Veridical visual perception and a computer that emulates it

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Visual perception in our everyday life is almost always veridical. We can see shapes and positions of objects in a scene as they are out there. However, the veridical perception is theoretically an ill-posed problem. The scene out there is three-dimensional while a retinal image of the scene is two-dimensional. The visual system resolves this ill-posedness by using a priori constraints. For example, it has been shown that 3D mirror-symmetry of an object is especially an effective constraint for detecting the object and recovering its 3D shape from a single 2D retinal image. I will discuss how and what kind of constraints the human visual system uses to regularize the ill-posed problem. I will also show how the theories of the human visual system were implemented as computer algorithms and how well the algorithms perform.