



Recovering the incomplete sampling values in GPR data with interpolation techniques

Merve Özkan Okay¹, Refik Samet²

*1 Computer Engineering Department, Ankara University, Ankara, Turkey
merveozkan@ankara.edu.tr*

2 Computer Engineering Department, Ankara University, Ankara, Turkey

Ground Penetrating Radar (GPR) is a widely used method to investigate the underground archaeological and geological structures [1]. The use of GPR in researches and applications has recently been increasing, because it can detect the underground structures quickly and accurately.

There are two main factors that affect the success of GPR research and applications. These are data collection parameters and search area properties. Data collection parameters such as antenna frequency, sampling and profile range, etc. are under the control of users, and the values of these parameters can be selected according to the search area properties. On the other hand, the search area properties such as uneven surface, the archaeological and other obstacles, technical failures during data collecting, etc. are outside the control of users. As a result, the data collected from the search area become incomplete and inadequate. Due to the incomplete and inadequate data, an accuracy of 2D/3D visualization of the underground structures decreases [2]. This study proposes Mean interpolation techniques to produce incomplete sampling values to increase an accuracy of 2D/3D visualization.

GPR data consist of parallel profiles, profile consists of traces and trace consists of sampling values. In proposed study, first, the intermediate sampling values are extracted from the traces. Second, the new sampling values are produced instead of the extracted ones by applying different interpolation techniques using the remaining sampling values. Finally, the average is calculated by taking into account the amount of increase/decrease between neighboring values which used for production of sampling value. If more than two neighboring values are used to produce the incomplete sampling value, the distance is included in the calculation process.

The proposed Mean and standard Cubic, Cubic Spline, Linear, Median and Mean interpolation techniques were tested on real GPR data [3-5]. In order to determine the best interpolation method, the produced incomplete sampling value is compared with the original sampling value extracted from the trace. The method that gives the closest result to the original sampling value is determined as best one. The obtained results show that the proposed interpolation method gave best accuracy of 94-99%.

Keywords: GPR, profile, trace, sampling value, interpolation

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