作品名稱：Dream Painter
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出處：ACM MM 2022, Interactive Art https://dl.acm.org/doi/10.1145/3503161.3549976

KEYWORDS：Interactive Art, Co-creative AI, Robotic Art, Speech-to-image, Human-Centered-Interface, Latent-space

報告者：
111003853 iPhD Techart 劉士達 S.T. Liu

https://youtu.be/QngWQeS93gc

Art Statement

Dream Painter is an interactive robotic art installation that turns the audience's dreams into a collective painting. Tell your dream that you saw last night to a robot and the machine will paint it! The artwork consists of multiple parts: interaction station, painting robot, a kinetic and animated mechanism that moves the paper roll when one drawing is finished, and creative coding that transforms a spoken word to art on the canvas (we use machine learning (AI) for that). The robot paints with 8 colors. We all dream. Some dreams we remember in the morning, some are just gone. Often, the ones we record we hardly understand until the end. Well-known psychoanalysis Sigmund Freud has dedicated a lot of effort in understanding the human unconscious through analysing dreams. Freud was convinced in the power of the dreamworld when understanding the human mind. In his famous book Interpretation of Dreams he states the following: "The interpretation of dreams is the royal road to a knowledge of the unconscious activities of the mind." (Sigmund Freud, 1899) The artwork poses several important questions, like: can machine understand our unconscious? What happens if algorithms will be able to make sense of our dreams, understand us better than we do? Is there a limit of trust when it comes to the relationship between humanity and technology?

這是一件以即時AI演算法結合機器手臂，透過聲音辨識說出參與者的夢境，轉換成為一幅1~8色所繪製的圖案。作者希望透過這件作品提出幾個問題，來印證佛洛依德提到解釋夢境可以了解人類無意識活動。而這些問題包含了從機器能理解人類的無意識嗎？ 如果AI可以理解我們，那麼人類與技術之間的關係是否存在信任的限制？
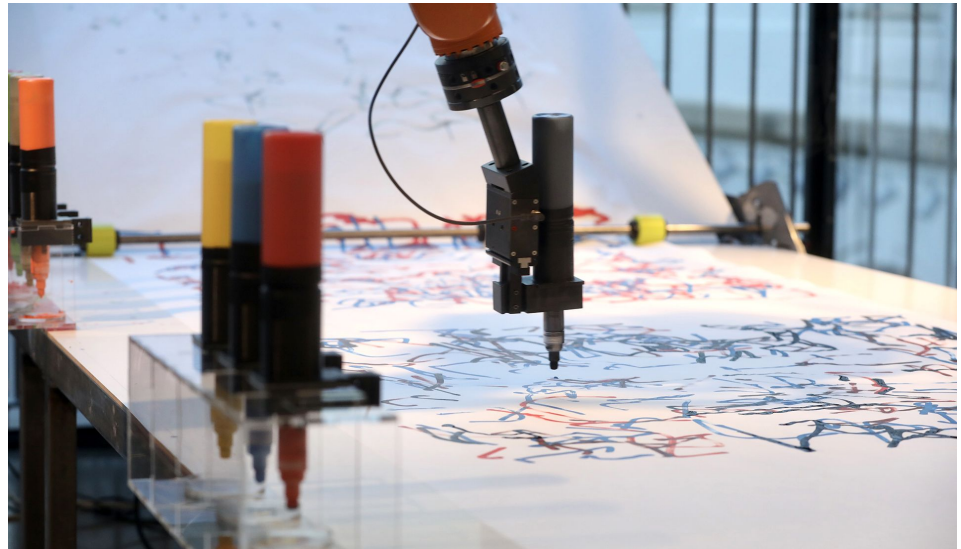
Authors
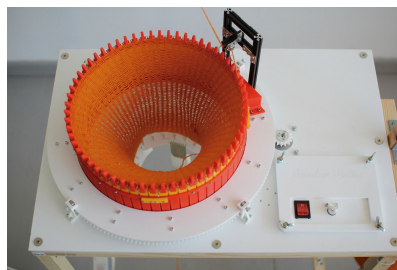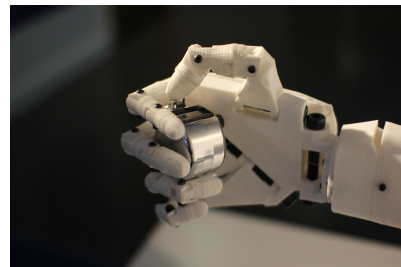
Varvara Guljajeva (Estonia)
現任：香港科技大學 助理教授
　　　主持媒體與藝術計算實驗室
學歷：愛沙尼亞 藝術學院 博士
專長：人工智慧、裝置藝術、聲音藝術、數位自造
經歷：曾在Ars Eletronica Museum、ZKM、MAD(NY)、
FACT(UK - Liverpool)、Santa Monica(Barcelona)、V&A
Museum(UK)...等展出
近年來在CMU (US)、DRHA(London)、Siggraph 2022演講與
擔任兼任講師，主題以AI、NFT、生成繪圖...等主題。

