The Community Game Development Toolkit

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Abstract

The Community Game Development Toolkit (CGDT) is a set of tools that make it easy and fun for students, artists, researchers and community members to create their own visually rich, interactive 3D environments and story-based games without the use of coding or other specialized game-design skills. Building on the popular 3D game design engine Unity, the toolkit provides intuitive tools for diverse communities to represent their own traditions, rituals and heritages through interactive, visual storytelling. Projects can be built for desktop, mobile and VR applications. The toolkit is used to teach game design and interactivity at universities across the country, used by students, artists and researchers, and supported by several grants. This paper provides context about what kind of work students, artists and researchers have created using the toolkit and provides documentation for how to use the toolkit. See https://danielp73.github.io/Community-Game-Development-Toolkit/ for updated documentation and other information about the toolkit.

Keywords: game design, collage, collaboration, worldbuilding, speculative futures

Introduction

The Community Game Development Toolkit (CGDT) is a set of game design tools that that make it fun and accessible for creators to develop visually rich, interactive 3D environments and story-based games without the use of specialized game design skills such as 3D modelling or coding. The toolkit is for anyone interested in creating interactive 3D stories, exploratory environments, and artistic games, regardless of technical experience. This includes college and graduate students in the fields of education, art, media, the humanities, communications, or any other field; researchers in education, the humanities or other fields; educators interested in exploring interactive storytelling and/or game design; and artists and artist communities.

The toolkit provides intuitive tools for diverse communities to represent their own traditions, rituals and heritages through interactive, visual storytelling. In order to quickly create vibrant, visually rich scenes without the use of 3D modeling, the toolkit draws on creators' own photos, collages, drawings, and sound recordings to create objects, textures, and soundscapes in 3D space. This technique allows creators to bring their own visual references and sensibility into the game environment and makes creative experimentation rewarding and fun even for creators who may have no prior experience in game design or visual art. This creative approach promotes an intuitive exploration of collage in 3D space, leading many creators who use the toolkit to create their own rich, collage-based visual languages as they experiment with the creation of open-ended audio-visual narrative.

The toolkit provides a set of drag-and-drop game components that make it easy to add many types of interactivity to games without the use of code, including interactive text, mechanisms for changing scenes, and more. These components empower creators with no prior technical experience to create fully interactive and engaging 3D visual narratives and games.

The toolkit has been used in college-level courses on game design and interactivity in programs around the USA and in workshops at conferences around the world. Additionally, the toolkit is used by artist groups to create exploratory visual worlds for screen, VR, and even performance art environments. Toolkit development is supported by an REU (Research Experience for Undergraduates) grant from the National Science Foundation through the Visualization and Virtual Reality Lab at Hunter College, City

University of New York, and by a Rural Drug Addiction Research Center Pilot Project Grant, University of Nebraska-Lincoln.

This chapter outlines the core features of the toolkit, provides and discusses examples of work created using the toolkit, and introduces other related game design toolkits.

Toolkit Functionality

The Community Game Development Toolkit is a software package that augments the functionality of the popular Unity game engine. Unity is a commercial game development tool capable of sophisticated and complex 3D game development used by large and small commercial game studios to produce commercial video games. Unity is available for free for personal and educational use, and is also used among artists, individual game developers, and in game design courses in universities because of its perceived ease of use and accessibility compared to other commercial game engines such as Unreal Engine. Unity is nonetheless a very complex software platform with a steep learning curve that can take months or years to master, even for otherwise technically knowledgeable practitioners (see Figure 1). Furthermore, most functionality in Unity requires the use of code, which is extremely challenging to work with for those who have no prior experience with computer programming.

