



Through Wall Human Detection

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Abstract

In this senior project, we design a radar system setup for through-wall human detection. The radar system components are mainly the network analyzer, low noise amplifier, and the ultra wide-band antennas. This radar transmits a series of 801 sinusoidal signals where the frequency is stepped between 45MHz and 10GHz.

The signal travels through space and penetrates the wall and hit the target (human) and reflects back to the radar system. The data is processed by MATLAB programming. After proper signal conditioning, the collected data is transferred into time domain using IFFT. Change detection is used to cancel the clutter and remove the impact of the fixed environment. With proper time calibration the range of the target was estimated.

Experimental Methods

1- Background Elimination method:

This method is based on change detection between background measurement and target measurement.

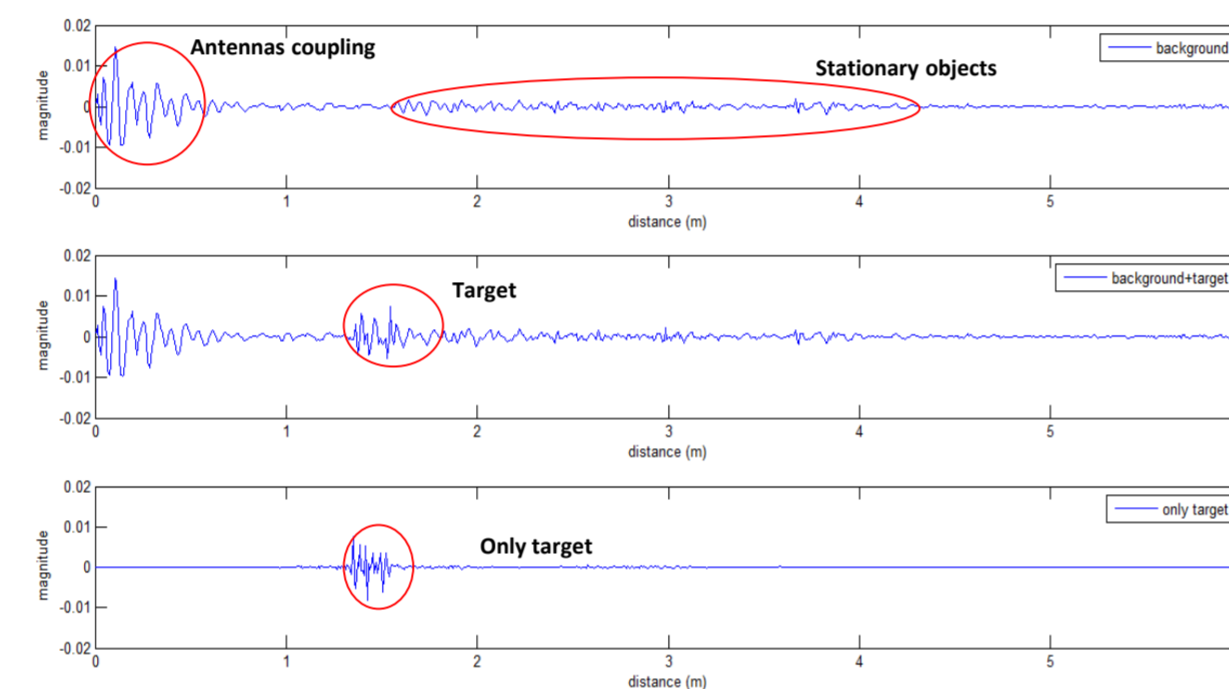


Figure (1)

2-Two Consecutive Elimination Method:

This method is based on change detection between two consecutive measurements with the existence of the target.



