

UNMANNED AERIAL SYSTEMS TO INVESTIGATE PATTERNS OF INVASION OF *ROBINIA PSEUDOACACIA* AT THE INDIVIDUAL LEVEL ON RIPARIAN ECOSYSTEMS

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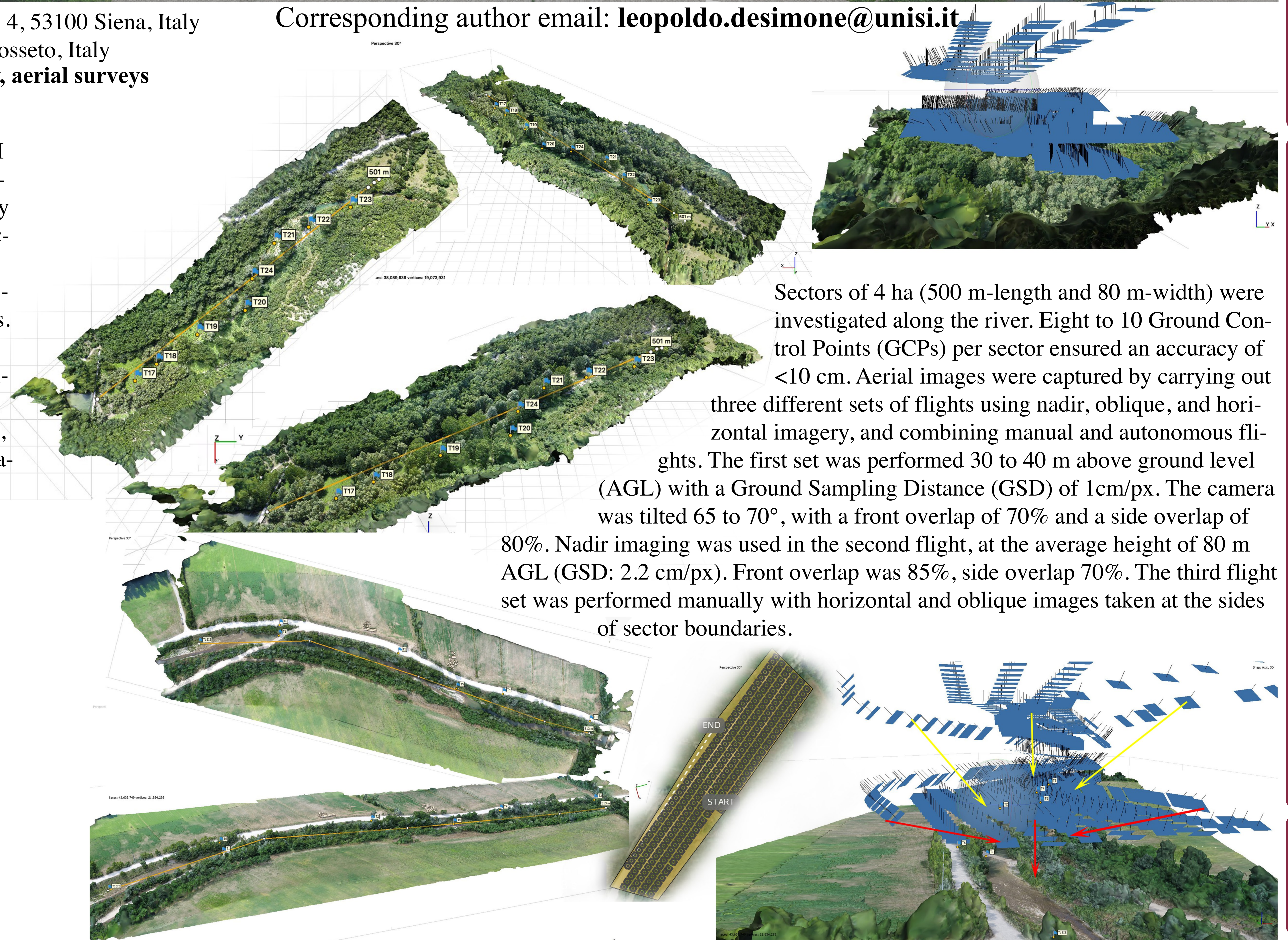
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In this study, we produced a template for conducting an extensive aerial survey at high, ecologically informative resolution using a DJI Phantom 4 Advanced in a complex landscape such as riparian ecosystems. Our aim was to evaluate the effectiveness of this methodology in detecting the presence and ecological preferences of *Robinia pseudoacacia* at the level of individual trees.

For each sector, all tree specimens were manually identified and georeferenced according to their phenological and/or vegetative features. Close range photos were fundamental for this purpose. Distant and close range photo sets were merged to build the 3D model using Agisoft Metashape.

Environmental and ecological measures included surface inclination, bankfull width, DSM, tree height (using an external DTM), their relative distance and altitude from the riverbed.

This work revealed how small and relatively inexpensive UAVs are useful tools to study and map the invasion process of alien species.



Sectors of 4 ha (500 m-length and 80 m-width) were investigated along the river. Eight to 10 Ground Control Points (GCPs) per sector ensured an accuracy of <10 cm. Aerial images were captured by carrying out three different sets of flights using nadir, oblique, and horizontal imagery, and combining manual and autonomous flights. The first set was performed 30 to 40 m above ground level (AGL) with a Ground Sampling Distance (GSD) of 1cm/px. The camera was tilted 65 to 70°, with a front overlap of 70% and a side overlap of 80%. Nadir imaging was used in the second flight, at the average height of 80 m AGL (GSD: 2.2 cm/px). Front overlap was 85%, side overlap 70%. The third flight set was performed manually with horizontal and oblique images taken at the sides of sector boundaries.

