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Tree Monitoring Using Ground Penetrating Radar: Two Case Studies Using Reverse-Time Migration

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Non-destructive testing (NDT) for health monitoring of trees is a suitable candidate for detecting signs of early decay [1]. Recent developments [2,3,4] have highlighted that ground-penetrating radar (GPR) has the potential to provide with a robust and accurate detection tool with minimum computational and operational requirements in the field. In particular, a processing framework is suggested in [2] that can effectively remove ringing noise and unwanted clutter. Subsequently, an arc length parameterisation is employed in order to utilise a wheel-measurement device to accurately position the measured traces. Lastly, two migration schemes; Kirchhoff and reverse-time migration, are successfully applied on numerical and laboratory data in [3].

In the current paper, the detection scheme described in [2,3] using reverse-time migration is tested in two case studies that involve diseased urban trees within the greater London area, UK (Kensington and Gunnersbury park). Both of the trees were cut down after the completion of the measurements and furthermore cut into several slices to get direct information with regards to their internal structure. The processing scheme described in [3,4] managed to adequately detect the internal decay present in both trees. The aforementioned case studies provide coherent evidences to support the premise that GPR is capable of detecting decay in diseased trunks and therefore has the potential to become an accurate and efficient diagnostic tool against emerging infectious diseases of trees.

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This paper is dedicated to the memory of Jonathon West, a friend, a colleague, a forester, a conservationist and an environmentalist who died following an accident in the woodland that he loved.

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