Mar Canet Sola (Barcelona, Spain)
現任：Tallinn Univ. Research Fellow
　　　Cudan Open Lab
學歷：愛沙尼亞 塔林大學 博士
　　　奧地利林茲藝術與設計大學 介面與文化設計碩士
專長：電腦程式設計、介面設計、數位自造
經歷：曾在Ars Eletronica Museum、ZKM、MAD(NY)、
FACT(UK - Liverpool)、Santa Monica(Barcelona)、V&A
Museum(UK)...等展出。
他也曾創辦Derivart and Lumm工作室

Related Work

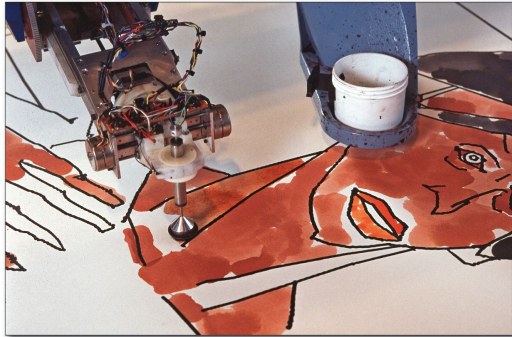similarly states that AI is not making art without the artists and that it is just a new tool.

赫斯曼提到如果AI沒有藝術家的情況下創造出藝術，他只是一種新工具而已。

Related Work

AARON
by Harold Cohen (1928-2016)
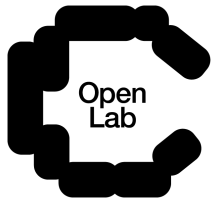2007

Drawing robots 5RNP
by Patrick Tresset
2015

Assembly Lines
by SougWen 愫君 Chung
2022

https://vimeo.com/144150449?embedded=true&source=vimeo_logo&owner=3324574

Background - AI (Speech-to-image)

CUDAN（**Cu**ltural **Da**ta **An**alytics）

實驗室核心人物：Maximilian Schich、Indrek Ibrus、Marek Tamm 三位教授主持

實驗室主要核心研究：Machine Learning、Analyze Images、audio/visual、Large Data、Artifical Neural Science

Background - $$$ Money $$$

[Horizon](#) Europe 2014~2027
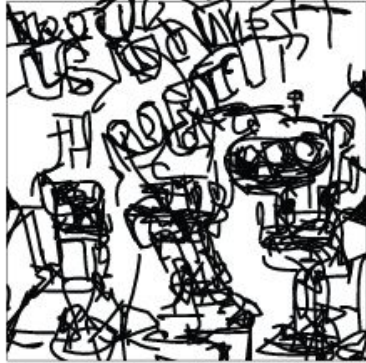
歐洲聯盟(歐盟)合資每年投入大量
資金支持科研計畫, 預計已超過 95.5
億歐元進行科學研究。

