Representing and Inferring the 3D Layout of Rooms

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We humans spend much of our time working, playing, and sleeping in rooms and can operate effectively in them. But computers have difficulty interpreting images of rooms because many important surfaces are hidden and nearby objects exhibit confusing perspective effects. For computers to interpret, navigate, or interact in rooms, they need better representations of space. I will describe our efforts to represent and infer 3D layout of a room from an image. I will show how we can use structural priors to detect hidden boundaries and to create perspective-robust models of object appearance. I'll present results for inferring the 3D layout of walls and furniture from one image. I'll also present an application to inserting 3D objects into an image and relighting them. Finally, I'll touch on our most recent work to organize an RGB-depth image into surfaces and objects with physical support relations.