Red Dead Redemption 2: Virtual ecology is making game worlds eerily like our own

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Wild game. Credit: Rockstar Games

Deer, bison and pronghorn traverse the plains in large herds…scavengers quickly sniff out carrion, sockeye salmon leap upstream, wolves attack in packs surrounding their prey, geese fly in fixed formations, possums play dead, rodents scamper into tree hollows, grizzly bears bluff charge when threatened and birds of prey soar on thermals.

That may sound like a mountie's report on the Canadian wilderness, but it's actually how Rockstar recently promoted Red Dead Redemption 2 – its critically acclaimed game, which transports players to a sprawling and immersive Wild West.

Red Dead Redemption 2 features more than 200 species of animal in a variety of habitats, and its record breaking success suggests that authentic natural environments which mimic the ecology of the real world will become a mainstay of future titles.

Video games have grown in scale and complexity to the point where intricate virtual ecosystems of this kind are now possible, with flora and fauna living and behaving in these virtual worlds as they do in ours.

As of 2018, the worldwide games industry was estimated to be worth around £100 billion. To put that into perspective, it's 1.5 times bigger than the movie industry and five times bigger than the music industry, with one in three people on the planet being a gamer. Not bad for an industry that is only around 50 years old.

Alongside the huge financial success of modern games is the ever-growing size of "open-world games", in which players are free to explore vast and interactive virtual worlds.

These virtual environments have gone from simple mono-block representations of landscapes to dynamic and interactive ecosystems. They have plants that can be foraged and a variety of wildlife that demonstrate complex AI-driven behaviour, interacting with the player and each other.

Virtual ecosystems

Within Red Dead Redemption 2, apex predators such as alligators lurk

patiently underwater, anything (including other animals) in the game that venture too close to the water's edge quickly meets its demise. Deer will also react to unseen predators, alerting the player to cougars lurking in nearby grass.

Horses, one of the most important animals in the game, also react to other wildlife – bolting at the sign of a bear or hidden rattlesnake – demonstrating authentic animal intelligence.

Exploring a forest in Red Dead Redemption 2. Credit: Rockstar Games

Guerrilla Games's open world role playing game Horizon Zero Dawn features machine as well as organic "animals". The machine animals in particular exhibit behaviours that don't primarily rely on the player's interaction. "Corrupted" machines will often attack their non-corrupted

counterparts, with the player often coming across the bodies of dead machines, alluding to a dynamic world that exists outside the player's attention.

The bodies of fallen machine animals, like in any real ecosystem, are not wasted. If not engaged in combat or roaming territory, "scrappers" (machines resembling hyenas), and "glinthawks" (giant vulture-type machines) will consume fallen machine animals they detect nearby – replicating decomposition and nutrient cycling.

Nintendo's open world game Zelda: Breath of The Wild uses "virtual foraging" which is required to progress through the game. However just like the real world, players also need to be careful as flora and fauna can be easily over-foraged, forcing the player to wait for stocks to replenish.

All of this is more impressive when we consider that it has all been achieved in a single generation. Video games as a medium are relative newcomers – the industry only emerged in the 1970s. After the same length of time, films were still black and white. One can only wonder what gamers will be playing ten, 20 or even 50 years from now.

The future of games

Ecosystems in games are increasingly dynamic and "lived-in", which opens the potential for education. Anna Groves, an American ecologist and gamer explained: "A kid who loves lighting the Hyrulian grassland on fire just might get excited about grassland restoration ecology when they find out it involves lighting real-life grasslands on fire."

As games increasingly use ecology as a core gameplay feature, its value and relevance as a subject field will inevitably increase – exposing children to an academic subject in an accessible and enjoyable manner.

Video games offer unparalleled creative freedom to explore subjects like ecology. Designers can create environments filled with long extinct species or pristine ecosystems that recreate how wilderness may have looked before human intervention. Children may "play" with imagined scenarios of the natural world in an intuitive, immersive and fun manner, far surpassing what is possible in traditional educational approaches.

As a result, they may gain a deeper appreciation of what natural states are possible through conservation than even a student engaging with depleted ecosystems in the real world could.

With the advent of virtual ecology, video games are increasingly functioning as "conduits" to other disciplines. Landscape architecture and psychology are increasingly feeding into contemporary game design. In the future, disciplines such as engineering, geology and even medicine could start to inform the next generation of games.

When designing the worlds we play in, future game designers might increasingly be educated in "traditional" elements of landscape design, including ecology and architecture. With this also comes the opportunity for people in different fields to collaborate in shaping the worlds of future video games, radically reshaping both professions in the process.

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