JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

Dimensional Deception: The Art, Tech, and Psychology of Using 2D Sprites in a 3D World

Mohan Singh Rajput
B.Sc. in Animation VFX and Gaming
Shreyarth University in Ahmedabad

Abstract

This paper looks at an interesting aspect; namely, how 2D bits, like flat pictures or sprites, into 3D world tricks us through good eyes and a good mind. It is something we'd dub "dimensional deception." The real issue is how this amalgamation affects the way we are attentive, think or feel when we play video games or watch animated movies. To figure this out, we draw on parallels between both worlds and share concepts from how we see things (Gibson: direct way; Gregory: building-up way), how our brains manage overload (cognitive load theory), and real-life examples from games and movies. In games like Paper Mario, where each character appears flat like paper in a moving 3D space, or Octopath Traveler with an HD-2D appearance, and even Doom with old-style sprites in a new 3D fighting, this combination makes the game's gameplay clearer and more fun. In movies like Spider-Man: Into the Spider-Verse and Across the Spider-Verse, where 3D models have 2D lines and dots, or Puss in Boots: The Last Wish, which looks like an artist's drawing from the storybook, as well as Arcane, which has painted textures on 3D shapes, the difference provides a better storytelling experience while tugging at our heartstrings. What we have is that the distinction between 2D and 3D catches our eye instantly, bringing attention to critical aspects of a story without draining our minds. It reduces extra mental work and thus gives us greater opportunity to dive into the story or into a game. Games employ this for easy movement and to get played repeatedly without boredom, while films use it for high-level emotional moments. It's easy on computers and creativity for artists. This can be relevant for future stuff like VR or AR and it reflects that a sound artistic plan is better than trying to seem too real. It's all about how, if it appears acceptable to our minds, we happily follow this trick, and it results in deeper emotional responses and superior media experiences.

Introduction

Reflect on the evolution of visual stories over time. Everything was flat 2D back in the day, for instance, old cartoons or easy video games where people danced from cartoon to cartoon on the screen. And then 3D arrived, making worlds seem deep, real, as in modern films where you may just as easily feel as though you are there. But now, the creators are mixing the two together – placing flat 2D things into 3D spaces. Not by mistake, it's the smart thing to do. In games and animations, this combination is becoming common because it taps into old charm while leveraging new tech. In video games, for example, designers began blending styles to increase the performance/readiness and look of things when playing on machines. Animated films do so to feel like comic books or paintings have come to life. Why do they choose this? Or just for fun or to get them to be able to save time and money when making characters flip from flat to deep. This "dimensional deception" occurs when our eyes perceive things that look flat in a deep world and our brain is like, "That's OK; that

works." It's as if you're tricking us, and in both cases, it improves your experience, whether you're controlling a character or watching. The crossover of game making and film animation helps as well. Tools like Unity allow both to adopt similar tricks, so ideas bounce from one to the other. In interactive stuff like games, players can move the viewing angle, so the mix has to be at least a little more effective to help them not get lost. In passive-watching styles like movies, directors control what you see, wielding the mixture to highlight major moments.

Research Question

Main: In what ways does placing 2D bits in 3D worlds reshape the way viewers pay attention, mentally and emotionally attend to video games and animated features?
Further questions:

- What mind-tricks let us see mixed flat and deep spaces O.K.?
- How does playing (games) and simply watching (films) differ in this regard?
- What art and tech rewards does it offer in every type?
- How does that flat-deep difference help stories and play?

It gives thoughts about getting eyeballs and not completely overloading people in its course. Video games can learn from film theorizing how to tell better stories through looks from video games, and animated movies can learn interactive aspects from games. Also, an understanding of how our eyes and brains work in mixed views can help you plan lessons or ads in which viewers will be more or less confused. In the end it shows that styled looks touch a heart more than truly beautiful ones: this pushes media to show off.

Scope

We focus on two key areas: video games where you control the angle while animated mediums where it is made through action. We analyze how the mix looks different depending on how it goes, staying within hit examples for the sake of real insight.

