

地圖風格自動化轉換 技術發展

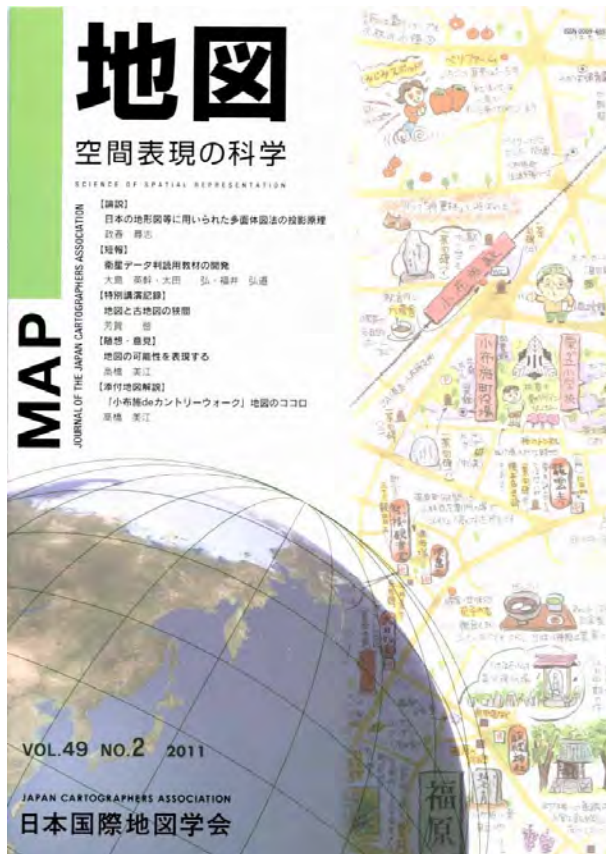
廖沄銘 研究副技師

中央研究院人社中心地理資訊科學研究專題中心
(中華民國地圖學會秘書長、臺灣地理資訊學會常務理事)

大綱

- 何謂「地圖風格自動化轉換」？
- 基於向量式GIS資料庫之地圖風格轉換
- 基於網格式地圖影像庫之地圖風格轉換
- 小結

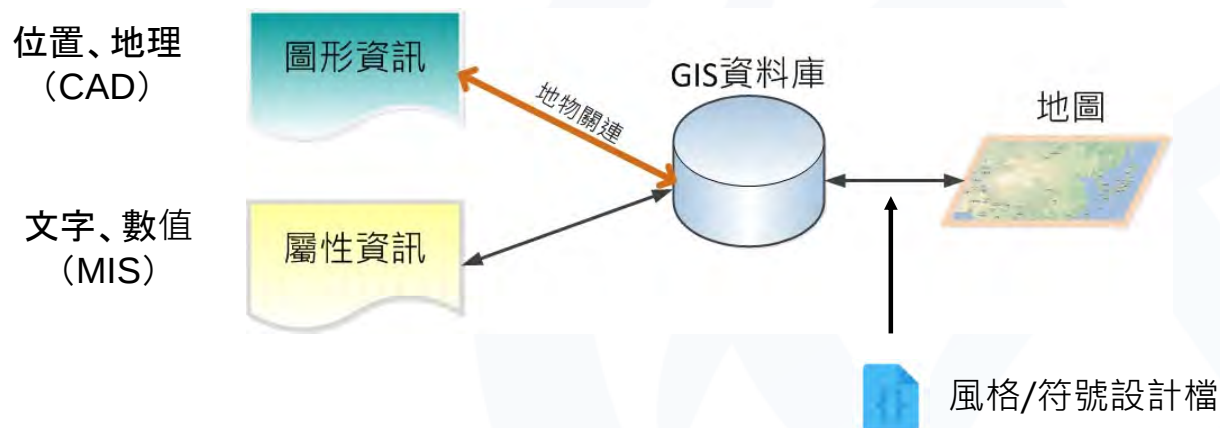
地圖是地理空間資訊表現之科學



地圖風格自動化轉換

- 地圖是地理實體或地理資訊模型的符號化 (symbolology) 表現，亦是地理資訊系統 (GIS) 的主要表現形式。
- 根據地圖的用途、主題及使用對象而有不同的設計風格 (Styles)；同時，註明的製圖師或地圖出版公司都有各自獨特的地圖設計風格。
- 基於既有地理資訊資料庫，針對不同用途自動化產生對應風格的地圖圖像，可以減少地圖編輯工作量及增加地圖的可利用性及選擇 (例如: GIS 底圖)。