該作者是申請Horizon 2020年度的經費
進行整個專案製作與研發工作, 並結合
塔林大學Open Lab進行共同研發創
作。

Background - Generated drawings

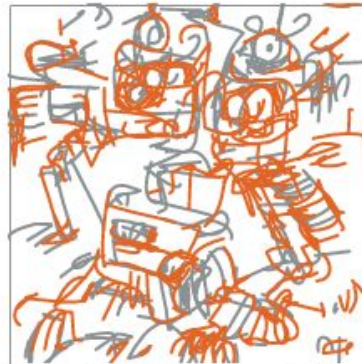hello robot we thought that you had already heard us but

Floating in the waters of the Mediterranean in Mallorca

I walking on the street Via Rocco lying on the floor

A girl skating

I dreamed of two robots killing each other

We climbed upstairs Installer

Background - AI model(CLIPdraw)

CLIPDraw: Exploring Text-to-Drawing Synthesis through Language-Image Encoders

Kevin Frans (MIT)

L. B. Soros (Cross Labs, JP)

Olaf Witkowski (Cross Labs. JP)

Abstract

CLIPDraw is an algorithm that synthesizes novel drawings from natural language input. It does not require any additional training; rather, a pre-trained CLIP language-image encoder is used as a metric for maximizing similarity between the given description and a generated drawing. Crucially, CLIPDraw operates over vector strokes rather than pixel images, which biases drawings towards simpler human-recognizable shapes. Results compare CLIPDraw with other synthesis-through-optimization methods, as well as highlight various interesting behaviors of CLIPDraw.
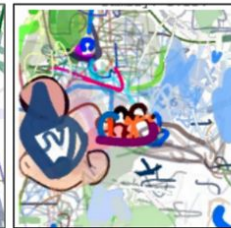
"A drawing of a cat".

"Horse eating a cupcake".

"A 3D rendering of a temple".

"Family vacation to Walt Disney World".

"Self".

Background - Differentiable Rasterizer 可微分光閘

Differentiable Vector Graphics Rasterization for Editing and Learning

https://people.csail.mit.edu/tzumao/diffvg/

Tzu-Mao Li (MIT)
Michal Lukac (Adobe Research)
**Michael Gharbi (Adobe Reearch)**
Jonathan Ragan-Kelley (MIT)

Abstract

We introduce a differentiable rasterizer that bridges the vector graphics and raster image domains, enabling powerful raster-based loss functions, optimization procedures, and machine learning techniques to edit and generate vector content. We observe that vector graphics rasterization is differentiable after pixel prefiltering. Our differentiable rasterizer offers two prefiltering options: an analytical prefiltering technique and a multisampling anti-aliasing technique. The analytical variant is faster but can suffer from artifacts such as conflation. The multisampling variant is still efficient, and can render high-quality images while computing unbiased gradients for each pixel with respect to curve parameters.

We demonstrate that our rasterizer enables new applications, including a vector graphics editor guided by image metrics, a painterly rendering algorithm that fits vector primitives to an image by minimizing a deep perceptual loss function, new vector graphics editing algorithms that exploit well-known image processing methods such as seam carving, and deep generative models that generate vector content from raster-only supervision under a VAE or GAN training objective.

(a) vector sculpting   (b) painterly rendering   (c) image vectorization
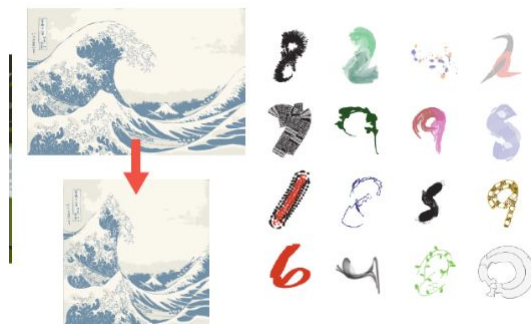
(d) seam carving   (e) generative modeling

Connection - DALL-E 2 (OpenAI)