Visual Perception Theory

Visual perception theory (as discussed in Literature Review) seeing is how we perceive, it's not just eyes creating photos or making pictures, it's our brain perceiving light and shapes. It highlights how we perceive depth with two eyes (binocular cues) or from images (size, overlap). The way our brain converts flat ones to three dimensions (3D) (perceptual constancy), or utilizes movement (motion parallax); even when things are too far away, they appear the same size and close to us they move faster. Gibson's ecological approach posits we perceive directly from the world we live in, no guessing. Fundamentally, it's bottom-up: light patterns (optic array) provide all information, with unchanging bits (invariants) like texture growing farther away or objects overlapping. Affordances are signals (indications) to us of what we can accomplish, like a flat path "walk here." This works for mixed media because once we start seeing depth cues in games, we can go straight on, like using a 2D sprite against 3D ground to jump on. But critics argue it overlooks brain work or illusions, such as the view of a flat drawing going down wrong. Gregory's constructivist theory, by contrast, is built top-down: we create perceptions out of guesses based on previous knowledge. Brain fills in the gaps cause illusions as stimuli are fuzzy so that the hollow mask looking full because we expect the face that way. In hybrid stuff, this is why we like 2D in 3D – our experience says "it's art, so okay." Like everything else in movies, context makes a flat effect feel emotional. Cons: does not account for baby seeing without experience, or for why some illusions go along even when you know the truth. Billboard sleight of hand in the graphics keep sprites staring in our faces, employing these theories for fake depth. Disney's animation rules are designed to bring hybrid animations to life, with animated moves. The cognitive load and attentionOur minds can handle only so much at once. Cognitive load theory by Sweller saysthere's intrinsic load (how hard the topic is), extraneous (bad design bringing work), andgermane (filling an effort building knowledge). Working memory has only a few chunks, sooverload harms learning or fun. Here attention chooses what matters (selective), pop outfrom contrast. Split the figure-ground main from back. Eye-tracking visualizes where eyes go to media. 2D in 3D removes extraneous load: basic flats

pop, characters oractions become visible. In games, this facilitates quick decisions; in film, it guides your narrative. Directors set the focus, players require clear visual language. Immersion, Presence & Emotional EngagementImmersion is about forgetting that it's fake, being there. Style consistency is better than real looks; you do in games, films from stories. Hybrids boost by stylising, dodging creepyrealness, letting how a person feels show through design. Matchingdimensions is far less important than art rules. Games: spatial feel (moves). Movies: story pull from visuals. The inclusion of 2D sprites in 3D environments, another method we refer to as dimensional deception, is a truly exciting development at the intersection of art, technology and psychology within visual media today. This blend of video games (Paper Mario) and animated feature movies (Spider-Man: Into the Spider-Verse) uses psychological theories to improve viewer engagement and offers the methodological efficiency that results in faster production. At the perceptual level, the ecological science of James J. Gibson's visual perception opens up a world to comprehend. Gibson suggests that perception is direct and bottom-up, based on invariant elements of reality, such as motion parallax (local objects seeming to move faster than things farther away), texture gradients that imply depth (Gibson, 1979). 2D sprites use techniques like billboarding in dimensionality deception to preserve these invariants, whereby flat figures always face us so that the optic flow and affordances—the perceived possibilities for action—are maintained (Gibson, 1966). In Octopath Traveler's HD-2D aesthetic, for example, pixel art sprites are used to show 3D backgrounds (where there's no cognitive dissonance!) thus creating a diorama-like effect that enables players to directly perceive navigable spaces. This ecological validity enables the mixed dimensions to be natural, for the visual world provides all potential input cues for interaction, much like Gibson explains how real-world environments create illusions versus lab illusions. In contrast to Gibson's face-to-face perception is Richard Gregory's constructivist theory, which focuses on perceptual top-down processing, in which prior knowledge and expectations generate perceptual hypotheses (Gregory, 1997). Gregory contends that sensory data are ambiguous, and that this causes the brain to deduce something based on experience, leading to illusions if hypotheses fall short (Gregory, 1970). In hybrid media, this explains why audiences accept dimensional inconsistencies in this way. The artistic framing helps define expectations on top of that, allowing the organism to build a coherent reality. As an example, in Spider-Man: Across the Spider-Verse, hand-drawn 2D lines and Ben-Day dots are drawn on top of 3D models, like comic book styles that evoke traditional perceptual schemata (Toon Boom, 2025). As viewers speculate, "this is stylized art," ignoring literal depth cues, an attitude consistent with Gregory's perspective on perception as an intelligent inference process. This top-down mechanism seems more pronounced in films, where directors shape framing to direct hypotheses and this can be shown, for instance, throughout Puss in Boots: The Last Wish's storybook illustrative style shifting based on emotional beats drawing on the audience's experience with fairy tales to increase readability and immersion (SlashFilm, 2021). Gibson and Gregory's relationship emphasizes the importance of how perceptual falsehoods in the three dimensions of human experience are leveraged by using not only overt environmental information but cognitive structuring—leading to visual hierarchies that favour these important ingredients while neither overwhelming viewers. This perceptual theory supports the cognitive load theory developed by John Sweller (1988), who addresses working memory limitations and classifies load into intrinsic (level of task), extraneous (inadequate design and lack of attention) and germane (learning-oriented) loads. You see this in how billboard sprites optimize game design, so they cut down polygon counts and draw calls, giving players time for gameplay and not rendering overhead (Microsoft Learn, n.d.). Thus, in Paper Mario, paper aesthetics act as a gameplay mechanic flipped dimensions for a puzzle by flipping dimensions, leading to reduction cognitive demands during repeated interaction (Kinephanos, 2015). Impostor systems for level of detail (LOD) add to this concept in the abstract, swapping 3D models for 2D billboards at distance where this system keeps ecological cues while reducing computational burden (80.lv, 2019). Emotionally, this efficiency provides better immersion; as Sweller has stated, germane load increases when extraneous is reduced, promoting a deeper narrative experience (Van Merriënboer & Sweller, 2005).

