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### ***Tipiditappi***



*Sughero d'albero fatto a pezzetti,  
tipi di tappi , quelli che vuoi.  
Tagliali lunghi, tagliali stretti,  
tipi di tappi, fatti da noi.  
Taglialo bene, taglialo tondo,  
tipi di tappi, quanti ne vuoi.  
Tappi di sughero per tutto il mondo,  
tipi di tappi fatti da noi.*  
*(Cecchi-Tognolini, Filastrocche e Canzoni)*

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## ORAL PRESENTATION

### Session 2: *Forest monitoring and management, land and forest planning*



## USING TERRESTRIAL LIDAR FOR MONITORING CANOPY STRUCTURE IN CORK OAK TREES

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Information on forest canopy structure, is required at a wide range of spatial scales for several environmental applications (ecosystem productivity model, ecological and forest management, disease and stress detection). Aerial laser scanner (ALS) demonstrated to be a promising techniques and an important source of precise and accurate information in forestry quantitative studies at landscape level. More recently several studies that have been published reported different potential applications of the terrestrial laser scanner (TLS) for forest stand and canopy variables estimation at plot level.

TLS allows the acquisition of very high volumes of data and high resolution point clouds that can potentially and productively be used to derive single tree attributes by post-processing of TLS point clouds.

The main aim of this work was to assess the capabilities of terrestrial laser scanner in measuring both changes by the time and differences among trees of canopy characteristics of *Quercus suber* L. (cork oak) plants.

The field measurements have been conducted in an experimental farm owned by the University of Sassari located in Oristano (Italy) on seven cork oak trees. For four years (from 2013 to 2016) TLS scans were periodically taken for each tree. After a voxelization process a segmentation method for discriminating foliage from wood was developed. Then, changes in canopy volume density and in radial growth of trunk were estimated by TLS scan results.

Analysis of results showed that the segmentation algorithm that was developed, accurately discriminated wood and foliage clusters. In addition, TLS technique was enabling to measure temporal changes on radial growth of cork oak trees. Finally, it was able to identify differences in crown density among plants. In conclusion, the results of this study suggested that TLS technique could be a promising tool for describing and monitoring the canopy structure also for broadleaf trees.

Keywords: Terrestrial laser scanner (TLS), forest inventory, wood volume, crown volume, *Quercus suber*