OpenAI

- 創立於：2015年於美國San Francisco
- 創辦人：Sam Altman, Reid Hoffman(linkedIn), Jessica Livingston, Elon Musk, Ilya Sutskever, Peter Thiel and others.
- 兩間公司：OpenAI Inc(非營利)與OpenAI LP(營利/有限獲利)
- 微軟已投資100億以上在OpenAI LP, 獨家供應給Azure, 現已轉為New Bing搜尋引擎
- OpenAI公司在2020年發表的GPT-3(Generative Pre-trained Transformer 3)模型, Stanford大學研究 GPT3相當7歲兒童, 2022年發表的GPT3.5心智年齡約9歲。
- OpenAI的產品/研發中產品：

  ChatGPT　　人工智慧聊天與應答機器人　　　　／相似產品：ChatGPT Plus、GPT-4
  DALL-E2　　人工智慧文字產生圖片機器人　　／相似產品：DreamStudio、Craiyon
  Whisper　　人工智慧語音辨識機器人　　　　／相似產品：Deepgram、AssemblyAI
  JukeBox　　人工智慧音樂點唱機機器人　　　／相似產品：Loudly、Melobytes
  MuseNet　　人工智慧音樂生成機器人　　　　／ 相似產品：AIVA、Boomy
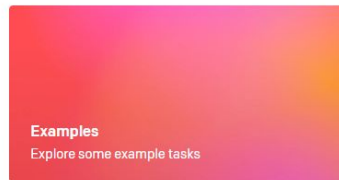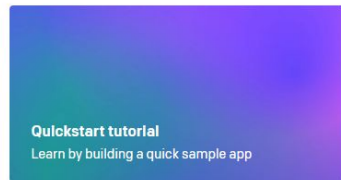
Connection - DALL-E 2 (OpenAI)

OpenAI API

- [Code Completion](#)
- Chat Completion
- Edit Completion
- [Images Generation](#) ([DALL-E](#))
- Fine-tuning (微調AI模型)
- Embeddings (搜尋、叢集、推薦…)
- Audio (語音轉文字，目前只有英文)
- Files
- Moderations (過濾不雅詞彙或違反內容政策)

Welcome to OpenAI

Start with the basics

Quickstart tutorial
Learn by building a quick sample app

Examples
Explore some example tasks

Examples
Explore what's possible with some example applications

Search...   All categories

Q&A
Answer questions based on existing knowledge.

Grammar correction
Corrects sentences into standard English.

Summarize for a 2nd grader
Translates difficult text into simpler concepts.

Natural language to OpenAI API
Create code to call to the OpenAI API using a natural language instruction.

Text to command
Translate text into programmatic commands.

English to other languages
Translates English text into French, Spanish and Japanese.

Natural language to Stripe API
Create code to call the Stripe API using natural language.

SQL translate
Translate natural language to SQL queries.

Parse unstructured data
Create tables from long form text

Classification
Classify items into categories via example.

Python to natural language
Explain a piece of Python code in human understandable language.

Movie to Emoji
Convert movie titles into emoji.

Calculate Time Complexity
Find the time complexity of a function.

Translate programming languages
Translate from one programming language to another

Advanced tweet classifier
Advanced sentiment detection for a piece of text.

Explain code
Explain a complicated piece of code.

Connection - DALL-E 2 (OpenAI)

