The Space of Human Shapes

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Abstract

The human form has been the dominant subject of painters and sculptors for millennia. It is the shape we are most attuned to, the one most important to recognize and to build our environments around. Modeling this shape and the way it moves has been a grand challenge in computer science. This task is one of the main components of the graphics Turing test: can a machine fool an observer into thinking the synthetic projection of a moving, talking person is real.

In this talk, I present strides taken in the direction of modeling realistic, time-varying human shape. These strides are formed around the premise that realism depends on samples from reality. The capacity to sample the shape of the real world has grown dramatically in recent years with the advent of fast, reliable imaging sensors and controllable illumination sources. Using existing shape scanners, I will describe how my collaborators and I have developed tools for modeling how a human shape varies over time and how body shape varies across a population. I will also present recent work on modeling the most challenging part of a human: the face. For this task, we have developed a completely new shape scanner that enables us to capture a moving face at high spatio-temporal resolution. To illustrate the success of these shape capture and modeling methods, I will give live demonstrations of interactive human body modeling and three-dimensional video reconstructions of a human face. Finally, I will discuss open problems on the frontiers of digital human modeling.