



The Illusion of Intelligence

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1.1 Introduction

The secret is out. Game AI is seldom about any deep intelligence but rather about the illusion of intelligence. Often we are trying to create believable human behavior, but the actual intelligence that we are able to program is fairly constrained and painfully brittle. Yet, we struggle to put up a good show and strive to keep up the illusion.

Well, maybe we should be a little more purposeful and directly work on propping up the illusion, instead of shoring up the crumbling intelligence. Maybe there are tricks that we can use to fool the players into *believing* there is real intelligence there. Instead of working toward patching up the actual intelligence, perhaps we should also consciously work toward promoting the appearance of intelligence.

In fact, if you do not work on the illusion side of the equation, you are likely failing to do your job. Expectations play a huge role in how humans perceive the world, and if expectations are not properly managed, then even truly human-level intelligent behavior might be perceived as incompetent and decidedly nonhuman.

This chapter aims to accomplish two things. To start, we will explain why it is scientifically possible to trick players into believing there is real intelligence. Then, we will look at six concrete ways to perpetuate the illusion of intelligence in the eyes of the player.

1.2 Why the Illusion Works

There are three things that work to make players very susceptible to the illusion. First, players want to believe that there are glimmers of real human-level intelligence in their games. Second, humans have this desire to anthropomorphize nonhuman entities, seeing human traits and emotions where there are none. Third, expectations can easily become reality in the mind of the player.

1.2.1 Players Want to Believe

We have the perfect audience to make this work. The players want to believe—in fact, they are willing participants in the illusion. They want to believe that the fake video game characters have human-like qualities. The players are incredibly forgiving as long as the virtual humans do not make any glaring mistakes. Players simply need the right clues and suggestions for them to share and fully participate in the deception.

1.2.2 Eagerly Ready to Anthropomorphize

When people talk about a thing or creature as if it were human, they are anthropomorphizing it. Anthropomorphism appears to happen naturally as we see things all around us that remind of human traits, emotions, or intentions. Your computer hates you, your car is temperamental, and your recently picked flowers are starting to look sad.

One theory put forth by neuroscientists is that similar parts of the brain are involved when we think about both human and nonhuman entities (Gazzola et al. 2007). This suggests that anthropomorphism is the result of using similar processes as when we think about people. It is a sort of a misattribution effect that is perhaps hardwired into our brains.

Another theory is that when people try to understand incomprehensible behavior, they often apply familiar human traits to make sense of the situation (Waytz et al. 2010). So when a human-like entity in a game exhibits any kind of behavior, human-like traits are the first template we try to apply. How can we understand this behavior? Well, let us try applying human behavior and see if that explains what we are seeing. When this happens, the confounding of actual human intelligence with AI is greatly enhanced.

And here we are, as video game developers, presenting human-looking avatars that animate, move, and speak similar to humans. Anthropomorphism is a welcome effect that encourages the illusion.

1.2.3 The Power of Expectations

Expectations powerfully control how we experience the world. For example, if you believe a bottle of wine is very expensive, you will not only think the wine tastes better, but your actual enjoyment will be more. Researchers at Caltech and Stanford presented people with a \$45 bottle of wine and a \$5 bottle of wine. Using brain-imaging techniques, they found that the human brain actually *experiences more pleasure* when the participants believed they were drinking the expensive wine versus the cheap wine, even though both were the same (Plassmann et al. 2008). This is not people reporting that the wine was tastier—neurologically, the brain actually experienced more pleasure.

Similarly, the placebo effect is a real phenomenon in humans that likely works on the same mechanism of expectations. A *placebo* is a medically ineffective treatment for a

medical condition that is intended to deceive the patient. If we give a person this ineffective treatment, the person will often have a perceived or actual improvement. This is called the *placebo effect* or *placebo response*. Brain-imaging techniques have shown that placebo causes real physiological changes in the brain that are measurable (Lieberman et al. 2004). The effect is attributed to the perceptions and expectations of the patient (Kirsch 1985).

Clearly, expectations can have a powerful effect on what we experience. This further emphasizes that managing player expectations can have a significant effect on promoting the illusion of intelligence.

1.3 Selling the Illusion

Now that we understand why the illusion works and how it is reinforced, our goal is to further encourage and nurture the illusion. This can be done through expectations and performance.

1.3.1 Promoting the Quality of the AI

One simple way to manage expectations is to simply tell the player about the strengths of the AI. Over the years, several games have chosen to tout the quality of their game's AI in press releases, interviews, and box art.

