

SEMS: RESEARCH PROJECT DESCRIPTION

1. Project Background and Description

Miniature intelligent robot to inspect pipe network and confined space

The project aims to design, model and fabricate an in-pipe inspection robot to sense real-time flow condition within a water pipe network and detect leakages so that they can be repaired within the shortest time possible. Hydraulic model of water distribution system combined with optimisation algorithm will be used to detect and localise leakage in water distribution systems. This will help to use the developed robot in more targeted areas (subset of large system) in order to pinpoint the exact location of the leakage for isolation and repair purpose with minimum disruption to delivery of service.

The robot will be designed to be easily controllable remotely and be accurate in sensing from any angle around the circumference of the pipes. It needs to be fitted with video capturing capability to detect leakages accurately by transmitting data real-time to a ground station. The efficacy of the fabricated prototype will be tested in an in house built water pipe-network. Such a system, with some modification, is also expected to be suitable for inspecting other confined space and the conditions of other pipe-networks such as gas and oil distribution systems.

In the context of smart city, design and implementation of a smart water system deserves utmost attention. At present, water loss in distribution networks is an issue of significant concern. Some countries lose as high as 35% of produced water through leakages in the distribution pipe-network. As a part of the smart water system, sensing, detection and minimisation of water loss through leakages in water distribution network in a sophisticated way is highly essential.

2. Project Scope

Design, and fabrication of a miniature robot capable of inspecting pipe network and confined space
Development of sophisticated control and communication methodologies for the operation of the robot
Sensor integration and efficacy testing of the developed robotic system in real-time scenario

3. Desired Skills from the Student

Basic knowledge of Engineering design and Instrumentation

4. Supervisory Team

Primary: Dr M Hasan Shaheed
Secondary: Dr Ranjan Vepa