Figure 1
Screenshot of the Unity game engine environment
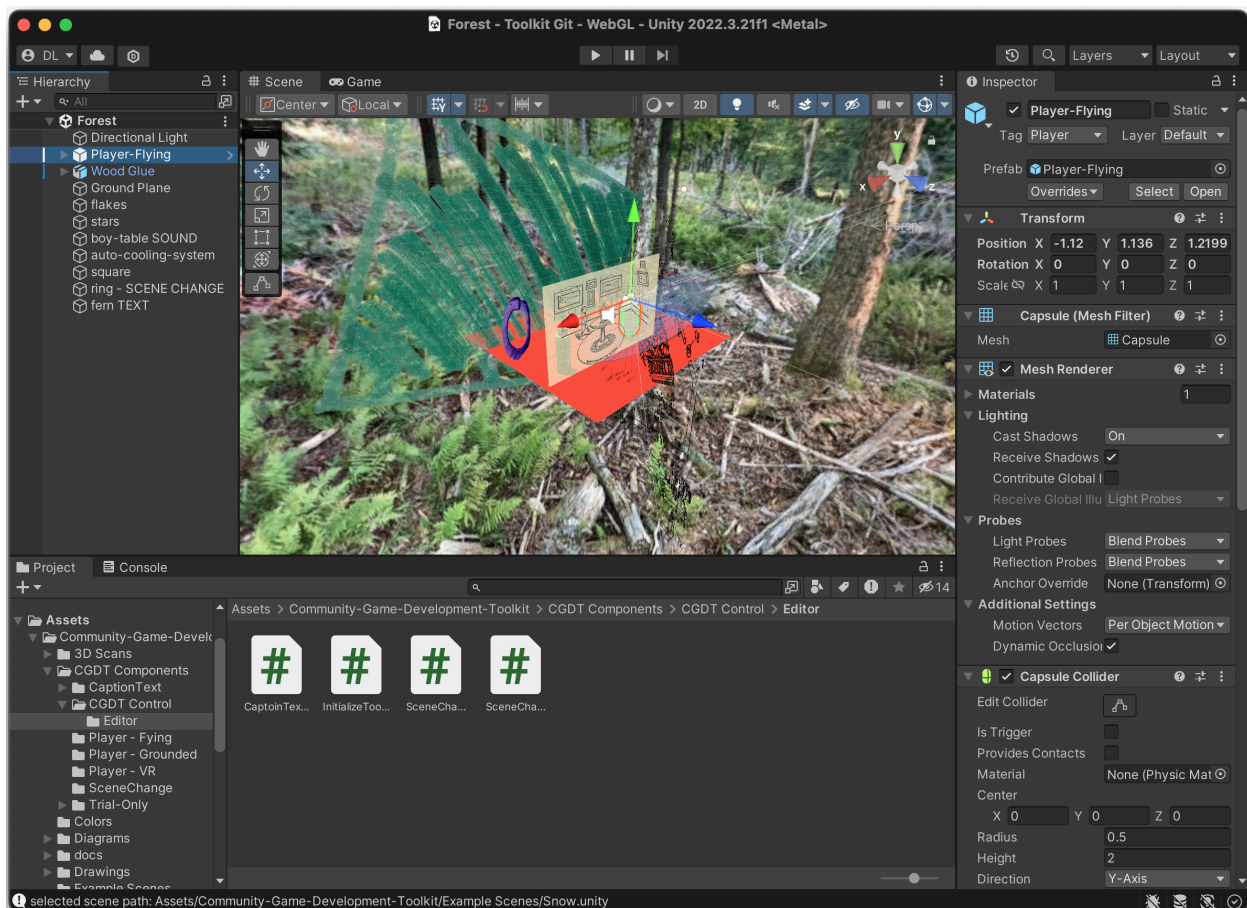
The CGDT provides a core set of functionalities, a number of user interface elements and a comprehensive set of web-based documentation and tutorials that make the process of building interactive 3D scenes within the Unity game engine environment significantly more accessible and

intuitive than those provided by the engine itself. Specifically, the CGDT is focused on the creation of visually rich, collage-based scenes using easily created art assets including drawings, paintings, photos, diagrams, and 3D scans. For assets such as drawings and paintings, toolkit documentation provides tutorials for how to scan the artwork and isolate the drawing or painting from its white background so that it appears as an organic shape in the 3D scene, rather than as a white rectangle with a drawing or painting on it. For photos, toolkit documentation walks users through the process of extracting certain objects or selections from photos and isolating them from their background so that they too can appear in the scene as organic 'cut-out' shapes rather than as a square image (see figure 2). The toolkit also provides components that automatically process imported images so that they are immediately ready to be inserted into the scene using drag-and-drop.