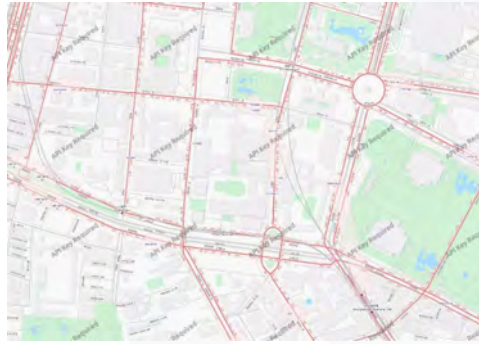
基於向量式GIS資料庫 之地圖風格轉換



基於開放街圖(OpenStreetMap)資料庫產生的不同風格地圖



OSM



OSM Transport



OSM Bike Map



OSM Humanitarian



Stamen



Stamen Watercolor/OSM

Stadia Maps

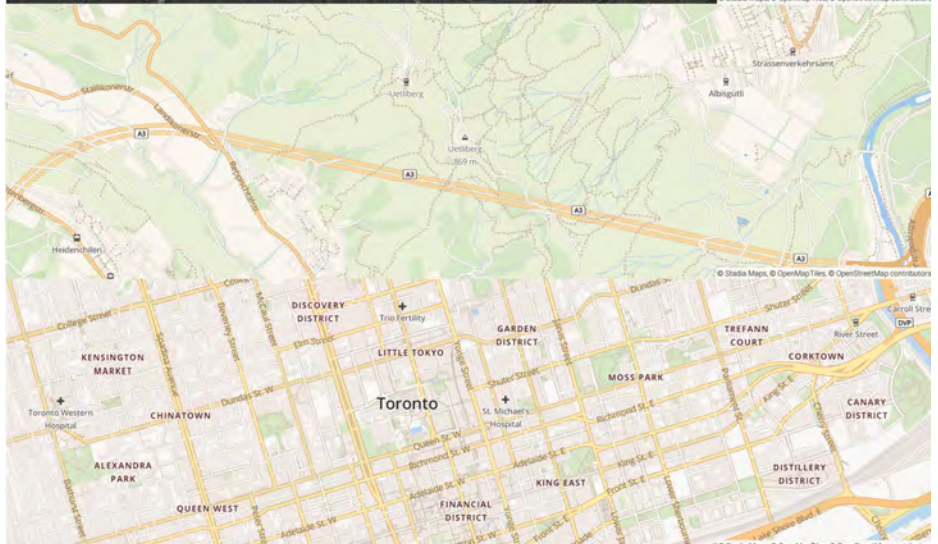
Alidade Smooth



Alidade Smooth Dark



Outdoors



OSM Bright

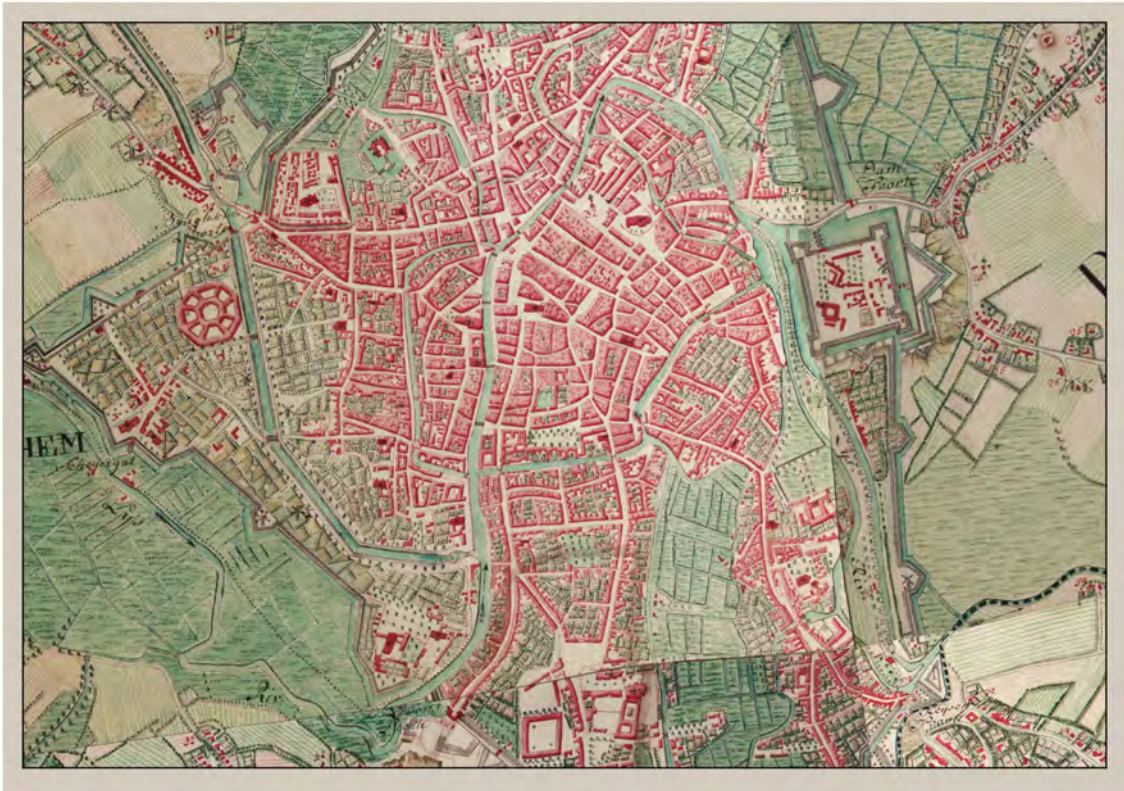
古圖變新圖