Figure (2)

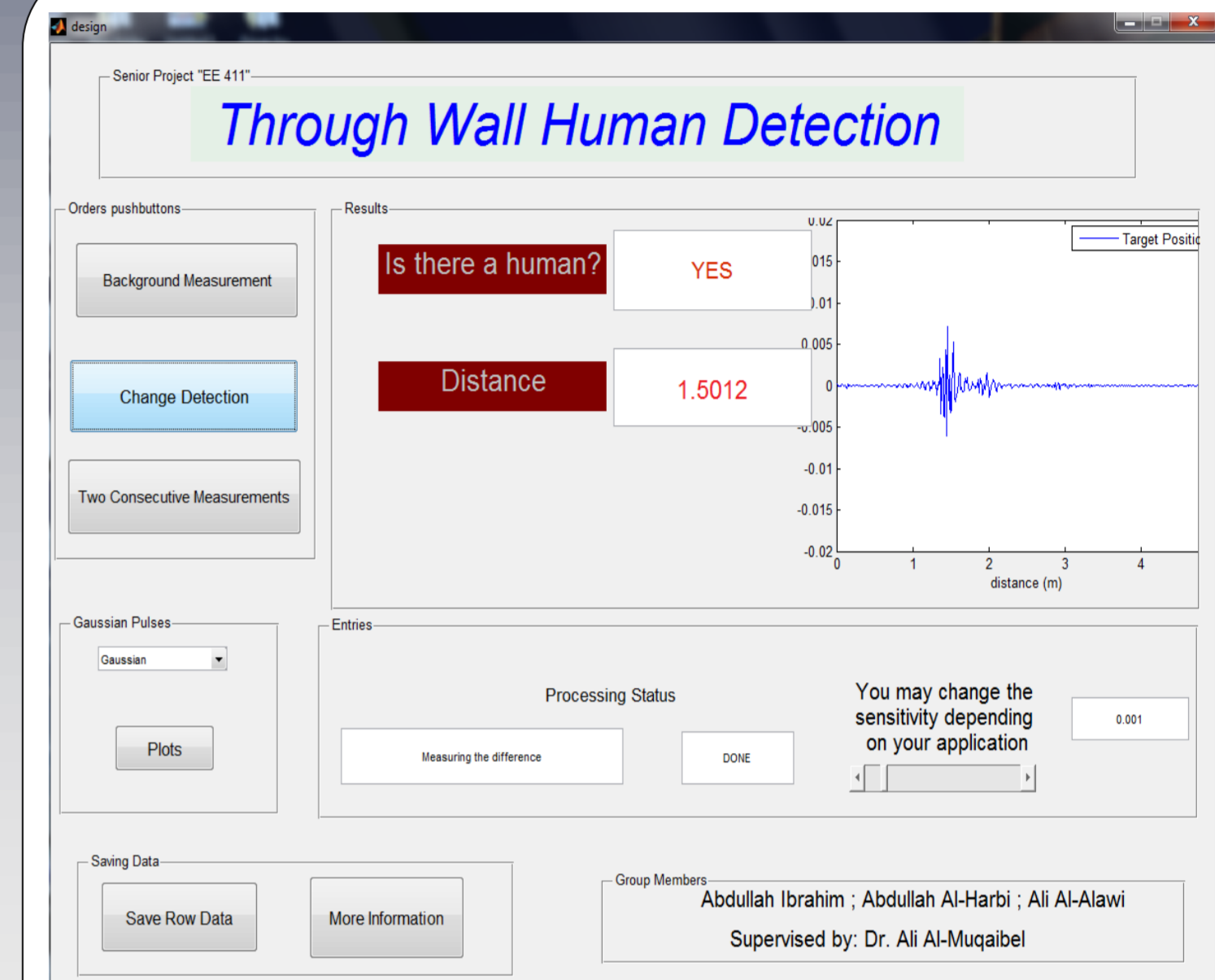
Results

There are many scenarios that can be considered in our project. One of these scenarios is to use a gypsum board with dimensions 1.63m , 1.02m and 1.5 cm height, width and thickness, respectively. The target was standing behind the board at 1.5m Figure (3).



Figure (3)

The board is installed in front of antennas directly without any separation distance. The result was displayed on the Graphical User Interface (GUI) in Matlab as shown in figure (4):



Figure(4)

In this figure we select the choice of two consecutive measurements. The display shows the place of the human in the plot and gives the nominal value of his position. So, the nominal value is 1.5012 m, which is correct.

Recommendations

- Use portable network analyzer.
- Use two low noise amplifiers to increase the range of detection.
- Fix the antenna position to avoid vibrating them.
- Use more than one antenna to receive the signal to increase the resolution of the measurements.