

Single View Metrology in the Wild

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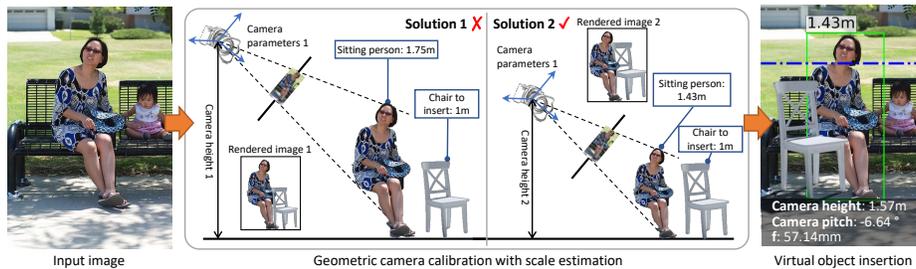


Fig. 1: Given the image on the left, single view metrology can recover the scene and the camera parameters in 3D only up to a global scale factor (for example, the two solutions in the middle). Our method accurately estimates absolute 3D camera parameters and object heights (middle, left) to produce realistic object insertion results (right).

Abstract. Most 3D reconstruction methods may only recover scene properties up to a global scale ambiguity. We present a novel approach to single view metrology that can recover the *absolute* scale of a scene represented by 3D heights of objects or camera height above the ground as well as camera parameters of orientation and field of view, using just a monocular image acquired in unconstrained condition. Our method relies on data-driven priors learned by a deep network specifically designed to imbibe weakly supervised constraints from the interplay of the unknown camera with 3D entities such as object heights, through estimation of bounding box projections. We leverage categorical priors for objects such as humans or cars that commonly occur in natural images, as references for scale estimation. We demonstrate state-of-the-art qualitative and quantitative results on several datasets as well as applications including virtual object insertion. Furthermore, the perceptual quality of our outputs is validated by a user study.

Keywords: Single view metrology, absolute scale estimation, camera calibration, virtual object insertion