廖汝銘、莊廷瑞、黃正鵬、劉濠雄，2014，〈利用開放街圖建立歷史地圖重繪版－以台江內海地區為例〉，發表於第十四屆地圖學術研討會，臺北 臺北市立大學。

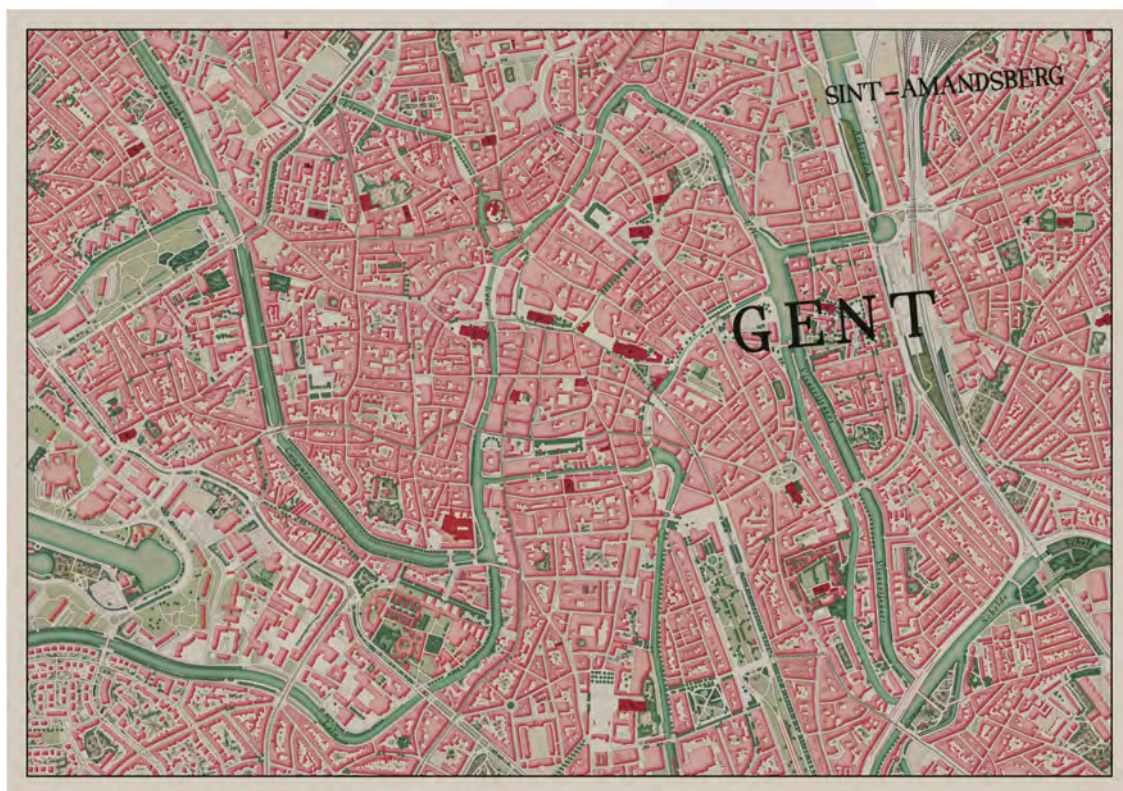


- 網友Manuel嘗試利用運用QGIS軟體及OSM圖資繪製仿古風格（1777 Ferraris map 風格）地圖



1777 Ferraris map of Ghent

新圖變古圖



2021 FerrarGIS map of Ghent

ArcGIS Pro Styles

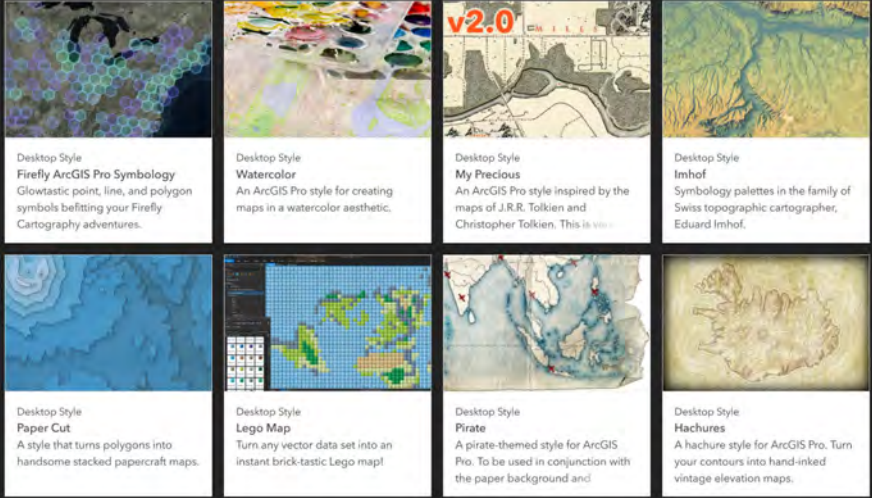
Styles are containers that store symbols, colors, color schemes, label placements, and layout items. They promote consistency and standardization across maps, scenes, and layouts. The symbol galleries and color pickers you work with when you author maps, scenes, and layouts are populated by items stored in styles.

ArcGIS Pro Styles

Download Styles for ArcGIS Pro
Explore and download an assortment of styles for use in ArcGIS Pro.

Creative Styles
These styles provide symbology to make fun and creative maps.

