图片包含 游戏机, 星星, 烟花

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Neurons

By Hao Wang

Simulating the dynamic resonance of a network of neurons, the viewer is guided to find connection and serenity between behavior and heart.

https://vimeo.com/1046066402?share=copy#t=0

Introduction

Neuron is a meditative experience piece centered on interactive art, inspired by a concept I have previously proposed - Ecological Mind. The work uses a camera to capture the viewer's movements, and through the alternating changes of the network and red and white dots, it simulates the dynamic responses of neurons in both resting and active states. The core concept of this work is to explore the deep connection between human behavior, emotions and the inner neural network. Through a simple and intuitive form of interaction, the audience can intuitively feel how their own actions affect the surrounding environment, and in the process become aware of the correlation between their own internal states and external behaviors.

Concept and Background Research

Neurons are inspired by a concept I proposed earlier - Ecological Mind. this is based on the current human way of collaborating on the Internet, which is similar to a network of neurons forming a complex collaborative system that adapts and regulates its own changes and the surrounding environment. Such a network of human communities constitutes a system of ecological mechanisms in the social environment, forming the Ecological Mind: in the unbalanced development of the individual and the group, each unit of neurons (referring to individuals/persons) communicates with the environmental ecology, while maintaining self-regulation and evolution.

图示

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图形用户界面, PowerPoint

描述已自动生成This work incorporates more complex ecological dynamics by combining Bateson's Steps to an ecology of mind with Latour's Reassembling the Social: an Introduction to Actor-network-theory to simulate the reality of multiple levels of feedback between the individual, the group and the environment. and the environment in reality.

Technical Implementation

This work combines a variety of technologies, centered around visual computing, interactivity and dynamic drawing techniques.

The first challenge was to create a network of neurons, for which I sought out a mathematical formula - the Lissajous curve - from the Generative Design website. This code uses the Lissajous curve to generate a collection of points that vary in frequency and outputs a static picture of the model.

卡通人物

中度可信度描述已自动生成 图片包含 画

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I then adjusted the curve to dynamically change based on frequency (freqX, freqY) and phase (phi), and the curve is continuously redrawn based on changes in p.frameCount to show the changing dynamics.

I then use the camera to determine if there is motion by comparing the difference in pixel values (motionAmount) between the current frame and the previous frame. The results of the detection are used to trigger animation effects (such as nodes turning red or lines changing color).

鱼在游泳

低可信度描述已自动生成 图片包含 灯光, 黑暗, 雨, 停止

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Finally, I dynamically resize the canvas to fit the window with p.windowResized and p.resizeCanvas. But this causes the graph to stretch and lose its aesthetics, so I try proportional scaling based on the height of the window to ensure that the curved graph stays in good visual proportion across screens.

Reflection and Future Development

This project was relatively smooth, successfully implementing dynamic visual art based on Lissajous curves and detecting real-time motion control node colour changes. However, I found that there is still room for improvement in the accuracy of motion detection and the singularity of interaction (e.g., I found that if the lights were turned off during video production, the camera would not be able to detect the motion and the interaction effect would be lost). In the future, I might optimise the diversity and hierarchy of the visual presentation and add more interactive experiences, such as gesture recognition, audio-driven, and multi-user interaction. Meanwhile, the project can realise the effect of a meditation art gallery through spatial design and experience design.

References

[1]. Bateson, G. (1972). Steps to an ecology of mind. Chicago: University of Chicago Press.

[2]. Latour, B. (2005). Reassembling the Social: an Introduction to Actor-network-theory. Oxford University Press.

[3]. Generative-gestaltung.de. (2025). *Generative Design*. [online] Available at: http://www.generative-gestaltung.de/2/sketches/?02\_M/M\_2\_5\_01 [Accessed 11 Jan. 2025].