Figure 2
Drawing, isolated from its white page background, placed within a 3D scene using the toolkit

In addition to 2D assets, the toolkit provides documentation for how to easily create 3D scans of both spaces and objects using common devices such as an iPhone or iPad. The documentation details how to easily import these 3D scans into a scene, and how to manipulate their size and position. The toolkit also documents how to create 360-degree photospheres using common devices, and how to import and process these assets, which function as 'skyboxes', or sky-like backgrounds behind objects placed within a scene.

Creating interactivity in Unity generally requires writing code. This is a daunting challenge for creators unfamiliar with computer programming, and even for those with prior coding experience but without expertise in writing code in the Unity environment. The toolkit provides components for creating interactive visual narrative without the use of code. The toolkit provides two types of pre-coded 'players', or ways of navigating the scene as a user—a player that moves along a ground plane, and a player that 'flies' through the scene, independent of any ground plane. The toolkit also provides an intuitive method for setting up scene changes in projects, creating the possibility for branching, or "choose-your-own"

adventure style narratives. Finally, the toolkit provides an easy system for creating interactive, text-based captions for objects in scenes, in which the user can click through a series of lines of text (see figure 3).

Figure 3
Object with associated text caption

Toolkit Use and Examples

The intuitive, collage-based creative process engendered by the toolkit and its very low technical barrier of entry, make the toolkit an ideal starting point for creating experimental, unconventional and non-linear forms of audio-visual interactive narrative. The collage-focused workflow is particularly useful for creating and experimenting with artistic visual languages, and building open-ended, fragmented, and intertextual stories using these languages. The toolkit can be particularly useful for members of diverse communities seeking to create interactive visual narrative that explores visual aspects of community members' traditions, rituals, or heritages. The collage-based use of pre-existing and easy-to-create 2D artwork allows community members to easily create visual worlds composed of visual fragments of objects, textiles, clothing, patterns, and other visual ephemera. This can be integrated with 3D scans of any real-world object, or interior or exterior space. The creative process of building interactive narratives with the toolkit also lends itself to experimental and unconventional forms of artistic collaboration and collaborative storytelling. The following examples will bear out these uses of the toolkit.

Collective Futuring in Nebraska's Panhandle (work currently in progress): Project by Ash Eliza Smith, Samantha Bendix, and Daniel Lichtman (see Figure 4.)

Figure 4
Screenshot of Collective Futuring in Nebraska's Panhandle

Over the course of this project, team members worked with several rural communities in the panhandle of Nebraska, specifically with the substance use disorder (SUD) community, a cohort of middle school students, and members of a non-profit agency that funds community projects. Participants included a range of people of different ages, ethnicities, races, and mental and physical health statuses. In workshops, community members use a collage-based story-engine developed from the Community Game Development Toolkit to engage in worldbuilding exercises. Community members and project team members composed scenes by arranging 3D scans of objects, particularly objects in public spaces, as well as scans of drawings and cut-out photos.

Participants use these exercises to collectively imagine alternate and speculative futures for themselves and their community, taking a creative approach to questions such as: What kind of public works projects might improve community health? How can community members reimagine community health clinics to improve treatment for SUD? How can world-building and collective digital storytelling connect members of geographically dispersed, rural communities to support each other's mental health?

Extending beyond the existing functionality of the CGDT, team members are currently developing the project to further support communal discourse within the digital story-engine. This includes collective voice-commentary, empowering participants to reflect on and respond to each other's ideas as presented in the story-world, as well as an upvoting feature which will serve as a springboard for funding the physical realization of projects developed in world-building workshops and scenes.