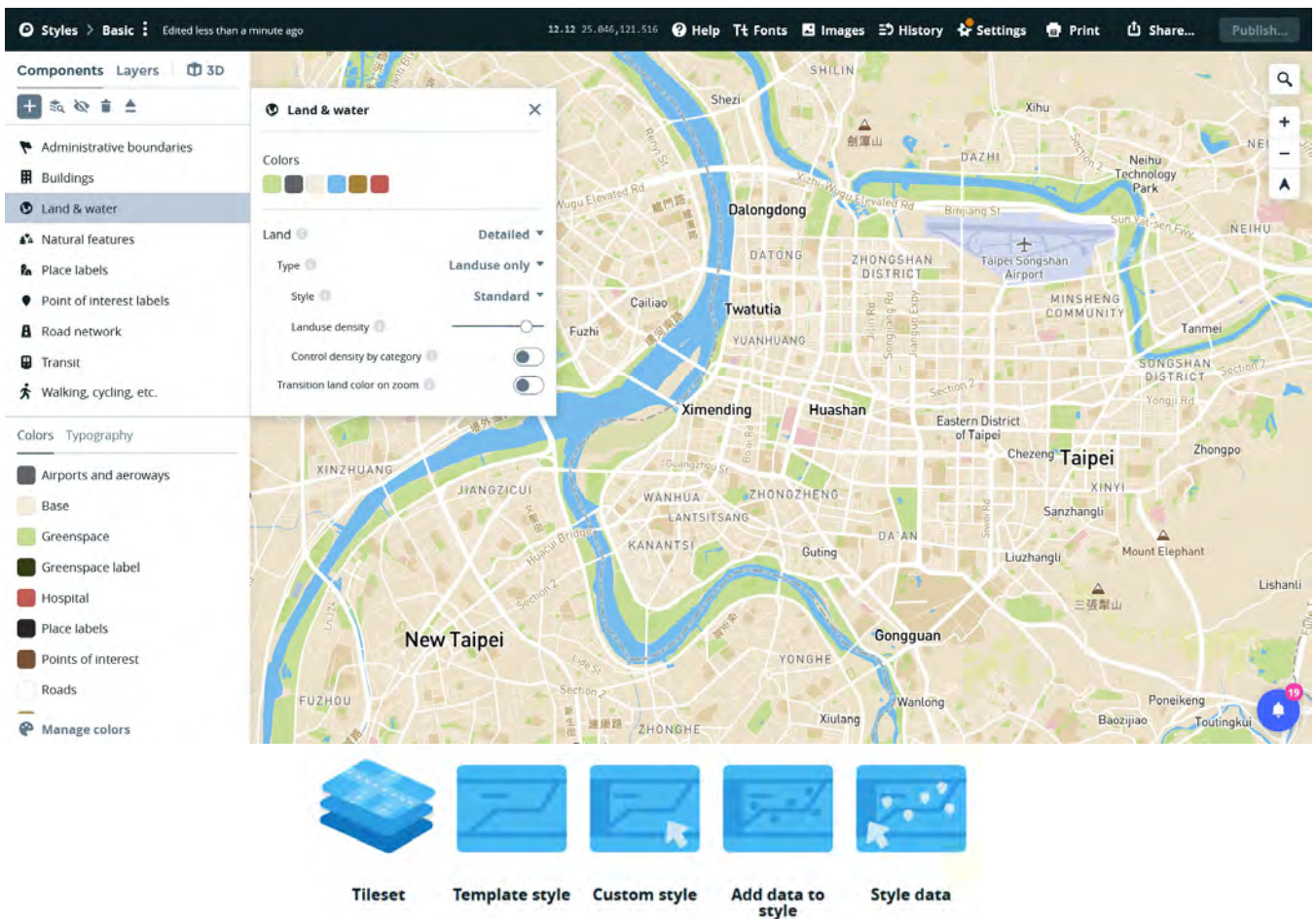
- Click "View Gallery" to access additional creative styles for use in ArcGIS Pro!
- Click on one of the card previews below to instantly download the style.



Desktop Style	Preview	Description
Firefly ArcGIS Pro Symbology		Glowtastic point, line, and polygon symbols befitting your Firefly Cartography adventures.
Watercolor		An ArcGIS Pro style for creating maps in a watercolor aesthetic.
My Precious		An ArcGIS Pro style inspired by the maps of J.R.R. Tolkien and Christopher Tolkien. This is view...
Imhof		Symbology palettes in the family of Swiss topographic cartographer, Eduard Imhof.
Paper Cut		A style that turns polygons into handsome stacked papercraft maps.
Lego Map		Turn any vector data set into an instant brick-tastic Lego map!
Pirate		A pirate-themed style for ArcGIS Pro. To be used in conjunction with the paper background and
Hachures		A hachure style for ArcGIS Pro. Turn your contours into hand-drawn vintage elevation maps.

