# PLUMBOAT

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## ABSTRACT

*In the world of science and technology we can see that robots are revolutioning our world, thus performing critical jobs in extreme environmentthrough engineering techniques.Recently, there has been increasing interest in the emerging field of robotics thus leading emerging era of robots calls for different types of skills. In this paper we are going to present an idea on robotics and its application in various fields we come across.Our main idea is to develop a system which will sense the parameter such as water leakage, gas leakage or the noise generated in the underground pipes.As we heard Leaky water pipes pose serious problems for cities, as it leads to the loss of roughly a billion Litres of clean drinking water every day, causing inconvenience to the people.Whenever there is a leakage problem in the underground pipes the entire roadways are dug to detect the cracks in the pipes and also the water supply is stopped for the same amount of span causing inconvenience to the people. Also, due to the destruction of entire roadways it becomes very difficult for the people to drive vehicles on the roads leading to traffic jam and inconvenience.The main purpose of our project is water-management. To avoid such problems.We have designed a robot which will sense the parameter such as water leakage, gas leakage or the noise generated in the pipe.which helps us to find the exact location of the leakage thus avoiding the dig up of entire length of the pipe.Which will not only save money,time and manpower but also will prove to be beneficial and thus giving a effective working environment.*

***Keywords: Dug, Leakages, Robot, Roadways, Water management.***

## I. INTRODUCTION

The important objectives that are associated in installing of robotic systems in industries are: 1) Saving of manpower. 2) Improved quality & efficiency. 3) Ability to work in any hostile environment. Our project is aimed at developing an intelligence robot named as “PLUMBOAT” to detect dangerous water, gas leakages and noise in the underground pipes. The robot is designed to move as per the command given by the controller. To move in all the direction like forward, reverse, right and left. If any gas or water leakage detected, robot will inform to control unit with the help modules at transmitting and receiving end . It can move from one location to another location. It is also a Mobile Robot which has got certain artificial intelligence features. Robotic workers never get tired. Do not need to be paid. It can be made to perform even the most dangerous tasks without concern.

## II. LITERATURE SURVEY

After the survey of various methods used for water leakage detection we came through a few of these like water leakage detection using acoustics and ultrasonic scanning.

### 2.1. Tube Bot

Leaky water pipes pose serious problems for cities, as it leads to the loss of roughly a billion liters of clean drinking water every day. A self-powering robot, called TubeBot, a maintenance robot designed for use in the piping of urban drinking water systems. TubeBot is an autonomous robot that generates electricity from the pressure of water to power itself and keep it moving. The system ultrasonically scans the whole length of the piping system and sends the data to a remote location. In this way the cracks are detected using this robot.

It's quick at detecting and can fix almost all kinds of leaks. The tubebot works without an additional energy supply, this is because it incorporates intelligent functionality of using the existing pressure in the pipes to move. By employing this robot, urban drinking water agencies can expect to save and conserve this precious resource.

As observed the design in the above project is such that it requires ultrasonic scanning thus making it expensive. It also requires considerable amount of research to enable it to fit into the pipes of smaller diameter.

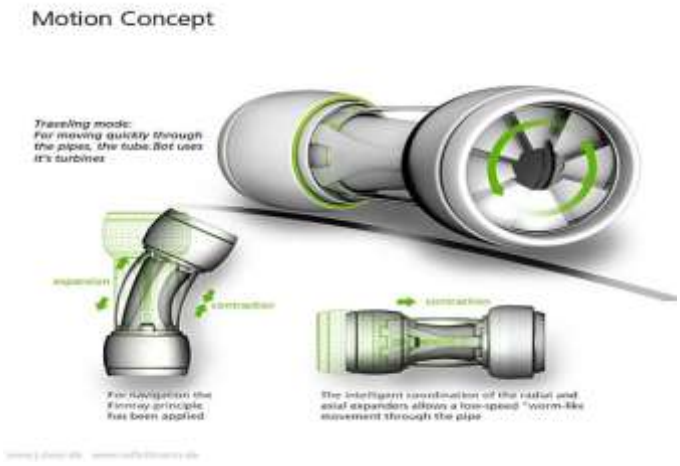



**Fig. 1 TUBEBOT**

### 2.2 Understanding Acoustic Leak Detection

What are the Sounds of Water Leaks?

Water leaks in underground, pressurized pipes may make many different sounds:

- "Hiss" or "Whoosh" from pipe vibration and orifice pressure reduction
- "Splashing" or "Babbling Brook" sounds from water flowing around the pipe
- Rapid "beating/thumping" sounds from water spray striking the wall of the soil cavity

- Small “clinking” sounds of stones and pebbles bouncing off the pipe

What Factors Affect These Sounds?

There are several factors that affect the loudness and the frequency range of the sounds made by water leaks transmitted on the pipes and transmitted to the surface of the ground:

1. Water pressure in the pipe
2. Pipe material and pipe diameter
3. Soil type and soil compaction
4. Depth of soil over the pipe
5. Surface cover: grass, loose soil, asphalt, concrete slab, etc.
6. The loudness or intensity of the leak sound is directly proportional to the water pressure inside the pipe (up to a limit).