A positive example of this is from 2006 when the game *The Elder Scrolls IV: Oblivion* heavily promoted their Radiant AI system, which was subsequently used on *The Elder Scrolls V: Skyrim*, *Fallout 3*, *Fallout: New Vegas*, and *Fallout 4*. Similarly, the series *Left 4 Dead* let players know that an AI director was helping craft the tension and experience. When players have heard about or can even name the technology behind the game, then that is evidence it could be really good.

An example where this did not work out as well was *Madden NFL 98* that bragged in a press release about their liquid AI system used to make their video football players move and flow like water. This partly backfired due to the weak analogy, since water is not very intelligent. However, the worst blowback came from a competing football game, *NFL GameDay 98*, that snidely commented in a Next Generation magazine interview that “Liquid AI is the stuff that ran down EA’s leg when they saw *GameDay*.”

A subtle use of managing expectations is to use hints during loading screens to highlight aspects of the AI. If the AI is considering several aspects to make a particular decision, perhaps mention this to the player as part of a tip. It will make the player more aware of how the AI is responding, and it might make both the AI and the game seem more interesting.

If your game is doing something truly remarkable, then there might be value in letting players know. However, you need to be confident that you can deliver and not have it backfire.

1.3.2 Perform with Animation and Dialog

The AI must give the performance of its short lifetime if it wants to impress. The chief way this is done is through subtle animation and dialog. Unfortunately, this is frustrating for most game AI programmers because they do not directly create the animations or the dialog. The best they can do is make compelling arguments to management that these assets should be created. However, this is so important that it really does need to become a priority.

To understand how important this is, let us work through a very short thought experiment. Imagine all of the ways that the player comes to understand and experience an AI character. Let us call this the *vocabulary* of the AI. The vocabulary consists of every dialog clip, every grunt, every animation, every movement, and every interaction. Imagine that an AI character had only two sound clips (an attack grunt and a death cry) and had only four animations (idle, walk, attack, and die). The vocabulary of this particular AI is severely stunted, ironically, with the most interesting behavior happening when it dies. There is virtually no way you can convey a deeply intelligent AI with such a limited vocabulary.

Fortunately, one way to programmatically add to an AI's vocabulary is with the head look. If the AI's head and gaze can be controlled directly, then you as an AI programmer can wield great power. With head control, you now have the ability for the AI to notice things, compare objects in the environment, anticipate actions, and truly seem aware. Let us illustrate this with a simple scenario. An AI has two enemies to fight: left bad guy and right bad guy. After running a complex evaluation, the AI decides it is best to fight the left bad guy. Fighting ensues, but the problem is that the subtleties of the decision were both instantaneous and hidden. However, what if the AI spends a second looking at each enemy and sizes them up before attacking the left bad guy. What if during the fight with the left bad guy, the AI occasionally looks back at the right bad guy to keep an eye on him. This can telegraph deep intelligence to the player for something that the AI instantaneously chose and is no longer concerned with. However, it is the showmanship of the situation that will convey a conscious and relatable AI character.

Another element of animation that programmers have control over is speed. Fast movements convey being upset, agitated, confused, and nervous. Slow movements convey being relaxed, calm, and in control over the situation. These are all very human adjectives that we might want the player to liberally apply to our AI characters.

In the right situation, one of the best reactions to play might be one that is completely ambiguous. Consider this stroke of genius from the 2005 game *Façade*. In *Façade*, there were two AI characters who would respond to free-form text entered by the player. When the AI inevitably did not understand a player statement or knew that the statement was of questionable moral content, one of the AI characters might respond simply with a raised eyebrow. The genius of this choice is that the interpretation is left up to the player, because it is an ambiguous reaction. However, it is the perfect time for the player to project all kinds of human properties and thought processes onto the AI, furthering the illusion.

One of the truly great secrets in game AI is to use dialog between AI characters to emphasize and sell the intelligence. The first prominent example of this was in *F.E.A.R.* where pursuing AI guards would converse with each other, remarking, "Where did the player go?" and responding with, "He is behind the boxes!" All of a sudden, not only were the guards hunting down the player, but they were working together! The surprising thing was that this was all smoke and mirrors. An AI module simply monitored what was happening and called for these dialog moments as they fit the moment (Orkin 2015). It is a great technique that has been used many times since in games such as *The Last of Us*.

