

UWL REPOSITORY
repository.uwl.ac.uk

The use of ground penetrating radar for mapping tree root systems in urban environments

Lantini, Livia ORCID: <https://orcid.org/0000-0002-0416-1077>, Tosti, Fabio ORCID: <https://orcid.org/0000-0003-0291-9937>, Giannakis, Iraklis, Egyir, Daniel, Benedetto, Andrea and Alani, Amir (2019) The use of ground penetrating radar for mapping tree root systems in urban environments. In: ISETT 2019 Emerging Technology and Policy Trends Related to Urban Transportation Solutions, 3-5 Oct, Rome, Italy. (Unpublished)

This is the Accepted Version of the final output.

UWL repository link: <https://repository.uwl.ac.uk/id/eprint/6673/>

Alternative formats: If you require this document in an alternative format, please contact: open.research@uwl.ac.uk

Copyright:

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

Take down policy: If you believe that this document breaches copyright, please contact us at open.research@uwl.ac.uk providing details, and we will remove access to the work immediately and investigate your claim.

The Use of Ground Penetrating Radar for Mapping Tree Root Systems in Urban Environments

Livia Lantini¹, Fabio Tosti¹, Iraklis Giannakis¹, Daniel Egyir¹, Andrea Benedetto², Amir M. Alani¹

¹School of Computing and Engineering, University of West London (UWL), St Mary's Road, Ealing, W5 5RF, London, UK, Livia.Lantini@uwl.ac.uk, Fabio.Tosti@uwl.ac.uk, Iraklis.Giannakis@uwl.ac.uk, Daniel.Egyir@uwl.ac.uk, Amir.Alani@uwl.ac.uk

²Department of Engineering, Roma Tre University, Via Vito Volterra, 62, 00146 Rome, Italy, andrea.benedetto@uniroma3.it

The importance of street trees in the urban environment is widely recognised. They provide several environmental, economic and social benefits, increasing the liveability of cities and improving people health. Nevertheless, the absence of proper urban planning, combined with the deficiency of resources and methodologies for road maintenance, have led to a conflict between the trees and the urban surfaces. The uncontrolled development of tree roots can cause extensive damages, such as the cracking and uplifting of pavement and curbs, seriously endangering the safety of pedestrians, cyclists and drivers. In this framework, ground penetrating radar (GPR) has already proven its effectiveness as non-destructive testing (NDT) method for the evaluation and monitoring of road pavements. Its ease of use and cost-effectiveness, together with the reliability of results, allow a comprehensive investigation of the subsurface conditions, thus allowing maintenance interventions to be planned. This research aims to demonstrate GPR potential in mapping the root system architecture of street trees. To this extent, data were acquired from various tree species, using different antenna systems and survey methodologies. Thus, a multi-stage data processing methodology was applied, in order to provide an effective mapping of tree root systems. In addition, information on the mass density of roots at different depths was provided. Results have proven the viability of the proposed method for root detection and mapping under road surfaces. Furthermore, potentially dangerous situations for road safety were successfully identified, demonstrating GPR potential in assessing the conditions of the subsurface.