

ABSTRACT

Non-contact detection of respiration using a radar system is more efficient than using sniffer dogs, which do not know how far away or how many victims to find and are more likely to indicate the presence of dead victims than living victims in post-disaster recovery. Therefore, there will be obstacles in the form of collapsed walls that block the range of detected victims. The presence of an obstacle radar system detection will cause attenuation and phase shift effects on the radar signal, as well as the addition of other detected beat frequencies besides the target frequency.

This thesis detects human respiration under rubble through laboratory experiments using an FMCW radar system with an operating frequency of 24 GHz. The method to solve the obstacle presence problem consists of identifying the obstacle response and then using it to eliminate the beat frequency arising from the obstacle. Furthermore, the phase detection method involves extracting the doppler response associated with human respiration. Human detection activities under rubble also have clutter caused by other objects underneath, so it is necessary to reduce this clutter. This thesis proposes a weighting process method for clutter reduction and performs a comparison with singular value decomposition (SVD) and linear trend subtraction (LTS) methods.

The results obtained using obstacle response identification and phase detection methods show the ability to remove the wall effect and extract the respiration pattern. In addition, the results of using the weighting process method showed a higher and more stable increase in the signal-to-clutter ratio (SCR) value compared to other methods. Based on the calculation of the respiration rate detected after clutter reduction using the three methods, there is a slight improvement compared to the two-step FFT results.

Keywords: FMCW radar, weighting method, SVD, LTS, SCR, respiration, through the wall