The Raisin Truck Makes Raisins – Project by Daniel Lichtman with Contributions By Ian Giles, Helena Haimes, James Prevett, David Baumflek and Johann Arens (see Figure 5.)

Figure 5
Screenshot of scene from The Raisin Truck Makes Raisins. Drawings in this frame by Johann Arens

The Raisin Truck Makes Raisins is a collaboratively produced, 3D game/virtual environment that uses collage, spatial orientation/disorientation and visual abstraction to reflect on the experience of caring for young children during pandemic and lockdown. Scenes in the game are produced in collaboration with a community that includes economically diverse, queer and immigrant care takers.

Collaborating caretakers contributed sketches, drawings, photos, and sound recordings that, by their own definition, reflected on their emotional relationship to the landscapes, objects and environments in which they cared for children during the pandemic. These materials were scanned and isolated from their backgrounds and collected into a series of interactive scenes. Through visual abstraction and collaboratively produced collage, these scenes present a diverse range of experiences with childcare-in-isolation: busy, beautiful, frustrating and chaotic, marked by vulnerability, aggravation and resilience. ("The Raisin Truck Makes Raisins," n.d.)

MetaEternity – Project By Teresa Braun, Ayodamola Okunseinde, June Bee, and Zelong Li (see Figure 6.)

Figure 6
Screenshot, and view of performance with virtual world in background, from MetaEternity


This project, an interactive virtual world for VR and live performance considers how social, emotional, and psychic life might continue in the metaverse after physical death. The project incorporates the use of the CGDT with other media technologies, to create a virtual world in which visitors to the gallery can draw and write in response to this theme and upload their content into the shared virtual environment, and appear in the 3D scene. The project asks, "How do we make sense of our social and material relationships in physical space vs. virtual space? Is there some form of continued existence we can embed in the metaverse? If VR offers us a glimpse into these worlds, how can we move away from the insularity and single-player mode that it usually affords?" (Braun, n.d.)

Collaborative Worldbuilding workshop at Museums Without Walls Conference (see Figure 7.)

Figure 7
Screenshot of virtual world created during the workshop
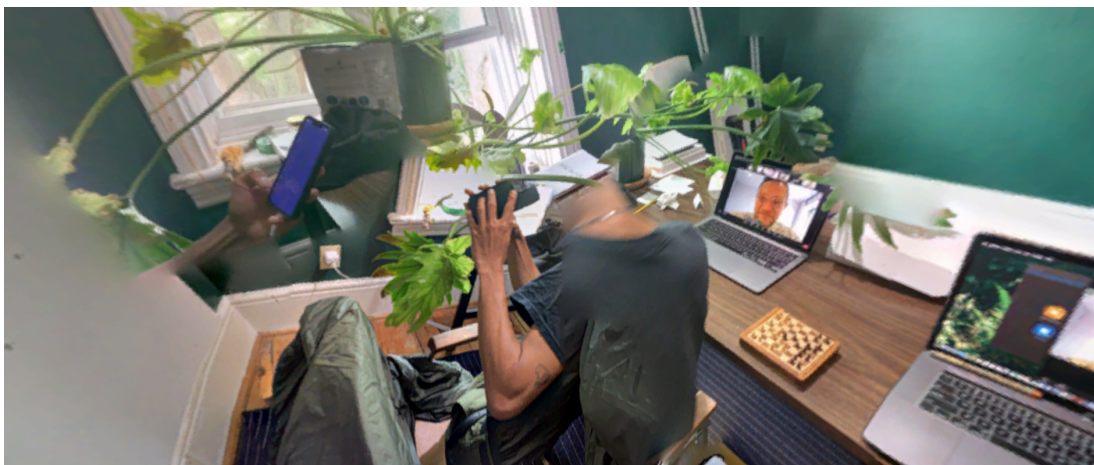
This scene (Figure 7) was collaboratively produced by participants during a workshop at the Museums Without Walls Conference, hosted by the Museu sem Paredes and Queens University in 2022. During the workshop, participants worked together to produce an interactive 3D environment composed of audio recordings and photographic fragments of participants' immediate, physical surroundings. Over the course of the workshop, participants captured audio and photographic source material and worked together to compose this material into a 3D scene using the CGDT. Participants then collectively explored the resulting environment as avatars, charting a network of chance encounters with disembodied audio-visual fragments of participants' surroundings as they move through the virtual space. Each play-through of the scene yields a unique path through this collaboratively produced collage, representing a unique, virtual composition of participants' collective experience of space, material, and sound.

