASED GARBAGE/SEWAGE MANAGEMENT SYSTEM USING IOT

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ABSTRACT

Internet of Things (IoT) makes every gadget smart by connecting them to the Internet. It improves the lifestyle of humans with the help of data collection. IoT is growing rapidly in terms of technology, investments, and popularity. IoT plays a major role in day-to-day activities of a person. Because of the multiple functionalities present in an IoT it can be utilized for maintenance of sewage system. In densely populated cities maintenance of the sewage system is a headache and it needs continuous monitoring of the system. In some of the developing nations sewage works is carried out by human beings. Sewage monitoring and maintaining is a dangerous work due to exposure of hazardous gas by human beings during the maintenance of the system. Solid waste removal is one of the tedious works carried out manually. The proposed system accumulates all the solid waste in a particular area with the support from the smart technology. The design of the system provides monitoring of various threshold values, alerting the administration and cleaning with the help of IoT. Maintenance cost is reduced drastically, and the system works without human fatality.

Keywords: IoT, Microprocessor, Robot, Topology

I. INTRODUCTION

Cleaning the drainage system manually is one of the risky process which can claim many human lives (Sumathy et al., 2018). Toxic gases released from the chemicals produced in the drainage is a severe health hazard to human beings. A well concealed drainage can cause severe damage to sanitary workers when it is opened for cleaning. Sometimes due to high pressure in the sewage tank it may explode or may cause leaks in the walls of the tank or pipe. This damage exposes toxic gases to both human beings and environment which in turn causes severe damage. The solution for this problem is to maintain the drainage properly and periodically.

Maintenance of the drainage refers to cleaning them within a stipulated time period. Improper maintenance of drainage creates health hazards to the people living in that area. With the help of growing technologies there should be a way to maintain drainages automatically without any human intervention (Shanmugaraja et al., 2019). The intent of this work is to provide a solution with IOT for maintaining the drainage system. The proposed work monitors the drainage 24 x 7 for the following criteria.

1. Pressure level
2. Leakage
3. Hazardous gas
4. Total capacity
5. Flow monitoring
6. Level of the liquid
A threshold value is set for all these criteria and if the sensed value is higher than that of the threshold value then the supervisors of the sanitary system are alerted with a message or alarm call etc (Vijaya et al. 2015). Microcontroller is equipped with this system which is responsible for comparing the threshold value and sensed value. If the sensed value is greater than that of threshold value, then it automatically alerts the admin as said above. The proposed work aims to reduce fatality rate of workers involved in it.

II. SYSTEM ARCHITECTURE

In the proposed method battery powered device is used. The design is simple, and it is a low-cost model. It contains sensor for detecting the water level, gas emission level and a navigation system. Navigation system helps the device to move ahead without stumbling. When the sensed values increases than that of threshold value then alert is sent to the administrative system. The system in turn alerts the authorities about the problem that is sensed by the device. There is a system for registering all the readings received periodically. This is used for analyzing the system. Based on the type of the surface cleaning differs. The design of the device includes self cleaning system. This device is covered by aluminum for durability.

III. METHODOLOGY

The working of the proposed system is explained in this methodology. Here robot movement motor helps to move the system back and forth and in all the directions. Gas sensors and Temperature sensors are used to sense the threshold values (Shanmugaraja et al., 2012). The systems consists of various components which includes robot movement motor, Micro controller, communication units , power supply, battery and a motor driver.

3.1 Wheels and Motors Position In The Model

For the movement of the IOT Robot geared motors are used. Wheels cannot be directly connected with the motor due to 360-degree rotation of the device (Chaudhari et al. 2019).

3.2 IoTShield

It facilitates the device with wireless communications, flexibility in using the device, external memory card options and along with input sensors. It also provides compactness and high integrity. One such type is ARMAIOT which provides hardware’s with latest technological features with use cases, software codes and libraries that are already tested. No additional software is necessary to run. Arduino compatible software’s can be used here in this shield.

