

# Uncanny Valley

Anthropomorphic forms are appealing when they are dissimilar or identical to humans, but unappealing when they are very similar to humans.

Anthropomorphic forms are generally appealing to humans. However, when a form is very close but not identical to a healthy human—as with a mannequin or computer-generated renderings of people—the form tends to become distinctly unappealing. This sharp decline in appeal is called the “uncanny valley,” a reference to the large valley or dip in the now classic graph presented by Masahiro Mori in 1970.<sup>1</sup> Though some have disputed the existence of the effect altogether, attributing any negative affective response to a simple lack of familiarity with artificial and rendered likenesses, more recent empirical research suggests the uncanny valley is a real phenomenon. The cause likely regards innate, subconscious mechanisms evolved for pathogen avoidance—that is, detecting and avoiding people who are sick or dead.<sup>2</sup>

Although a full understanding of the variables required to take an anthropomorphic likeness into the uncanny valley has not yet been realized, some conditions have been identified. The strength of the negative reaction seems to correspond to the fidelity of the likeness—a highly realistic likeness that is identifiable as artificial will evoke a stronger negative reaction than a less realistic likeness. Abnormally proportioned or positioned facial features, asymmetry of facial features, subtleties of eye movement, and unnatural skin complexions are all sufficient conditions to trigger uncanny valley effects.

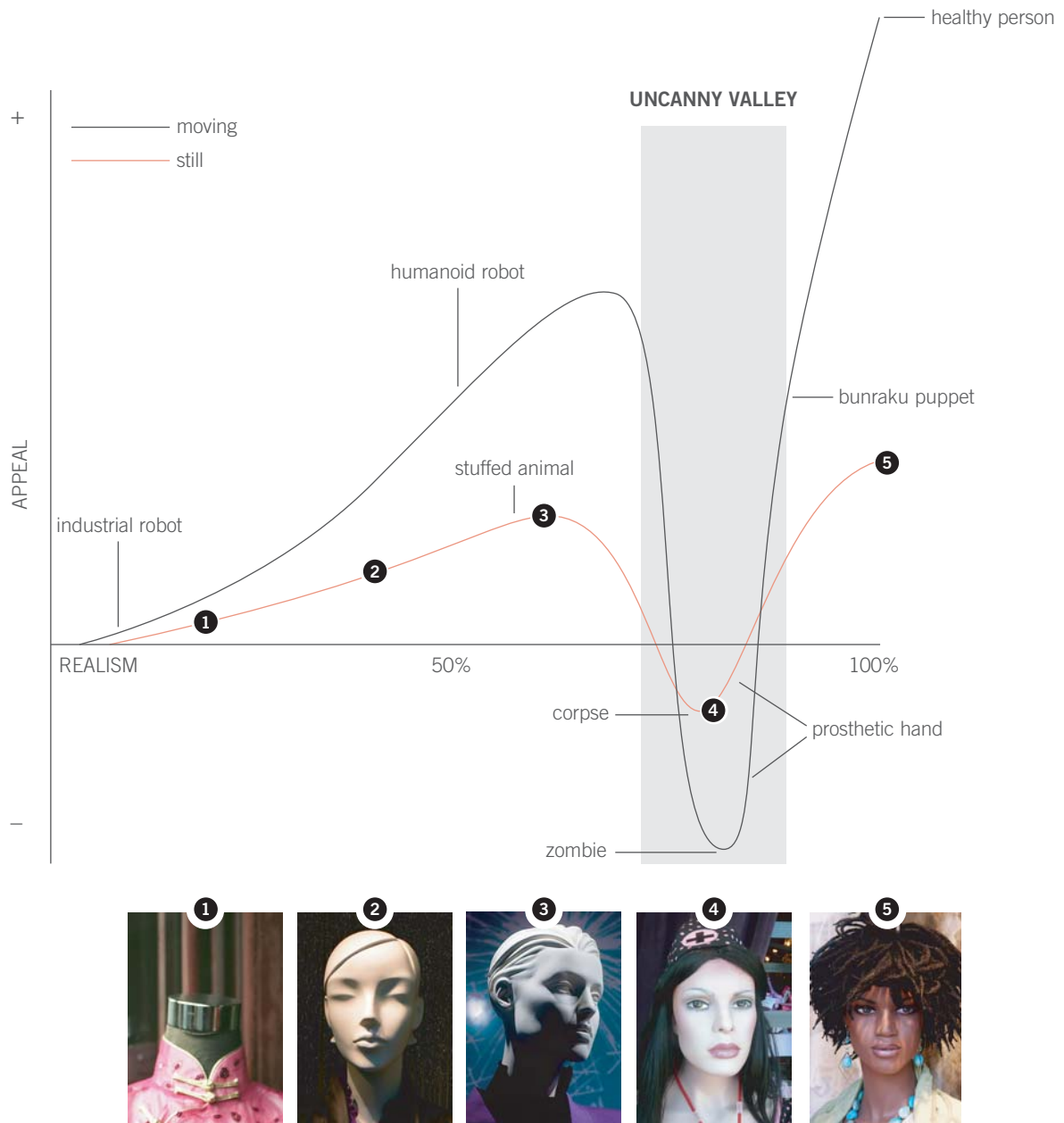
Although the uncanny valley is generally observed by animators and roboticists, there are plenty of examples where the caveats of the principle are not abided. For example, director Robert Zemeckis decided to depict computer-generated characters with a high degree of realism for the movie *The Polar Express*. The resulting effect was both impressively realistic and eerie. The movie raised awareness of what is called “dead eye syndrome,” where the lack of eye movements called *saccades* made the characters look zombielike, taking the Polar Express straight through the uncanny valley. Another example is found in retail contexts. There is a general perception among retailers that the effectiveness of mannequins is a function of their realism. However, barring a mannequin that is indistinguishable from a real person, the uncanny valley suggests that retailers would be better served by more abstract versus highly realistic mannequins.

Consider the uncanny valley when representing and animating anthropomorphic forms. Opt for more abstract versus realistic anthropomorphic forms to achieve maximum acceptance. Negative reaction is more sensitive to motion than appearance, so be particularly cognizant of jerky or unnatural movements when animating anthropomorphic bodies and faces.

See also Anthropomorphic Form, Threat Detection, and Top-Down Lighting Bias.

<sup>1</sup> The seminal work on the uncanny valley is “Bukimi No Tani [The Uncanny Valley]” by Masahiro Mori, *Energy*, 1970, vol. 7(4), p. 33–35.

<sup>2</sup> See, for example, “Too Real for Comfort? Uncanny Responses to Computer Generated Faces” by Karl MacDorman, Robert Greena, Chin-Chang Hoa, et al., *Computers in Human Behavior*, May 2009, vol. 25(3), p. 695–710; and “The Uncanny Valley: Effect of Realism on the Impression of Artificial Human Faces” by Jun’ichiro Seyama and Ruth Nagayama, *Presence*, Aug. 2007, vol. 16(4), p. 337–351.



Masahiro Mori's classic graph plots familiarity or appeal of an anthropomorphic form against its degree of realism. The uncanny valley resides to the right of the continuum, dipping sharply just before the likeness of a

genuine healthy person. The mannequin images illustrate the benefits of abstraction and total realism in depicting human likenesses, as well as the perils of the uncanny valley.