

渡鳥畫廊 Doniao Gallery

專題編號：109-CSIE-S015

執行期限：108 年第 1 學期至 109 年第 1 學期

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一、摘要

Doniao Gallery is an interactive experience themed “belongingness” that focuses on the implementation of emotion recognition and IoT technologies. The project is done in collaboration with undergraduates from the university’s Department of Interaction Design.

關鍵詞： Belongingness, Affective Computing, Emotion Recognition, IoT。

二、緣由與目的

Belongingness is fundamental to individual well-being. Yet, as young Taiwanese now spend more and more time at the workplace, belongingness has become increasingly neglected. *Doniao Gallery* aims to help our community acknowledge this problem and take corresponding actions by letting each and every person experience, contact, and immerse in two unique interactive artworks.

三、研究範圍

The project focuses on the implementation of emotion recognition and IoT technologies.

四、使用技術方法

(1) Unity system: Unity app is the main program that integrates all parts and technologies of the project. The system is implemented with State pattern and various algorithms such as shader (for rendering),

Bazier, etc.

(2) Kinect touch subsystem: Kinect detects and processes touches on screens using camera depth data, which is augmented with median filtering algorithm that reduces data noises.

(3) Android Studio networking subsystem: Android-OS device communicates with Unity app using network socket.

(4) Emotion recognition subsystem: 2D face image (captured by camera) emotion recognition is developed using OpenCV, PyTorch, Dlib, onnx. Recognition result is then sent to Unity app by network socket.

(5) RPi IoT subsystem: Raspberry Pi transfers infrared sensor signal via TCP to Unity app, which processes the signal with multithread.

五、架構流程

There are two independent interactive experiences (artworks), namely 生活 and 夢境. Each is presented on a computer screen, activated by motion detection, and lasted for 90 seconds.

生活 asks the user to pick up a phone to listen to a collection of “caring” messages. Concurrently, the user’s emotion is captured and reflected on the screen upon three tones: happy, sad, and unemotional.

夢境 captures the user’s emotion constantly to generate orbs of two types (positive and negative) at three placements in the artwork: back-, middle- and fore-ground. The user moves a character on the screen with his/her hand to consume

these orbs, setting corresponding artwork's "grounds" to be either positive or negative.

六、工具說明

- (1) Languages: C#, Python, Java.
- (2) Frameworks: UWP, MSTest, PyTorch, Dlib, OpenCV, onnx.
- (3) Tools: Unity, Visual Studio, Android Studio, PyCharm, Git.
- (4) Peripherals: Raspberry Pi, Kinect, Digital camera, Infrared sensor, Android-OS device.

七、結論

We learnt a lot regarding software engineering, AI, and IoT. The collaboration with students from the Department of Interaction Design also provides us with new insights in teamwork, communication, and project management. The result has been promising, and we look forward to continuing the project in the future.

參考文獻

- 1. <https://github.com/WuJie1010/Facial-Expression-Recognition.Pytorch>
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