檢視圖庫

Mapbox Studio: style editor



The screenshot shows the Mapbox Studio interface with a map of Taipei. The left sidebar contains a 'Components' panel with categories like Administrative boundaries, Buildings, Land & water, Natural features, Place labels, Point of interest labels, Road network, Transit, and Walking, cycling, etc. The 'Land & water' component is selected, showing a 'Land & water' panel with color and land use controls. The main map area displays a detailed view of Taipei, including districts like Dalongdong, Twatutia, Ximending, Huashan, and Gongguan. The bottom of the interface features a 'Tileset' section with icons for Template style, Custom style, Add data to style, and Style data.

基於網格式地圖影像庫 之地圖風格轉換

AI產生的畫作



Jason Allen's art created on Midjourney titled "Space Opera Theater"

AI影像產生器

- Midjourney
- Stable Diffusion
- DALL-E



a watercolor drawing of city map in the Asia by DALL-E



a watercolor drawing of city map in the Asia by Midjourney

基於(生成對抗網路)GAN的無監督圖像轉換技術 (image-to-image translation)

1.CUT

github: <https://github.com/taesungp/contrastive-unpaired-translation>

paper: <https://arxiv.org/abs/2007.15651>

2.CycleGAN

github: <https://github.com/junyanz/pytorch-CycleGAN-and-pix2pix>

paper: <https://arxiv.org/abs/1703.10593>

3.Pix2Pix

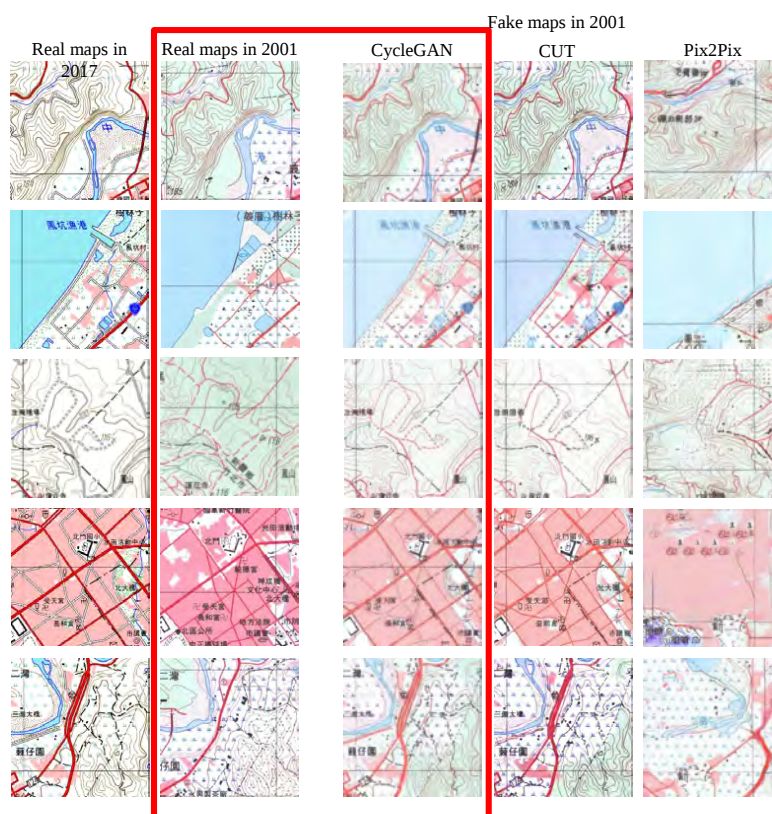
github: <https://github.com/junyanz/pytorch-CycleGAN-and-pix2pix>

paper: <https://arxiv.org/abs/1611.07004>

基於圖像轉換技術進行地圖風格轉換

目前進行中的實驗：

將2017年二萬五千分
一基本地形圖樣式轉
換成2001年二萬五千
分一經建版地形圖
(第三版)樣式。



(地圖引用自二萬五千分一經建版地形圖)

