

Learning Real Scale of Object Instances And Categories Scale Distributions from CAD Models

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Abstract—This paper presents a method to automatically learn a scaled CAD model representation of object instances seen by a depth sensor. The CAD models representing objects belonging to different categories are downloaded automatically from the Internet. When an object is placed in front of the camera, the system tries to recognize it and estimate their pose against the already learned CAD models using a fast scale-dependant 3D feature. Upon failure, a learning stage is triggered that categorizes the object using a scale invariant view based descriptor to retrieve CAD models from the categories database with similar geometries as seen from the sensor viewpoint. The retrieved CAD models are fitted against the partial view of the object, the model that best fits the partial view is selected and a scaled version of model that fits the object instance is stored for future recognition. Moreover, after a certain amount of object instances has been learned, the system learns a scale distribution for each category that can be used to filter false positives based on the already-learned distribution to improve the efficiency of the learning stage. This approach has several advantages over: (i) high-precision scanners as they have a high cost and the scanning process is cumbersome and (ii) mesh reconstruction methods based on images or fusion of partial views regarding accuracy and completeness of the CAD model. We demonstrate the use of this approach to learn a set of object instances and present recognition and pose estimations results using the scale invariant semi-global 3D feature CVFH.

I. INTRODUCTION

II. FRAMEWORK

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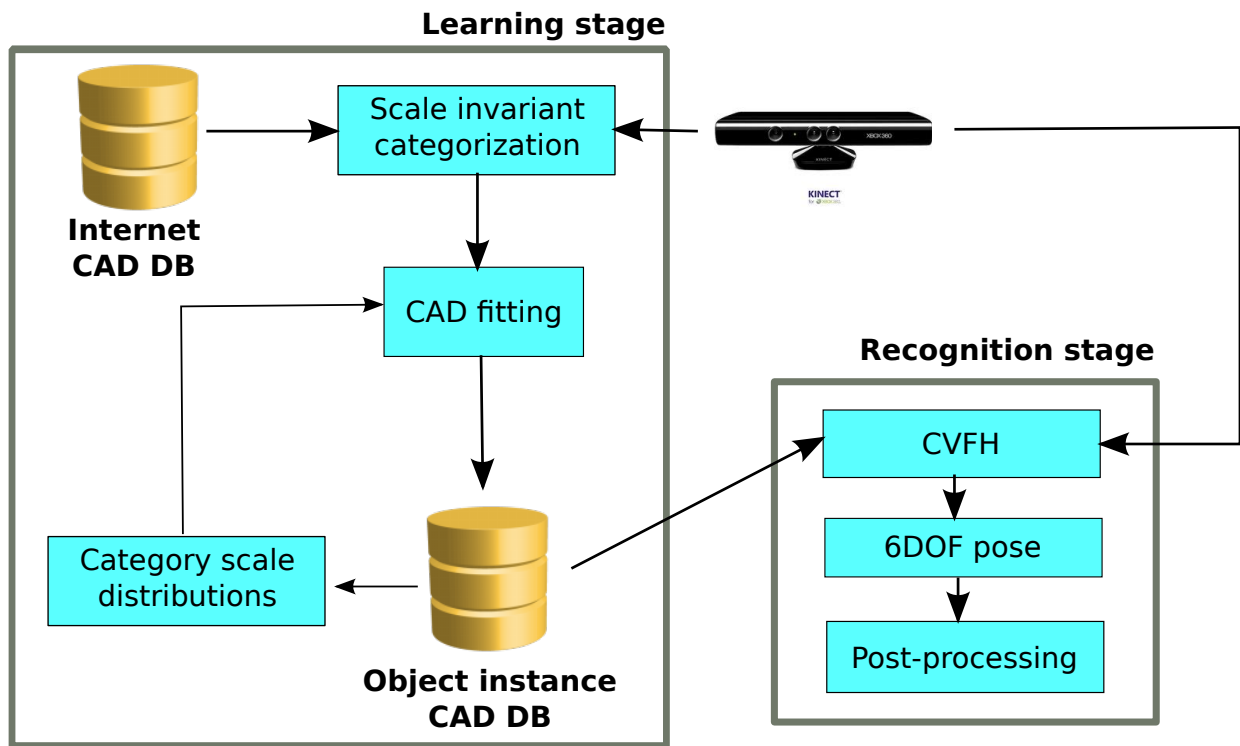


Fig. 1. Framework

III. LEARNING STAGE

A. *Categorization*

B. *CAD model fitting*

IV. CATEGORIES SCALE DISTRIBUTION

V. SCALE DEPENDANT RECOGNITION AND POSE ESTIMATION

VI. EVALUATION

VII. ACKNOWLEDGMENTS

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References are important to the reader; therefore, each citation must be complete and correct. If at all possible, references should be commonly available publications.

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