M. SOLLA, H. GONZÁLEZ-JORGE, P. ARIAS SANCHEZ, H. LORENZO. **Non-destructive GPR evaluation of underpass arch-shape structures.** *Gerontechnology 2012;11(2):94;* doi:10.4017/gt.2012.11.02.307.00

Purpose In recent decades, road inspections have used automated vehicles that integrate LiDAR, GPR, and IRI measurements[1]. GPR-data provide valuable information–typically about the pavement thickness–for road assessment[2]. The aim of this work is to test the GPR-system to provide geometric information about underpasses of roads, principally related to the depth and span length. **Method** Both high and low frequency antennas (500 and 200 MHz) were used to determine the most appropriate survey methodology for our purpose. This technique was used to detect the different layers of an arch structure. To validate the method, GPR-data were compared with the ground-truth data provided by a mobile laser scanner. **Results & Discussion** The GPR-results showed the potential of the system to obtain information about subsurface structures (*Figure 1*), and the arch geometry (depth and span length) were defined. However, the heterogeneity of the backfill over the arch made it difficult to use the field data we obtained. Finite-difference time-domain (FDTD) modeling was used in this work to understand the response of the radar-wave and to assist in the data interpretation. The synthetic models were built from the ortho-image provided by laser scanner, defining the structure in fine detail, which resulted in large scale and more realistic models. Laser scanner errors in geometric measurements were lower than the 6 mm of the laser used as the ground truth for this work. By exhaustive interpretation of the field data–once they were analyzed through modeling–we found that the GPR-data are consistent with the laser scanner data and open the possibility of using GPR-information to obtain the geometry of subsurface structures for road inspections. This information could be useful to make structural calculations and predict critical failures.

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Keywords: ground-penetrating radar, laser scanning, road inspections
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Full paper: doi:10.4017/gt.2012.11.02.307.679

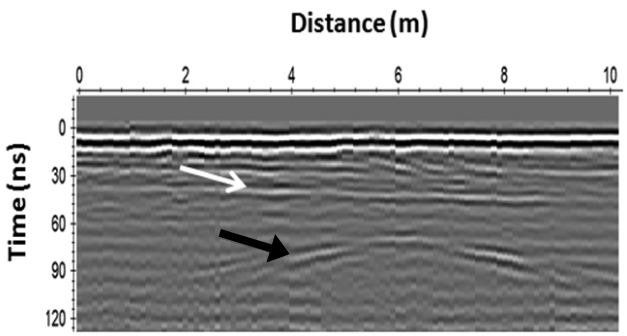

Figure 1. GPR data acquired with the 200 MHz antenna showing the reflection produced by the arch- air interface (red arrow). White arrow indicates a different backfill layer