

# Design and Development of 2D Hand-drawn Style Plot-oriented Games

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**Abstract.** Along with the in-depth study of human-computer interaction, it has been found that video games with great artistic expression can be an effective medium for idea dissemination and education. Among them, storyline-oriented games with more complete storylines and stronger narrative ability have become a major entry point for educational game development. In this paper, we design and implement a 2D hand-drawn style game using Unity engine, which is centered on storyline narrative and integrates various puzzle games. Players can realize the development of the plot by observing the game scenes and completing the game tasks, and realizing the ideological theme of the game after unlocking all the game plots. In the design and development of this game, we have written original scripts, designed and drew game characters and scenes, designed human-computer interaction content and scripted game functions, and finally completed the game production to achieve the expected goals.

**Keywords:** hand-drawn style; human-computer interaction; plot-oriented gameplay; educational games

## 1 Introduction

With the full development of digitalization, cross-disciplinary intermingling, and fun learning research, the combination of video games and education is becoming a major hot trend. Not only can games keep people's interest, but the fun and unique experience of video games themselves can also enrich the learning process and enhance the effect of learning[1].

In this paper, we developed a 2D hand-drawn style game[2] based on a plot narrative that synthesizes a variety of puzzles, centered around the theme of critically viewing the relationship between humans and machines and being wary of the infinite advancement of technology. We used Unity for the development of the game and Adobe Photoshop to draw the scene materials by incorporating unique hand-drawn art. The visual art and content design of the game are based on historical and realistic background research and incorporate artistic expression to enhance the player's visual immersion. The interactive operation of the game is based on a variety of puzzle games with easy-to-understand gameplay as the interactive carrier, and the design of specific game content and form is based on the characteristics and attributes of the scripted characters to enhance the playability of the game.

## **2 Game content and scenario design**

### **2.1 Script Design**

The core idea of the whole script is to look at the relationship between humans and machines dialectically, to be alert to the alienation of human beings by the infinite development of science and technology, and to emphasize the importance of retaining the autonomous thoughts of human beings amidst the rapid advancement of science and technology[3]. The script innovatively lets the player take the role of a machine in the game, jumping out of the subjective perspective of human beings to carry out the game from the spectator's perspective of a machine, which enhances the game's interest; at the same time, the script sets the game as a game in which human beings are gradually alienated by science and technology into robots that lose their minds as technology develops, which ultimately leads to a utopian future in which science and technology will rule over human beings, thus enhancing the effect of the game's theme expression.

The script divides the game into four scenarios: the early stage of technological development, the transition period, the high-speed period, and the future period through the historical nodes of technological development. Players take on the roles of representative machines in each technological stage, namely radio, computer, intelligent robot, and strong artificial intelligence. The script sets the game scene in the office of a technology company that can focus on the relationship and changes between technology and human beings. Through the observation of human working life in each technological stage, the player collects elements that reflect the changes of both technology and human beings and completes the game tasks set by the machine characters, then enters the next technological development stage to advance the development of the game's plot. In the end, the player will be able to understand the theme of the game based on all the elements collected[4].

### **2.2 Art Design**

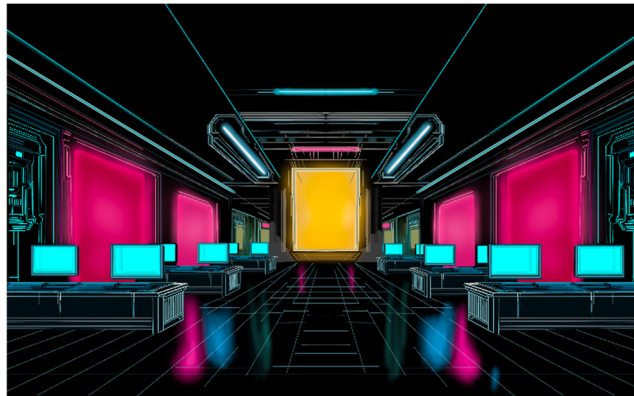
In the process of game art design, we take 1920\*1080 pixels as the page design size, and refer to the real office prototypes under each technological era and the art creation works of related themes, such as *The Matrix*, *Blade Runner*, and other futuristic sci-fi movies, to improve the reproducibility of the game setting, and at the same time, enhance the player's visual experience and sense of immersion. Scenes under different technological stages correspond to the style performance of different era backgrounds. All screen elements, color combinations, and style treatments in the same game scene are integrated with the era characteristics and attributes of the current scene background setting[5-7].