Student Project – Fangrou Zhou (see Figure 8.)

Figure 8
Screenshot of Zhou's project

Zhou, a student in New Media Arts Program, Baruch College, City University of New York, created a game world that imagined participating in a Chinese music reality television show. In this project, Zhou made extensive use of images found on the internet to create this collage-based scene.

Student Project – Nehemiah Lucena (see Figure 9.)

Figure 9
Screenshot of Lucena's project

Lucena, a student in New Media Arts Program, Baruch College, City University of New York, created a game scene that recalled a life before giving up the use of substances. This scene made use of photo cutouts, drawings, 360-photos, and scans of hand-written text.

Brief History and Examples of Game Design as an Inclusive Medium

In her 2012 book *Rise of the Videogame Zinesters*, Anna Anthropy criticizes the homogenous nature of commercial video games, the audiences video games are designed for, and the demographics of commercial video game designers: "Mostly, video games are about men shooting men in the face," (p. 9) and "since digital games have existed, their creation has been dominated by a small part of the population: generally white male engineers." (p. 36). Anthropy would like to see more games created by, and about people like her: "I have to strain to find any game that's about a queer woman, to find any game that resembles my own experience." (p. 10). Anthropy calls for the creation of 'zinester' games— small, short, experimental video games, often created by one person, and often drawing on the creator's own autobiography. Anthropy's own 2012 game *dys4ia*, which she calls a 'game journal' recounts Anthropy's experience with gender dysphoria and hormone replacement therapy. The game has become canonical in the history of autobiographical games that chart the experiences of marginalized people.

Anthropy calls for the creation of games by amateurs, non-professionals, and community members of all types. Her book suggests several game-making platforms that, at the time, attempted to make game development accessible to non-specialist audiences, and to support the development of alternative styles of game design. One important example she discusses is Twine, which supports the creation of interactive, web-based fiction. A canonical example of a game created in Twine is Zoë Quinn's 2013 *Depression Quest*, an "interactive novel" that presents the story of a character suffering from depression. Among other game-making platforms, Anthropy also discusses Game Maker, which supports the creation of games using an icon-based system for creating simple interaction.

Contemporary Tools for Making Game Design More Accessible and Inclusive and Comparison to the Community Game Development Toolkit

A number of contemporary tools aim to make game design and world-building accessible to non-specialist audiences today. One such example is The Verb Collective, by Justin Berry and Bobby Berry, described in their paper, "The Verb Collective," 2019. This toolkit is a set of pre-coded action, or "verb," components for Unity that users combine to create interactivity. This system is designed to support both beginning and advanced users and is focused on "emergent dynamics and fostering exploratory play" ("Verb Collective", n.d.). Using a workflow that resembles that of visual coding environments, creators make use of combinations of verb components to experiment with and create interactivity in their scenes in Unity. CGDT differs from The Verb Collective in that it focuses primarily on a creative process for experimentation with visual scene design based collaging 2D artwork and 3D scans into 3D space, and provides pre-coded components for a simple set of possible interactions. CGDT also differs in that it presupposes no knowledge of any coding skills, while the use of The Verb Collective toolkit involves an exploration and understanding of modular concepts of coding (though it does not require users to write their own code).