How Do Leak Sounds Travel on Pipes?

1. Metal pipes, particularly iron mains between 6 inches and 12 inches, copper services, and steel pipes transmit the sounds of water leaks for hundreds of feet in every direction. Asbestos-cement pipe and PVC pipe do not transmit the sounds nearly as far.

2. Thus knowledge of the pipe material and diameter is important to knowing how far the leak sound may be transmitted along the pipe walls.

## 2.3 Problem Statement

### 2.3.1 Tubebot

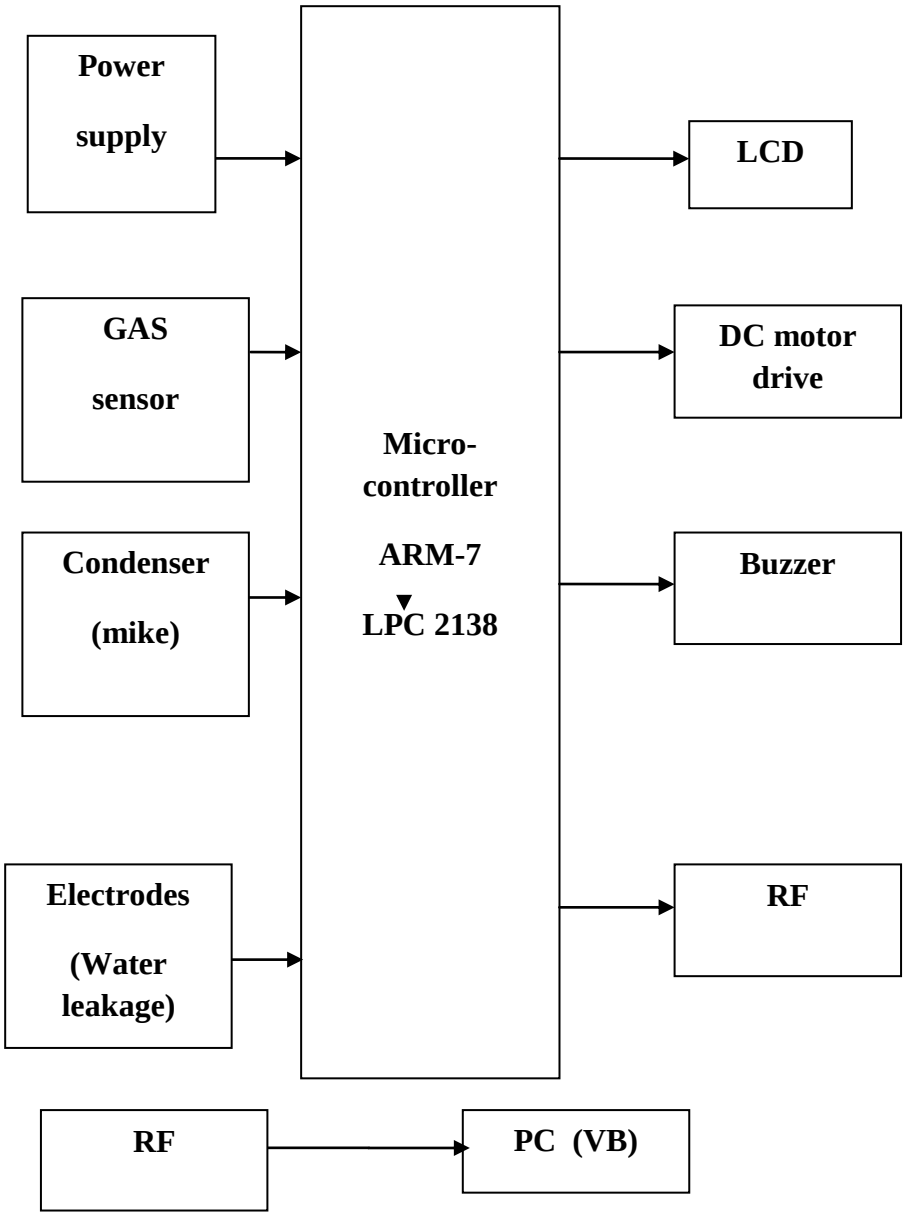
As observed the design in the above project is such that it requires ultrasonic scanning thus making it expensive. It also requires considerable amount of research to enable it to fit into the pipes of smaller diameter.

### 2.3.2 Detection using acoustics

The above method is adopted in foreign countries for the detection of leakage in the underground pipes. It is also very costly since it requires the core knowledge and application of acoustics. It consists of methods wherein a human being has to hear the sounds and also study the intensity of the sounds underground. Also, the pressure and sound intensity need to be compared. The material of pipes used need to be examined. Size of the pipe also needs to be considered. This method is not always accurate. Its implementation also requires a large amount of concentration. It is also very expensive.

