UNIVERSITI TEKNOLOGI MARA

DETECTION OF LEAK SIZE AND ITS LOCATION IN A WATER DISTRIBUTION SYSTEM BY USING *K*-NN

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AUTHOR'S DECLARATION

I declare that the work in the thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

Water distribution systems and their integrity are essential for human life and society. Maintaining them is very challenging and becomes the main issue for many developed and underdeveloped countries. Loss of water may happen in many different ways such as evaporation of free water surfaces, leakage, inaccurate metering and unmetered usage. Water distribution systems contain pipes with different diameters, pumps, junction, valves and tanks to transport water through the system, and water leakage in the system represents a serious economic costs. All water distribution networks suffer from leaks and the amount of leakage widely varies between countries and regions within a country. This thesis proposes a classification model to detect water leakage, focusing on finding water leakage's location and size, using *K*-Nearest Neighbour (*K*-NN) classification method. The system is simulated using EPANET (Environmental Prediction Agency Network) software based on actual water distribution system (WDS) data from Benghazi city, Libya. The data used in this thesis can be divided into two types. Firstly, data collected from available sources as Supervisory Control and Data Acquisition (SCADA). Secondly, the data collected from the main valve chamber controllers, which are located in the main pipes. The successfully achieved four set objectives inclusive of (1) a new classification model to detect water leakage, (2) analysis of the effects of leakage size on the variables within a WDS, i.e. flow, pressure, pipe volume, velocity and water demand, (3) locating and specifying the leakage size in the WDS, and (4) evaluate the performance of the designed *K*-NN algorithm for accurate leak detection. The study showed that the best model of the *K*-NN technique produces a classification accuracy is 100% for the leak size and 96.5 % for the leak location.

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