Intelligence Drainage Cleaning Using Arm Robot

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Abstract— **The recent development in robotics has enabled robot technology to solve many practical problems that humans encounter in day-to-day activities. But, even today manual scavenging of the drainage is practiced in all places of India, wherein men enters the manholes and clean the waste materials in the drainage manually with no technical equipment. It is a dreadful process where the drainage wastes are cleaned by the people that may include the basic tools like buckets, brooms for disposing the drainage wastes. This practice might jeopardize the lives of humans; therefore, a drainage cleaning robot is essential to replace the human intervention. The overflow of drainage water leads to several hazards to the environment. The method used now days contains pumps to suck the drainage water but it fails to clean the rock solids inside the drainage hole. In order to overcome this issue, an attempt has been made to design and develop a ARM robot, which can be controlled by the PWD workers and efficiently cleaning and disposing the drainage wastages thereby controlling the overflow of drainage water by transmitting messages from drainage using transmitter encloses RF transmitter and diode logic to the receiver which has Arduino UNO and GSM modem with RF receiver placed on the street poles.**

Index Terms— **Arduino UNO, GSM modem, robotic arm**

I. INTRODUCTION

Robots are been in use for making the human life easier and comfortable. It plays a vital role in all sorts of applications like agriculture, industries, security and environment. There are so many hazards occasions in day to day life for human life where the human can't work .In that situations without a significant amount of safety precautions like, the disposal of wastes that are hazardous, radioactive substances, distant handling of volatile devices and righting and hostage situations among others the pick and place robots, often called arm robot can be used [2]. Robots can work safely at these dangerous conditions. These robots guarantee the human safety and replace enormous human work force. It can be also applied in surgeries, defense purposes and medical science with artificial intelligence, manufacturing field and super market field. These are compact and efficient robotic systems. There is a need for the development in cleaning the drainage wastes by using robots. Since drainage cleaning involves manual scavenging which leads to several health hazards to the person entering the manholes of the drainage. Often the drainage water overflows which makes unhealthy environmental conditions that provides platform to become a breeding place for mosquitoes.

According to the study takes place at 2014, nearly 1300 manual scavengers' dies due to the health disorders [10]. The reason behind this is that the drainage consists of more toxic gases like methane that leads to higher mortality rate of the manual scavengers. Also the improper disposal of drainage wastes causes degrade of our surroundings.

II. EXISTING SYSTEM

Without taking the risks for human life or limb, robots can replace humans in some hazardous duty service. For example consider the bomb disposal. Robots are used in many bomb squads across the nation. Robotic arms can seize a suspected bomb and place it in an explosion-proof safe box for detonation and/or disposal. Similar robots can help clean up toxic wastes. Robots can work in all types of polluted environments, chemical as well as nuclear. They can work in environments so hazardous that an unprotected human would quickly die. The nuclear industry was the first to develop and use robotic arms for handling radioactive materials. Robotic arms allowed scientists to be located in clean, safe rooms operating controls for the robotic arms located in radioactive rooms.

In existing system before many year people enter the manholes in order to clean the wastes. Later pumps and tanks are used. These days due to technological development sewer robots are used in cleaning the sewages[3].The greatest disadvantage of the existing method is that it fails to clean the muds that are in the form of rock solids due to the deposition of slits. The monitoring of drainage can be done in order to avoid the overflow of drainage water into the streets that cause environmental degradation.

III. PROPOSED SYSTEM

The proposed system attempts to completely clean the drainage that consists of rock solids thereby monitors the overflow of drainage water without manual interruption. The block diagram comprises of water level indicator, Transmitter, Receiver, Robotic arm.
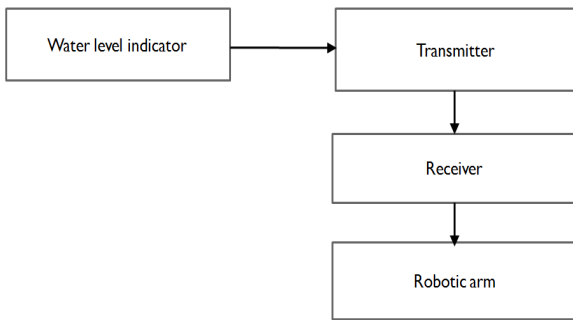
Figure 3.1 Complete block diagram

Figure 3.1.2 Block diagram for transmitter

A. WATER LEVEL INDICATOR:

The water level indicators are to be placed inside each drainage of the street that are connected to each other in a single transmitter by means of wire. The water level indicator is used in order monitor the overflow of drainage water. Let us consider street contains five drainage holes and each drainage includes three levels of water flow which is to be monitored i.e., overflow of drainage water, medium flow and underflow.
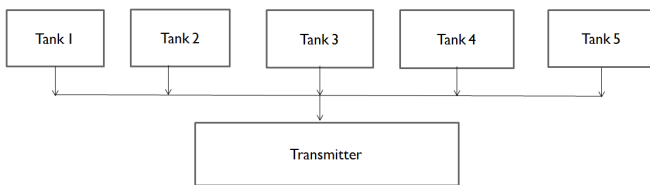

Figure 3.1.1 Block diagram of water level indicator

Once the water in the drainage reaches the limit, it triggers the transmitter that is placed inside the drainage. Based on the level of water the information is given to the transmitter. If the drainage water is high in the tank1, the message to be transmitted the transmitter is as "The water level in the tank1 is high". If the water level in the drainage is low, it can be understand by the PWD workers that the drainage is completely cleaned. The transmitter is used to transmit the message to the receiver. The same method is given in the each tank. The default of supply voltage is given to inside the drainage. And the three level of the indicator is get attached with the aluminum strip and placed at the different level. Once the water gets to immerse the strip, it acts as the good conductor to get shorted with another level which triggers to send the 4 pin input to the diode logic in the transmitter.