Keywords: My dream, fish, center, black
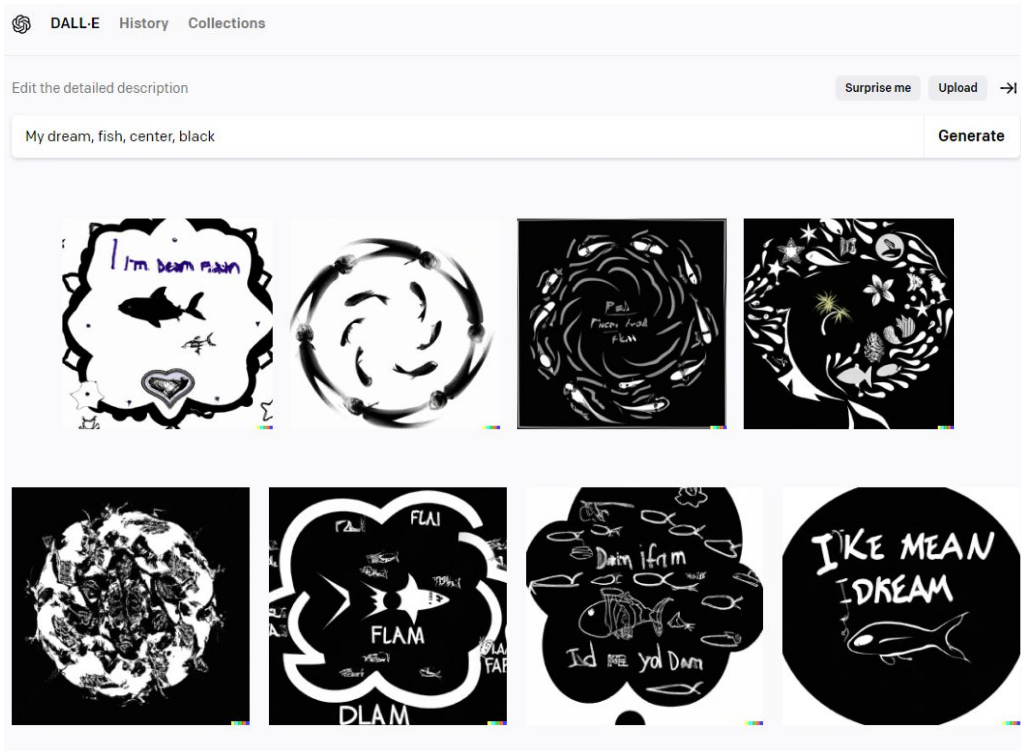
可能的作法想像：

DALL-E 2
可透過文本方式 產生人工智能繪圖

1.假設透過OpenAI的API進行串接
可運用Speech-to-text工具，將語音轉成文字型態，以前曾運用過工研院的TTS(Text-to-Speech)；Google後來也推出了 Cloud STT(Speech-to-Text) 可以精準自動語音辨識(ASR)

2.轉換完成文字之後就能帶入DALL-E2的API進行轉換成繪圖的樣式

3.機器手臂的繪製路徑生成，必須靠各廠牌機器手臂的程式語言(Python、C++)，或是直接讀取向量格式(SVG、DXF)

Comment

Drawing Robot很多人做過類似專案，能再次用此方式上ACM MM的互動作品特殊之處在於結合了多種新舊技術的整合。曾經印象最深刻的作品是去2019威尼斯雙年展的時候看過Sun Yuan and Peng Yu(孫原、彭禹): Can't Help Myself。

也許這類的作品持續會結合虛擬世界Metaverse或運用GPT-3或4的AI功能

https://www.youtube.com/watch?v=ZS4Bpr2BgnE

Extend - Dobot ARM 2.0 桌上型機器手臂

ConnectDobot 9600Bd
repeat 10 times
do GetPose
DisconnectDobot

Dobot Blocky

Graphical programming tools

SDK API

图形化编程

書畫技法　精益求精

支持BMP、SVG、DXF等格式
點線面一應俱全
0.2mm重複定位精度
帶來精湛筆法
大功率激光雕刻
木料、皮革不在話下

References

Original Link:
https://dl.acm.org/doi/pdf/10.1145/3503161.3549976

Art Work Website:
https://var-mar.info/dream-painter/

Artists:
https://var-mar.info/about/

Related Works:

AARON
https://www.semanticscholar.org/paper/Harold-Cohen-and-AARON-Cohen/0835f128bfd720dcb1b2ab507781ff9ab4855cba

Drawing robot 5RNP
https://www.digitaltrends.com/cool-tech/robotic-artist/

Assembly Lines
https://sougwen.com/project/assembly-lines-2022