Arcane employs 3D models and 2D painterly textures for a "moving painting" effect, blending styles for maximum emotional depth and reducing cluttered visuals (Bloop Animation, 2025). In films like Klaus, hybrid animation uses 2D characters with 3D lighting, referencing constructivist hypotheses for aesthetic consistency while minimizing production time with streamlined pipelines (The Science Survey, 2025). Ultimately, dimensional deception is more than visual gimmicks, providing artistic freedom, via extreme expressions and unrealistic points of view—as with Spider-Verse's move with frame manipulation, using "on twos" for stylized movement and "on ones" for fluidity (Screen Rant, 2024). Psychological—it gets around the uncanny valley by giving value to abstraction over photorealism and provokes deeper responses by means of design instead of fidelity (Gregory, 1974). This is best done in an almost non-futuristic way by combining different techniques such as texture atlasing and impostors, which work seamlessly together, for both real-time

games and shot-specific films (Game Dev Beginner, 2024). This synthesis, grounded in Gibson's invariants for direct affordances and Gregory's inferences for contextual acceptance (which are managed by the load principles of Sweller), suggests why hybrids such as Entergalactic or The Wild Robot hold audience interest. By mitigating cognitive distance and promoting perceptual flow, dimensional deception enhances efficiency and quality of the story as a whole and confirms that artistic coherence beats dimensional uniformity in producing unforgettable experiences across media.

Methodology

Research Approach

This is a compare-and-contrast study involving cases, combining game design, animation ideas, mind science, and tech how-tos. We examine interactive vs passive through psych, tech, art and media filters.

Case Selection

Games

Paper Mario (flat chars on 3D), Octopath Traveler (HD-2D), Doom (sprites in 3D). Films: Spider-Verse (2D on 3D), Puss in Boots (storybook 3D to 2D), Arcane (painted 3D). Selection was done to provide variety, to succeed and vary look, from mild to wild blend.

Psychological Mechanisms: Universal Effects

The flat-deep collision establishes hierarchy: 2D pops on 3D, pulling eyes to critical bits – chars in games, feels in movies. Simplified 2D is brain friendly, swift, clear form, and noise free. Skips uncanny by stylising, connecting through design, not movements. Films: believe the tale. Games: You manage camera, so need consistent depth; returning play wants non-tiring visuals. Studios movies: Maker captures the exact, dramatic changes like Spider-Verse to upset, confusing games; strong movies.

Technical Benefits Across Media

Less shapes with 2D, saves memory, quick animate (frames vs bones). Faster alterations, style maintains, mixes artist skills. Free for eccentric poses, unusual views. Films: Tuning lights per shot, no live speed required.

Case Study Insights

Paper Mario: To play tricks (flat) comic fun puzzles rely on limitations. Players love silly. Octopath: Pixels with 3D blur, painting feel, old meets new, relatable links to simple char lines. Spider-Verse: 2D lines across 3D, dots, twos anim, feeling through changes in style. Puss in Boots: 3D like 2D book, low frames in action, lines for feel, switches with hero’s mood. Arcane: 3D with hand paint, 2D overlays, a moving art feel, profound affect through expression.

It’s not so much that it’s so wrong as that it’s so clever, that it’s so cleverly designed. Our minds love buying into this cocktail of art that’s right and consistent so we can forget everything ‘fake’ and plunge into the fun, or a story.

Main Takeaways from Our Study:

Psych Power: Flat 2D pops in deep 3D pop, directing attention like a microscope to heroes or fights or sadness. It avoids brain overload (in Sweller's cognitive load theory) and helps us get everything out.
Medium Magic: You need the steady, readable designs you need to keep you running, jumping, and grinding without getting lost – think funny flips from Paper Mario. Films give directors more freedom to punch emotion with wild switches, like the glitchy heartbreak sequences of Spider-Verse that hit the bad guy while being on screen.
Tech & Art Wins: Saves computer power, speeds up making and frees wild styles - no need to resort to boring realism. The contrast is what our brains, however, love about it: From Gibson's direct seeing to Gregory's smart guesswork, our minds relish the contrast.

This is the media at maturity: no more "real = best" mentality. Creators like those behind Arcane or Octopath Traveler choose style over synthetic-deep 3D, finding hits that will stick in memory. As video games borrow film style and movies scoop up game tech (Unreal Engine everywhere), hybrids will reign over VR/AR and AI narratives.

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