Assuming the issues of concern from the above projects created in the past we have come to a conclusion to design a robot that will detect the underground leakages in the pipes. This robot is simple to design and very cost efficient.

## III. BLOCK DIAGRAM




## IV. BLOCK DIAGRAM DESCRIPTION

### 4.1 ARM 7

This generation introduced the Thumb 16-bit instruction set providing improved code density compared to previous designs.The most widely used ARM7 designs implement the ARMv4T architecture, but some implement ARMv3 or ARMv5TEJ. All these designs use Von Neumann architecture, thus the few versions comprising a cache do not separate data and instruction caches.Some ARM7 cores are obsolete. One historically significant model, the ARM7DI is notable for having introduced JTAGbased on-chip debugging; the preceding ARM6 cores did not support it. The "D" represented a JTAG TAP for debugging; the "I" denoted an Icebreaker

debug module supporting hardware breakpoints and watch points, and letting the system be stalled for debugging. Subsequent cores included and enhanced this support. It is a versatile processor designed for mobile devices and other low power electronics. This processor architecture is capable of up to 130 MIPS on a typical 0.13 µm process. The ARM7TDMI processor core implements ARM architecture v4T. The processor supports both 32-bit and 16-bit instructions via the ARM and Thumb instruction sets. The ARM7TDMI (ARM7+Thumb tag Debug fast Multiplier enhanced ICE) processor is a 32-bit RISC CPU designed by ARM, and licensed for manufacture by an array of semiconductor companies. The ARM7TDMI-S variant is the synthesizable core.

### 4.2. Dc Motor Driver (L293d)

The Device is a monolithic integrated high voltage, high current four channel driver designed to accept standard DTL or TTL logic levels and drive inductive loads (such as relays solenoids, DC and stepping motors) and switching power transistors. To simplify use as two bridges each pair of channels is equipped with an enable input. A separate supply input is provided for the logic, allowing operation at a lower voltage and internal clamp diodes are included. This device is suitable for use in switching applications at frequencies up to 5 kHz. The L293D is assembled in a 16 lead plastic package which has 4 center pins connected together and used for heat sinking The L293DD is assembled in a 20 lead surface mount which has 8 center pins connected together and used for heat sinking.

### 4.3. Dc Motor

DC motors are used to physically drive the application as per the requirement provided in software. The dc motor works on 12v. To drive a dc motor, we need a dc motor driver called L293D. This dc motor driver is capable of driving 2 dc motors at a time. In order to protect the dc motor from a back EMF generated by the dc motor while changing the direction of rotation, the dc motor driver have an internal protection suit. We can also provide the back EMF protection suit by connecting 4 diode configurations across each dc motor.

### 4.4. Rs232

RS232 is compatible with today's microcontrollers. It uses a 5V power supply which is same as source voltage of ARM-7. There is no need of dual power supply.

### 4.5. Liquid Crystal Display

LCD is used in a project to visualize the output of the application. We have used 16x2 LCD which indicates 16 columns and 2 rows. So, we can write 16 characters in each line. So, total 32 characters we can display on 16x2LCD.LCD can also used in a project to check the output of different modules interfaced with the microcontroller. Thus LCD plays a vital role in a project to see the output and to debug the system module wise in case of system failure in order to rectify the problem.

### 4.6. Gas Sensor

Gas sensor we are usingis **MQ-6.** Sensitive material of MQ-6 gas sensor is SnO2, which with lower conductivity in clean air. When the target combustible gas exist, the sensor's conductivity is higher along with the gas concentration rising. Please use simple electro circuit, Convert change of conductivity to correspond output signal of gas concentration.MQ-6 gas sensor has high sensitivity to Propane, Butane and LPG, also response to Natural gas. The sensor could be used to detect different combustible gas, especially Methane; it is with low cost and suitable for different application.

### 4.7. Electrodes (Water Leakage) Condenser Mike

Condenser means capacitor, an electronic component which stores energy in the form of an electrostatic field. The term condenser is actually obsolete but has stuck as the name for this type of microphone, which uses a capacitor to convert acoustical energy into electrical energy. Condenser microphones require power from a battery or external source. The resulting audio signal is stronger signal than that from a dynamic. Condensers also tend to be more sensitive and responsive than dynamics, making them well-suited to capturing subtle nuances in a sound. They are not ideal for high-volume work, as their sensitivity makes them prone to distort.

### 4.8. RF Transmission/Reception

**RF** refers to **Radio frequency**, the mode of communication for wireless technologies of all kinds, including cordless phones, radar, ham radio, GPS, and radio and television broadcasts.In our project, we have successfully implemented RF technology for data transmission as well as reception.

## V. CONCLUSION

By analyzing the project we come to know that communication is the main module, collecting data from every module and sending it to the control room which is done by RF transmitter and receiver.The feature such as buzzer used to indicate emergency and thus alerts the leakage area to control room.Also further advances can be made with this project. By having such a robot that can detect the leakage situations thus would save time, money, manpower.

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