B. TRANSMITTER:

The block diagram for transmitter includes 16 pin input since each tank in a street contains 3 pins and 1 pin as 0 there are totally 16 pins. The 16 pin input is given to diode logic where it converts 16 inputs to 4 pin output. Here HT12E encoder is used to encode the signal to RF transmitter.

The whole setup of transmitter part is placed inside the drainage. The drainage tank which is to be placed with transmitter is based on the distance between receiver and the tank. It transmits the water level to the receiver by means of RF transmitter.
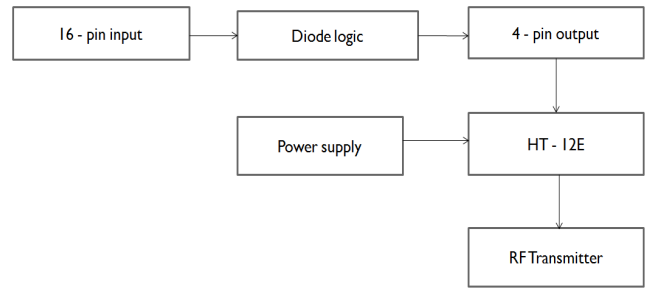
C. RECEIVER:

The receiver part encloses RF receiver, GSM modem, Arduino UNO. The whole setup is to be placed on the street poles.
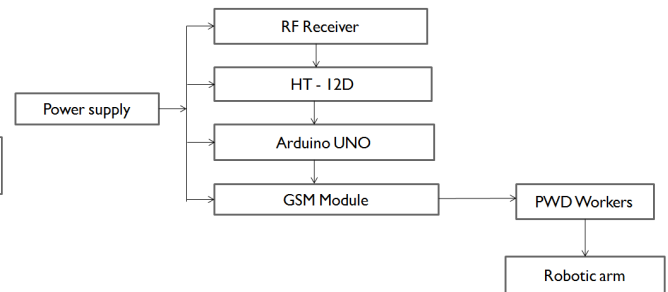

Figure 3.1.3 Block diagram for receiver

The RF receiver receives the signal from the RF transmitter and gives the signal to HT12D that decodes the 4 pin input to 16 pin output.

Arduino UNO uses AT commands [9] that are to be programmed and so the transmitter sends the message to the receiver.

GSM modem uses 890-915 MHz to send information from the mobile station to the base transceiver station. Here we are using GSM 900 module where the mobile number of the PWD workers is feed into the modem that enables the message along with the call.

D. ROBOTIC ARM:

Robotic arm works same as a human arm. Here it uses three different edge effectors.

1. Gripper
2. Grinding
3. Suction

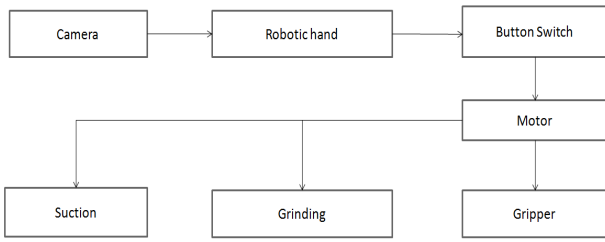The block diagram for robotic arm is given as below

Figure 3.1.4 Block diagram for robotic hand

The camera is first send along with the robotic arm that visualizes the current status inside the drainage [5]. This can be monitor by the PWD workers and so the required edge effectors are chosen that performs the operation.

The gripper is used in order to pick the garbage that is in the drainage and place it in a container which can be disposed in a secured manner and the force required for gripping [14] is

F > m (g+a) /u

Where

F - Gripping force

u - Coefficient of static fiction

m - Mass of the part [kg]

g - Gravitational Acceleration [9.81m/s^2]

a - Acceleration

The grinding is used in order to grind the rock solids that are present inside the drainage. The grinding can be performed by means of sharp blades that

The suction is used to clean the drainage water. The drainage water which has taken out contains grinded rock solids in the form of mud that are collected by means of a container.

All these control are made by the PWD workers by means of joystick or button switch.

