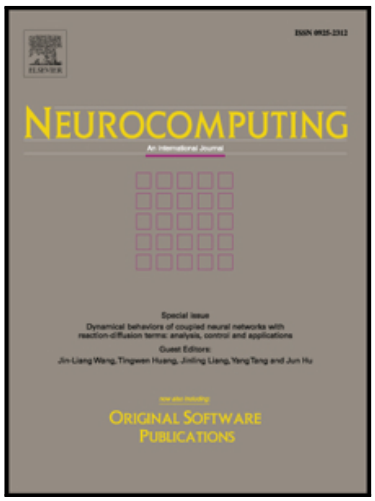

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PII: S0925-2312(17)30456-3
DOI: 10.1016/j.neucom.2017.01.097
Reference: NEUCOM 18206

To appear in: *Neurocomputing*

Received date: 14 May 2016
Revised date: 9 January 2017
Accepted date: 10 January 2017

Please cite this article as: Yingying Zhu, Jin Yan, Reconstructing Tree Trunks By 3D Bar Filters, *Neurocomputing* (2017), doi: 10.1016/j.neucom.2017.01.097

Reconstructing Tree Trunks By 3D Bar Filters

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Abstract

In this work, we propose an new problem to be solved: reconstruct the 3D points cloud of wild forest from 2D images sequences, locate the tree trunk position and estimate the tree trunk diameters from those reconstructed 3D points and we developed an novel method to solve those three problem once which is able to reconstruct the 3D tree trunk structures, locate the tree trunk and estimate the tree trunk diameters. This is the first work trying to solving those problems jointly. The previous work separate those problem as three sub-tasks: Reconstruct the 3D points from images sets using structure from motion techniques, detect the tree trunk locations and diameters by fitting cylinder models. Unfortunately, the first sub-task is extremely hard due to the poor discriminative image features , strong illumination changes, data corruption caused by the shadows and limited camera view inside the wild forest. The second sub-task requires the first sub-task to provide high quality 3D point cloud. In this work, we found that we are able to take advantage of the vertical structures in the forest to obtain more stable feature matching. Furthermore, with those vertical structure we are able to obtain the tree locations and diameters directly in the process of 3D reconstruction. We demonstrated that our method is able to provide a unified frame work for reconstructing the 3D tree models, estimate the location and trunk size using the 2D images sequences or videos taken in the forest.

Keywords: Wild Forest Mapping, Rigid Structure From Motion , Bar Filter