1.3.3 Stop Moving Like a Robot

Although it is crucial to have an adequate vocabulary, the quality of the movement is the other aspect that needs careful attention. If the AI movement is not smooth and lifelike, then the illusion will start to wear thin.

This is where knowledge of animation techniques, such as anticipation, ease-in, and ease out, can really help. Your goal is to make the movement fluid and credible. Work to identify jarring movements and eliminate them. Discontinuous movement is incredibly unnatural and draws attention to the inauthenticity of the situation. Be very sensitive to this when there are collisions. Sometimes, it is much better to briefly allow object penetration, thus avoiding hard collisions and discontinuous movement.

Reaction times are another key area that has the potential to destroy the illusion. Humans are incapable of instantaneous reaction. The fastest a hyperfocused human can react is 0.2 seconds with mental comparisons requiring a bare minimum of 0.4 seconds (Rabin 2015). Use these times as the baseline to always delay the results of a decision. However, realize that distracted or unfocused characters would have much longer reaction times.

A final aspect of movement that should be mentioned is that your AI should stop pursuing the player relentlessly, similar to a terminator. Intelligent creatures sometimes stop, they reflect, they hesitate, they reconsider, they second-guess themselves, they size up their opponent, and they pause. Movement is an indication of deeper thought processes, and variations in movement can convey all of these thoughts and more. In addition, enemies that temporarily back off are much more enjoyable adversaries. This is an old advice that was well known even during the early 1980s, as shown by the wave-patterned attack/retreat behavior of ghosts in *Pac-Man*.

1.3.4 Have a Reason to Exist

AI characters need to stop standing around waiting for the player to approach. Characters with nothing to do are a clear signal that the AI is fake and has no real purpose. AI characters should have a reason to exist beyond the player.

For each AI character, this can be as simple as figuring out their backstory, and why they are in their current situation. What is their agenda for today? By giving each AI its own motivations (beyond its interactions with the player), it can make each character feel more connected to the game world. After all, the game world is their home and reality. If it makes sense, it will be much more natural and realistic to the player.

1.3.5 Project a Strong Personality

Personality is the culmination of all the properties of an intelligent character. It implies the entire existence of the character up until the point you interact with it: where it was born, how it grew up, and how it interacts with its reality. It exudes emotions, motives, purpose, and competence. Personality implies incredible depth and authenticity.

Because personality has such power and influence, a carefully crafted personality can convincingly convey there is something beneath the surface of your characters, whether there is or not. Personality can be used as a shell around your character to imply humanistic qualities that are simply an illusion. How you leverage this tool can completely change how your players feel about the game.

In addition, a strong personality goes a long way to covering up any inconsistencies in the behavior or logic of a character. Strong personalities can be irrational and unpredictable, allowing incredible leeway in how players might critique their actions.

1.3.6 React Emotionally on Demand

Some programmers have this weird obsession with trying to get game AI to simulate emotions. This seems to stem from the belief that if an AI was truly sad, angry, or happy, then maybe it might finally convince players that some deep kind of intelligence was actually there. This can be equated to the practice of method acting, where an actor will immerse themselves in the character, and through this process, it is hoped that authenticity will emanate out of their performance. It seems to be an unfounded belief that if an AI truly feels emotions, perhaps it will pervade the AI's behavior, and maybe the player will notice.

Without simulating everything that makes up human-level intelligence, this approach for the purposes of games appears misguided. The more straightforward approach would be to directly convey emotions as directly demanded by the situation and the environment. For example, if surrounded by overwhelming forces, fear would be a good emotion to directly convey. Fear does not need to emanate from a simulation within the character; it can be directly shown through dialog and animation when the situation calls for it. If a creature calculates that it is doomed, it should give a performance that matches the situation, conveying a fear of death.

Players can only see an AI's behavior, not what is being simulated. If you want to make an AI appear emotional, then directly show that specific emotion in the correct situations. This can have a dramatic effect on how the player feels toward the AI.

1.4 Conclusion

In this chapter, we looked at the importance of promoting the illusion of intelligence. It is not enough for game AI characters to actually have intelligence, but there is a need and obligation to actively sell the illusion. Luckily, there are many things helping us out, such as players who are willing participants, unconscious anthropomorphism, and the power of setting expectations.

Fortunately, there are many levers that we have in order to promote the illusion of intelligence. We covered six main areas: promoting the quality of the AI, perform with animation and dialog, stop moving like a robot, have a reason to exist, project a strong personality, and react emotionally on demand. With many of these tricks up your sleeve, you should not only be able to sell the illusion, but master it.

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