Removing Interference from Above Ground Reflectors in Ground Penetrating Radar Data

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Background

Ground penetrating radar is a useful tool in the non-destructive evaluation of below ground structures. However, GPR surveys may detect reflections from above ground objects. The reflected signals from above ground targets may obscure the below ground features of interest.

Approach

The first step of this algorithm is to find the delay time of the above ground reflector *d(x)*. The GPR data is vertically time shifted to make the above ground reflection appear as horizontal stripes, as in Figure B. A best fit exponential curve is found for each row. The best curves are subtracted from the GPR data, and the vertical time shift is reversed.

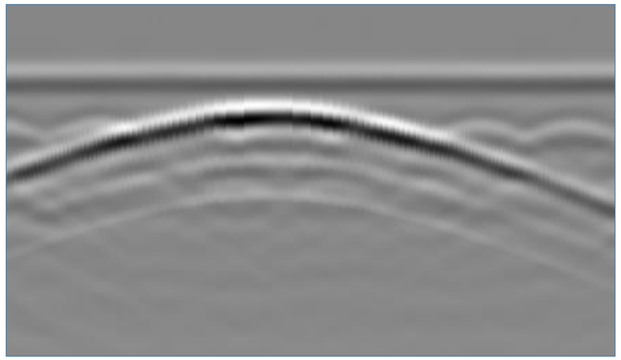

Figure A – GPR scan with added synthetic above ground signal

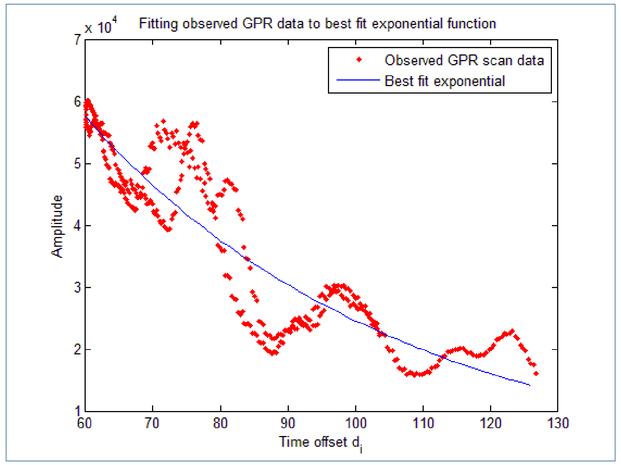

Figure C – Plot of amplitude versus time shift of a single row from Figure B. The curve shows the best fit exponential function for the data.

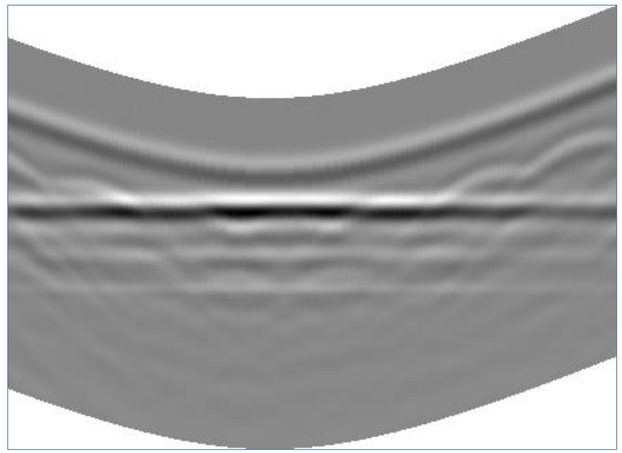

Figure B – GPR scan from Figure A, vertically time-shifted to make the above ground signal appear as a series of horizontal stripes

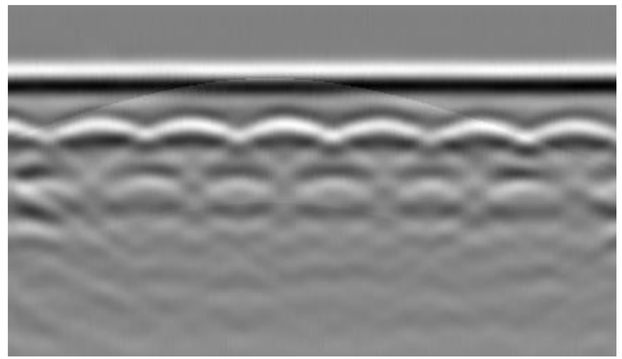

Figure D – GPR scan from Figure A with best fit exponential curves subtracted.

Results and Discussion

Figure A shows a GPR scan of a six inch slab of concrete with added synthetic interference. Figure D shows the GPR scan after the interference is removed. Some artifact noise is still visible, but the amplitude of the interference is reduced and below ground features are left undistorted.

Conclusions

The algorithm successfully removes interference from above ground reflectors.

The algorithm may be applied to below ground reflectors, such as rebar, pipes and storage tanks. It may be applicable to other geological structures if they are a high contrast target surrounded by a uniform media.

The algorithm requires the delay time of the reflector. This can be found manually, or found by a curve detection algorithm.

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