How to Bring Your Imaginary Friend to Life

by Lexie Kirsch

Children create imaginary friends because real people are complex and unpredictable, and imaginary friends are simple and controllable. Imaginary friends don't have hidden thoughts, feelings, or motives; they have (and do) whatever you want. They exist solely for you.

The problem with imaginary friends is that they are limited—not only *by* your imagination but also *to* your imagination. But imagine if they weren't. Imagine if you could really *see* and *interact with* your imaginary friend, but they still existed only to and for you.

We now have the technology to bring your imaginary friend to life. With augmented reality, you can give your imaginary friend a virtual body; with eye tracking technology, you can give your friend the gift of sight; with transcranial magnetic stimulation, you can give your friend the ability to interact with you; and with physiological monitoring, you can give your friend the ability to understand how you're doing on an even deeper level.

First, let's give your friend a body.

If you've ever played the Sims, you know how easy it is to design a person with the features, style, and personality of your choice. Technically, your friend doesn't even need to be human. You can create and customize your friend however you'd like. Then, using either a handheld device or head-mounted display, depending on your personal preference, you can augment your reality by projecting the virtual version of your friend into your environment. This will allow you to see your friend, both in real time and in the real world. No one else will know your friend is there, but you will know, and your virtual friend will seem very real to you. This realistic representation is what makes augmented reality useful in such a wide variety of fields, including medicine, entertainment, and education. With your new virtual friend, we can add companionship to that list as well! (Chicchi Giglioli, Pallavicini, Pedroli, Serino, & Riva, 2015)

Second, let's give your friend the gift of sight.

Using eye-tracking technology, or corneal reflection tracking if you want to get technical, your friend can look deep into your eyes to assess your desires, needs, and emotional state—all based on the size of your pupils! You could also *say* these things, but messages delivered through eye movements are easier for computers to compute than voice recognition is (Al-Rahayfeh & Faezipour, 2013). Also, since no one else can see your friend, you may not want to look like you're talking to yourself. Employing eye-tracking for communication is subtle, effective, and reliable, and with recent developments, you can rotate your head freely without your friend losing track of you (Morimoto & Mimica, 2005).

Third, let's give your friend a sense of "touch."

Through non-invasive transcranial magnetic stimulation (TMS), your virtual friend can *interact* with your movements. Researchers have animated virtual hands that move in response to TMS pulses in the motor cortex (Bassolino et al., 2018). That means, if you raise your hand for a high five, your virtual friend won't leave you hanging. And by matching your movements, they also won't *miss* your hand like some humans somehow manage to do.

The only problem is that you wouldn't actually be able to *feel* the pressure of contact: it would be illusory. If, however, you did want to feel that contact, researchers are developing ways to convey sensory information, such as location and pressure, through intracortical microstimulation of the somatosensory cortex (Tabot et al., 2013). This is how people with prosthetic limbs are able to interact with objects in their environment (Flesher et al., 2016). However, this sense of touch does involve implanting microelectrode arrays into your brain (Flesher et al., 2016). Although invasive, these electrodes would not be painful due to the lack of pain receptors in your brain. But surgery is surgery, so it's up to you if you think that's worth it—how much do you really like being hugged?

Finally, let's give your friend the ability to understand how you're doing.

Using psychophysiological monitoring, your friend can assess your current mental, physical, and emotional states. Your heart rate variability (HRV) reflects your physical and mental health (Thayer, Hansen, Saus-Rose, & Johnsen, 2009), and your physiological arousal reflects your levels of happiness, stress, depression, and distress (Pietro, Silvia, & Giuseppe, 2014). By knowing how you're feeling, your friend can respond to your needs more effectively. Researchers have coined this response *affective computing* (Pietro et al., 2014).

You might be thinking, isn't programming and applying all this technology more effort than just going out and making a real, fleshy friend? Perhaps. But not everyone is great at making new friends. You may struggle to create and maintain friendships due to autism, social anxiety, or various other reasons. Bringing your imaginary friend to virtual life could not only provide you with a comfortable and fulfilling relationship, but also your friend could assist you with developing important skills such as interpersonal communication, which is useful both for making friends and for nailing job interviews! Whether you desire a listener or a sounding board, your virtual companion can be of great service.

Plus, even if you *are* great at making real friends, you can still benefit from your imaginary friend's technology. Have a crush on someone? Your friend will know by your pupil dilation and be your wingman. Feeling stressed? Your friend will know by your physiological arousal and help you relax. Tackling a problem with a high cognitive demand? Based on your HRV, your friend will have an idea of whether you can handle the situation or need assistance (Thayer et al., 2009). With all this understanding of you, your friend will know exactly what you want, when, and how to help. They'll be there for you, when you want, for as long as you want. Moreover, advances in artificial intelligence and machine learning will help your friend learn from their mistakes and improve, so they can better serve you, even as you change. After all, they exist solely for you.

References

Al-Rahayfeh, A., & Faezipour, M. (2013). Eye Tracking and Head Movement Detection: A State-of-Art Survey. *IEEE Journal of Translational Engineering in Health and Medicine*, *1*, 2100212. http://doi.org/10.1109/JTEHM.2013.2289879

Bassolino, M., Franza, M., Bello Ruiz, J., Pinardi, M., Schmidlin, T., Stephan, M. A., … Blanke, O. (2018). Non-invasive brain stimulation of motor cortex induces embodiment when integrated with virtual reality feedback. *European Journal of Neuroscience*. https://doi.org/10.1111/ejn.13871

Chicchi Giglioli, I. A., Pallavicini, F., Pedroli, E., Serino, S., & Riva, G. (2015). Augmented Reality: A Brand New Challenge for the Assessment and Treatment of Psychological Disorders. *Computational and Mathematical Methods in Medicine*, *2015*, 862942. http://doi.org/10.1155/2015/862942

Flesher, S. N, Collinger, J. L., Foldes, S. T., Weiss, J. M., Downey, J. E., Tyler-Kabara, E. C., … Gaunt, R. A. (2016). Intracortical microstimulation of human somatosensory cortex. Science Translational Medicine, 8, 361, 361-141. http://doi.org/10.1126/scitranslmed.aaf8083

Morimoto, C. H., & Mimica, M. R. M. (2005). Eye gaze tracking techniques for interactive applications. *Computer Vision and Image Understanding,* 98, 1, 4-24. https://doi.org/10.1016/j.cviu.2004.07.010

Pietro, C., Silvia, S., & Giuseppe, R. (2014). The Pursuit of Happiness Measurement: A Psychometric Model Based on Psychophysiological Correlates. *The Scientific World Journal*, *2014*, 139128. http://doi.org/10.1155/2014/139128

Tabot, G. A., Dammann, J. F., Berg, J. A., Tenore, F. V., Boback, J. L., Vogelstein, R. J., & Bensmaia, S. J. (2013) Restoring the sense of touch with a prosthetic hand through a brain interface. *Proceedings of the National Academy of Sciences*, 110, 45, 18279-18284. https://doi.org/10.1073/pnas.1221113110

Thayer, J. F., Hansen, A. L., Saus-Rose, E., & Johnsen, B. H. (2009). Heart Rate Variability, Prefrontal Neural Function, and Cognitive Performance: The Neurovisceral Integration Perspective on Self-regulation, Adaptation, and Health. *The Society of Behavioral Medicine, 2009*, 37, 141-153. http://doi.org/10.1007/s12160-009-9101-z