As shown in Figure 1, in the scene design of the early stage of technological development, some of the characteristic elements of the 19th century are used for the layout of the screen, such as dial telephones, oversized handwritten notebooks, etc. to enhance the expression of the setting of the game era; in order to reflect the low performance of the player's point of view in the eyes of the old-fashioned radio, the screen adopts the vintage black and white tones, and the screen is processed with the blurring effect of the low pixel.



**Fig. 1.** Scenes from the early stages of technological development.

As shown in Figure 2, in the scene design of the future period of technological development, in order to reflect the player's point of view of the future of strong artificial intelligence in the eyes of the screen, the screen was high-definition sharpened display processing, and references to the same theme setting with the scene of the cyberpunk style for the layout of the screen, such as fluorescent displays and data conduits in blue and pink tones to enhance the expression of the setting of the game era and other elements.



**Fig. 2.** Scenes from the future stages of technological development.

Each game scenario has parts that are designed as collectible elements with special meanings. These elements can reflect the changes and characteristics of technology and human beings in each scene, making it easy for players to deduce and sort out the plot through these clues. Meanwhile, in order to reflect the setting of the script where humans are alienated by technology into robots, the characteristics of machines are added to humans in the form of visualization. As shown in Figure 3 in the scene of the transition period of technological development of the iron key attached to the human body, suggesting that humans began to be alienated by technology, and the magnetic attraction qualities of machine metal appeared on their bodies.

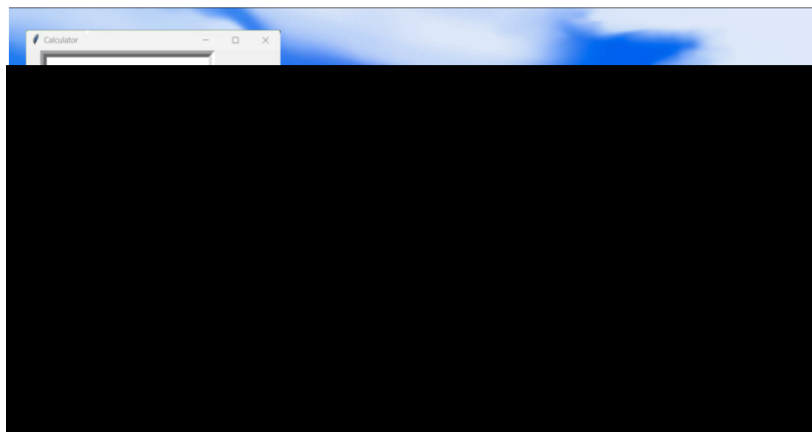


**Fig. 3.** The iron key attached to the staff.

### **2.3 Interactive Game Design**

The interactions in this paper are mainly reflected in the player's collection of scene elements and the completion of puzzle game[8] tasks in each scene. The graphics and operation design of each interactive game are based on the extraction of the characteristics of the machines in each scene to enhance the player's sense of character immersion. Mouse clicking, keyboard input, and keyboard control, which are easy to understand and highly maneuverable, are used as the main game operation methods to improve the playability of the game.

