

PREFACE

The work of the present thesis focuses on the development of target detection and identification technique of stationary target behind the wall. The thesis aims to develop technique for detection and identification of target shape and size from through-the-wall radar images using stepped frequency continuous wave radar (SFCW) radar based through wall imaging (TWI) system. Historical developments of TWI system is carefully examined to bring out the research gap and problems. A series of works have been done on the TWI, and the part of these works has been reported in various national and international journals, namely, Progress in Electromagnetic Research B, Defence Science Journal and Microwave and Optical Technology Letters. Further, the aim, introduction and scope of the thesis are briefly discussed below.

Through wall imaging radar system is an emerging technology that is used to image the scene behind the wall. It allows us to detect and identify objects and/or life signs behind a wall which cannot be directly accessed or seen using conventional measures. Such system is based on the principle of radar that uses radio frequency waves that have the capability to penetrate through the wall. Owing to its ability to sense through wall, TWI system is required for various civilian and military applications such as surveillance, indoor security, search and rescue mission of objects inside a building, etc.

Having numerous civilian, law enforcement, and military applications, through-the-wall radar imaging system is faced with several challenges. One of several challenges is detection and recognition of stationary target in presence of multipath and unwanted wall signal attenuation and dispersive effects. Different imaging algorithms have been used to investigate the effect of imaging on TWI data to select the effective imaging algorithm that

can be used for shape detection of target. The through-the-wall radar image of stationary targets behind a wall contains pixels reflected from the target as well as from the background noises or clutters. To suppress the background noises or clutter, a statistics based thresholding technique has been developed for approximate shape and size detection of target. The developed thresholding technique can detect the approximate shape and size of target while controlling accuracy and false alarm in a user-defined constraint. The obtained target image does not correspond to the actual shape and size of targets. Therefore, an artificial neural network model for shape and size recognition of the target from through-the-wall radar images (TWRI) has been developed. The developed ANN model can recognize and reconstruct actual shape and size of target irrespective of its variation in orientation and size.