3.3 Program execution

Atmel AVR is designed to have a single level pipeline with two stages. In this model while the current instruction is executed, the next instruction is fetched and kept ready for execution. Due to the reduced number
of clock cycles the system is fast when compared with the other ones. For task completion they have several in built pointers.

3.4 Instructionset

When compared with other micro controllers it is orthogonal in nature. It is not regular too. X,Y, Z are the three pointer registers which have different addressing capabilities (Shanmugaraja et al 2013). Each one is different from the other. R0 to R15 and R16 to R31 are register locations which have different capabilities. I/O ports used here too have different addressing capabilities.

The bits of CLR are set to zero and the bits of SER are set to one. Code generation is influenced by chip specific variations. In 128k bytes of memory the pointers are two bytes long and 3 bytes on other chips which are greater in size. It is not mandatory to have multiplier chip. C programming is used to make regular instructions (. The GCC compiler includes in built support for AVR and it is widely used in this field. Based on the suggestions from developers Atmel designed the instruction sets.

3.5 MCUspeed

The AVR line can normally support clock speeds from 0-20 MHz, with some devices reaching 32MHz. Lower powered operation usually requires a reduced clock speed.

3.6 Development

AVR have a large following due to the free and inexpensive development tools available, including reasonably priced development boards and free development software (Shyam et al 2017). The AVR are sold under various names that share the same basic core but with different peripheral and memory combinations. Compatibility between chips in each family is good, although I/O controller features may vary.

3.7 Topology used

Topologies used in sensor nodes are point to point, fully connected, mesh, ring, bus and star topology. The topology used in the proposed system is ring topology. This topology is the best topology to be used for this kind of systems. Here all the systems are to be connected with each other and they share the information through a communication medium.

Figure 2. Topology used in the Proposed System.

IV. RESULTS AND DISCUSSION

In the proposed system all the operations of the robot can be carried out through the mobile app. The robot can be moved forward, backward, left, right and turned with the help of the GUI. Based on the threshold value an alarm is send to the concerned authority through a message and a alarm call. The threshold values are fixed for 50%. Above the threshold values the systems starts alarming. With the help of the motors fixed the system can be moved to clear the debris in the sewage. Figure 3. Shows the temperature monitoring with the help of the application. Figure 4. Shows the daily average values of different sewage gases monitored in the system. when the sensed value is higher than the threshold value then the unit is alerted. Figure 5. Shows sample code used for implementing the system.
Figure 3. Temperature Monitoring

Figure 4. Average Daily values of different sewage gases

a. hydrogen sulphide
b. methane
c. ammonia
d. carbon dioxide

Figure 5. Code used for the implementation.

```cpp
#include <ESP8266WiFi.h>
#include <SoftwareSerial.h>
#define ssid "sewage_wifi" // WiFi SSID
#define password "project007" // WiFi password
String etatLed = "OFF";
int q;
int s1,s2,s3;
#define button1 16
int c1,c2,c3,a2=0;
String c1,c2,c3,a,p1;
ESP8266WebServer server ( 80 );
String getPage()
{
    String page = "<html lang=fr-
" FR><head><meta http-
equiv='refresh' content='2'/>
<title> Monitoring</title>
<style> body { background-
color: #fff00; font-
family: Arial, Helvetica, Sans-Serif;
Color: #000088; }</style>
	<ul><li>TOXIC GAS PRESENT:" + t1;
	<ul><li>TEMPERATURE :" + t2;
	<ul><li>SEWAGE LEVEL:" + t5;
	<INPUT type='radio' name='LED1' value='1'>ON</li></ul></ul></ul>

void handleRoot()
{
    if ( server.hasArg("LED")|| server.hasArg("LED1")
    {
        handleSubmit();
    } else {
        server.send ( 200, "text/html", getPage() );
    }
}
```

www.turkjphysiotherrehabil.org
REFERENCES


