ABSTRACT

An underground water leakage has become a major problem in some countries and will cause many losses for certain sides. This water leakage problem may cause water impurities and contamination, which lead to severe effect on human health. Due to the location, it is hard to detect the leak without digging the soil just to know where is the broken part.

This thesis proposes Ground Penetrating Radar (GPR) to detect underground water leakage. GPR is a system used for detecting a subsurface object with certain depth without digging the soil. The detection is performed by sending a wave spread through the soil to be reflected by the object and back to the detecting devices. This GPR is an effective way to solve this problem without risking the well-functioned pipes. Software that can be used to run simulations propagation of an electromagnetic wave that designed for GPR modeling, one of which is gprMax. It used Maxwell's equation in 3D using Finite-Difference Time-Domain (FDTD). GprMax can identify objects based on differences in conductivity in material conditions that have been specified.

The objective is to simulate the accident of underground water leakage and analyze the image of its leakage using gprMax. In simulation, the presence of underground pipe and leaks are detected using B-scan-based signal processing. The depth and radius of the pipes are 0.4 m and 0.075 m respectively, while radius of the leaks are 0.1 m, 0.15 m, 0.2 m, and 0.25 m. The waveform using the center frequency of 800 MHz. The simulation result shows gprMax capable to detect an underground water leakage, attach with the depth comparison between gprMax with equation results.

Keywords: *ground penetrating radar*, *gprmax*, *radar system*, *underground detection*.