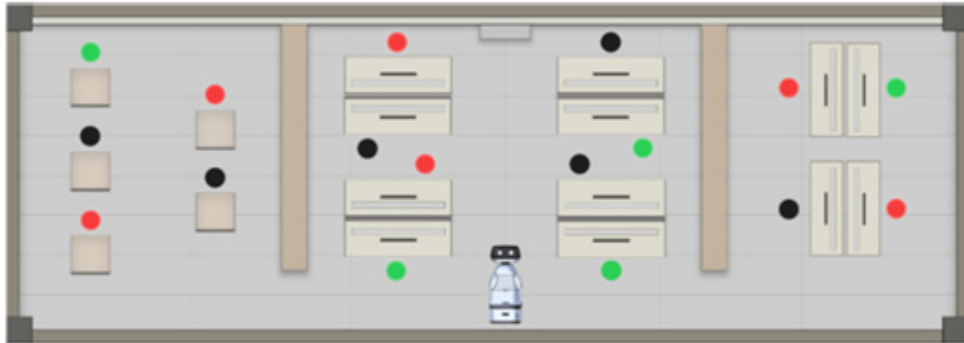
Figure 4 shows the task screen of a computer character set in the transition period of technological development. We combined the characteristics of computer processing forms and set the interactive game in this machine identity as calculating the data in the form and filling in the blanks. The player uses the picture information provided by the game, clicks on the calculator next to it to calculate the data in the blanks, and uses the keyboard to enter the correct answer. Blanks that are not filled in or are incorrectly filled in are colored red and turn white when the correct answer is entered, providing the player with a hint of the game situation.



**Fig. 4.** Form Filling Game Screen.

For example, Figure 5 is the task screen of the intelligent robot character set in the high-speed period of technological development. We combined the characteristics of intelligent robots

that can be moved and set the interactive game under this machine identity as operating the robot to move to complete the assignment of tasks. The player uses the keyboard AWSD to operate the robot to move back and forth to the red dot that needs to be assigned a task. When the red dots recognize the robot, they will turn into green dots, and when all the red dots on the screen turn into green dots, the game task will be completed.



**Fig. 5.** Mission Assignment game screen.

### 3 Implementation of game functions

#### 3.1 Dialog system

The dialog system is mainly used to advance the plot of the game. The functionality of the dialog system focuses on the display and replacement of text content in dialog boxes. The statement content of the list is initialized using hard-coded characters, and the display state of the sentence is detected using concatenation. Below is the core code:

```
IEnumerator TypeDialogue(string dialogue)
{
    string currentText = "";
    for (int i = 0; i <= dialogue.Length; i++)
    {
        currentText = dialogue.Substring(0, i);
        this.GetComponent<TextMeshProUGUI>().text = currentText;
        yield return new WaitForSeconds(delay);
    }
    nextButton.gameObject.SetActive(true);
    nextButton.interactable = true;
}
```

### 3.2 Backpack system

The backpack system is primarily a way to interact with the game and help organize the plot. The functionality of the backpack system focuses on the ability to click on the collect button of an element image and display the collected image in the backpack panel at the same time. Static instances are utilized to ensure that only one instance exists in the game in singleton mode, and storage slots are created on the backpack page based on the state of the collected element. Below is the core code:

```
public void AddNewItem()
{
    if (!playerInventory.itemList.Contains(thisItem))
    {
        playerInventory.itemList.Add(thisItem);
    }
    else
    {
        thisItem.itemHeld += 1;
        ShowPrompt();
    }
    InventoryManager.RefreshItem();
}
```

### 3.3 Interactive game implementation

The interactive game mainly uses mouse clicks to match information, a keyboard to input space information, and a keyboard to control the character's movement as the main interaction methods. The difficulty of realizing each interactive function lies in the keyboard control of the character's movement on the map. The game map is layered using Tilemap, and the rigid body component is added to realize the division of the moving space. Declare the speed variable of the moving character and write a method to detect the horizontal and vertical inputs of the keyboard keys and display the direction and distance of the character's movement. The following is the core code:

```
private void FixedUpdate()
{
    float moveX = Input.GetAxis("Horizontal");
    float moveY = Input.GetAxis("Vertical");
    animator.SetFloat("Horizontal", moveX);
    animator.SetFloat("Vertical", moveY);
}
```

```

    animator.SetFloat("Speed", moveDirection.sqrMagnitude);
    moveDirection = new Vector2(moveX, moveY).normalized;
    rb.velocity = moveDirection * moveSpeed;
}

```

## 4 Conclusions

In this paper, we designed and realized a 2D hand-drawn-style game mainly based on plot narration. Through the creative script and scene art design, it expresses the educational theme of being alert to the infinite development of science and technology and looking at the relationship between humans and machines dialectically and organically combines the game with education. The combination of plot-driven and puzzle games enhances the richness of the game interaction, and the unified art style and detailing also enhances the player experience.

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