IV.   IMPLEMENTATION STATERGIES

a.   Advantages:
1. Reduce in environmental degradation
2. The overflow of drainage water is monitored wihout human intervention.
3. Human life is saved and the proper disposal of drainage wastes

b.   Disadvantages:
1. Cost effective
2. This method requires trained techinicians to oprate the robotic arm

c.   Future scope:

This method can even be adopted by using hydraullic pressure

V.   OUTPUT

The output for the transmitter part is given in the figure 5.1 which is placed inside the drainage.
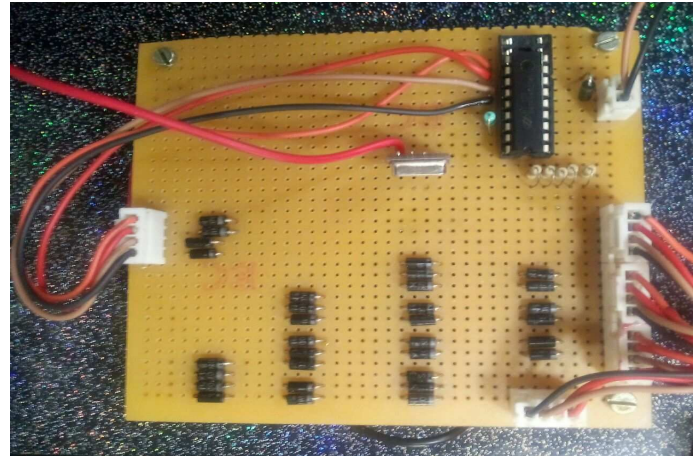

Figure 5.1 Transmitter

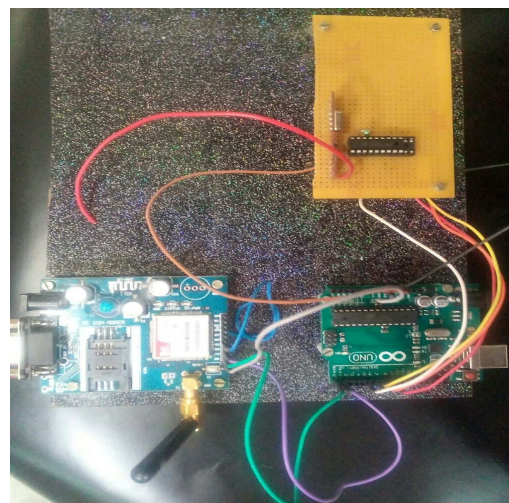The output for the receiver part is given in figure 5.2 which is placed on the street poles.

Figure 5.2 Receiver

The output for the robotic arm is given in figure 5.3 and the camera is interfaced with the monitor that enables to monitor the current status of the drainage.
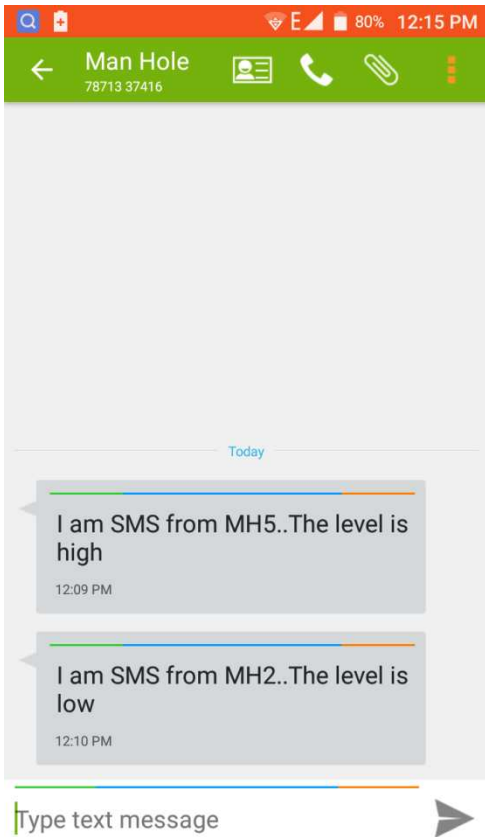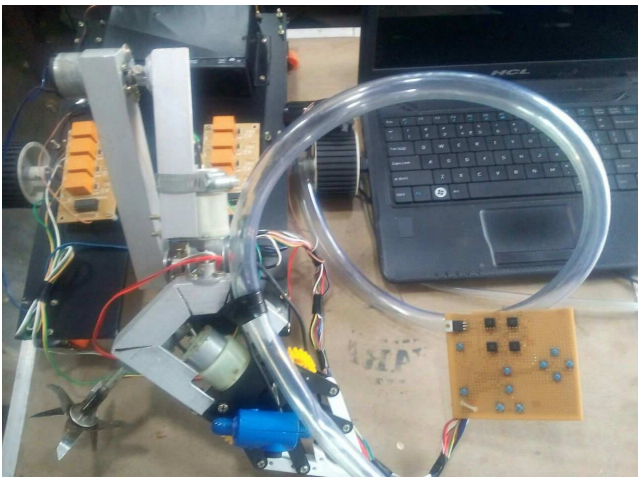
Figure 5.3 Messages to the PWD Workers

Figure 5.4 Entire Set-up

VI. CONCLUSION

By implementing this concept of intelligence drainage cleaning method there will be reduce in the manual scavengers in our country which reduces the health hazards for humans thereby reducing the environmental pollution in our country. Though the initial setup may cost high it gives healthy environment for us and for our future generation.

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