Scratch is a popular tool used by children and students for creating digital stories, games, and animation. The tool introduces coding concepts using a highly accessible visual interface in which creators manipulate code blocks and make use of supplied visual assets ("About Scratch," n.d.). CGDT differs from Scratch in its focus on visual scene composition and world-building, rather than core concepts of computer programming.

Another project, Games4Nature, supports school-aged students to make nature-based games for mobile devices using a predefined set of nature-themed resource cards and a document suggesting how to create interactive narrative using these resources. ("Games4Nature," n.d.) CGDT differs from this toolkit in that it focuses on open ended exploration of visual worldbuilding in which creators build their own visual language through collage, rather than a predefined theme and visual assets.

Google's application, Tilt Brush, provides an intuitive tool for digital drawing and painting in 3D space in a Virtual Reality environment ("TiltBrush," n.d.), While Tilt Brush makes art composition in digital 3D space accessible to non-specialist users, it differs from CGDT in its focus on drawing and painting tools vs. using a collage-based approach to creating art and interactive visual narrative in 3D space.

Context, Support & Who uses the Toolkit

The toolkit is being developed as part of the NSF-funded VR-REU program in immersive visualization and virtual/augmented/mixed reality at the Visualization and Virtual Reality Lab at Hunter College, Summers 2022, 2023 and 2024 (NSF Grant No. 2050532, P.I. Dr Wole Oyekoya). The toolkit is also supported by Rural Drug Addiction Research Center Pilot Project Grant, University of Nebraska-Lincoln via the project, Re-Imagining Place: Rural Substance Use Disorder, Worldbuilding, and Community Participatory Design (P.I. Ash Eliza Smith), as listed above. The toolkit is used to teach game design, worldbuilding and interactivity at Baruch College, CUNY, Winona State University, the University of Nebraska, Lincoln, Stockton University, and other universities.

The toolkit has been presented at numerous conferences, workshops, and exhibitions, including iDMAa at Winona State University (2021, 2022), Society for language Science and Art Conference at Purdue University (2022), Society for language Science and Art Conference at Arizona State University (2023), International Visual Arts Association, University of Illinois, Chicago (2023), Museums Without Walls at the Museu sem Parades (2022) the Show Don't Tell Symposium at Culture Push (2021) and the New Media Caucus Showcase at the College Art Association Conference (2021).

The toolkit is currently being used to create submissions for a special issue of the Hyperrhiz Journal of New Media Cultures, edited by Catalina Alvarez, Sue Huang, Daniel Lichtman (organizer) and Lee Tusman, to be published in 2024. Two papers about the toolkit have been published, detailing its functionality, and studying its usability and effectiveness: Park, Lichtman and Oyekoya, "Exploring Virtual Reality Game Development as an Interactive Art Medium: A Case Study with the Community Game Development Toolkit.", 2023; and Roth and Lichtman, "The Community Game Development Toolkit," 2022.

Conclusion

The Community Game Development Toolkit is a game design tool focused on making collage-based 3D scenes and interactive world-building accessible to diverse communities of students, artists, and scholars. Working with photos, drawings, paintings and 3D scans for visual scene composition and drag-and-drop components for creating interactivity, the toolkit is designed to be accessible to community members who have little or no prior experience in specialized game development skills such as 3D modeling or computer programming. As demonstrated by the work created by students, artists and scholars, the Toolkit supports creators to explore interactive worldbuilding as a means for representing their own traditions, rituals and heritages and the development of their own exploratory visual languages using collage.

Among other available tools for accessible game design, CGDT is unique in its focus on 3D collage, enabling creators to use their own visual references and languages, and simple drag-and-drop components for creating interactivity that do not require an investment in learning concepts of computer programming. CGDT is growing in popularity as a tool for teaching digital storytelling, game design and interactivity among college programs around the country, and among artists, community members and researchers for exploring innovative forms of interactive 3D worldbuilding.

Staying in touch

If you create a project using the toolkit, get in touch with me to tell me about it! I can be reached at daniel.lichtman@stockton.edu. I am also happy to provide support to you as you get started with Unity and the toolkit, and develop your project.

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