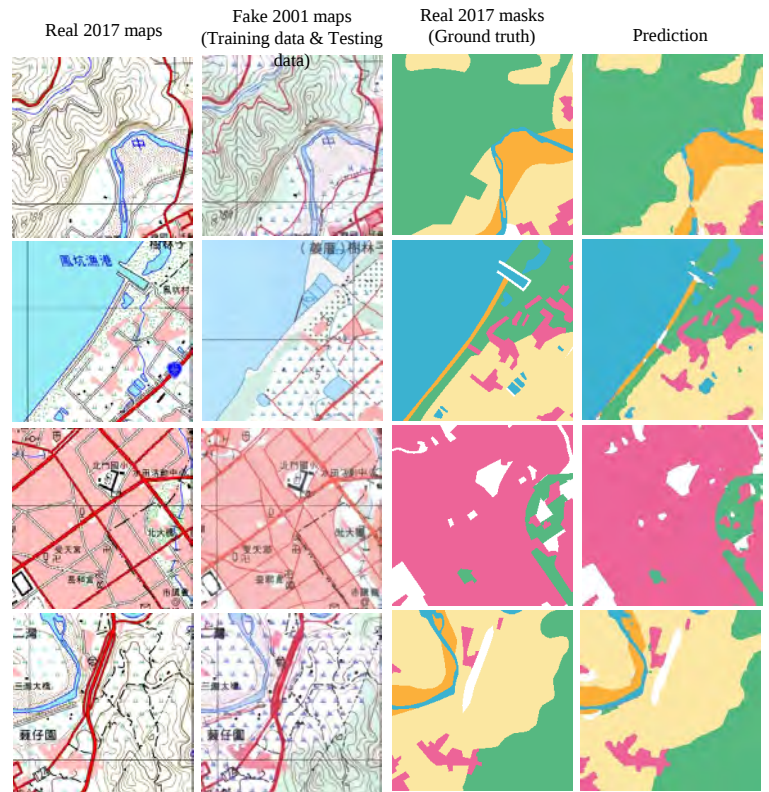
地圖風格轉換



Experiments -

Fake 2017 Model Evaluate 2017 Data

- Training data: fake 2001 maps
- Testing data: fake 2001 maps
- PA: 0.9281
- mIoU: 0.6627



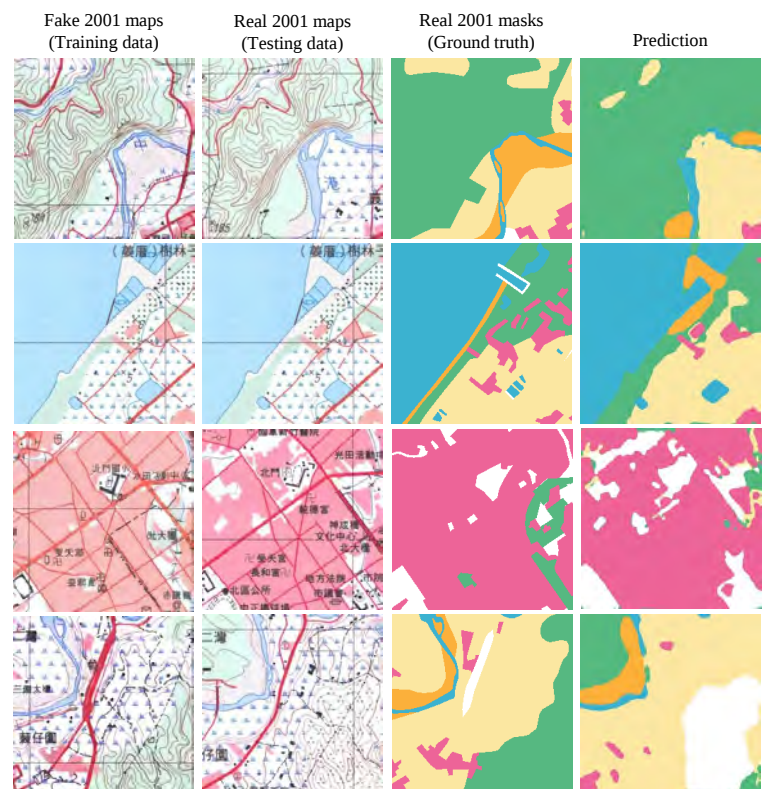
運用2017年模型來分類2001年地圖



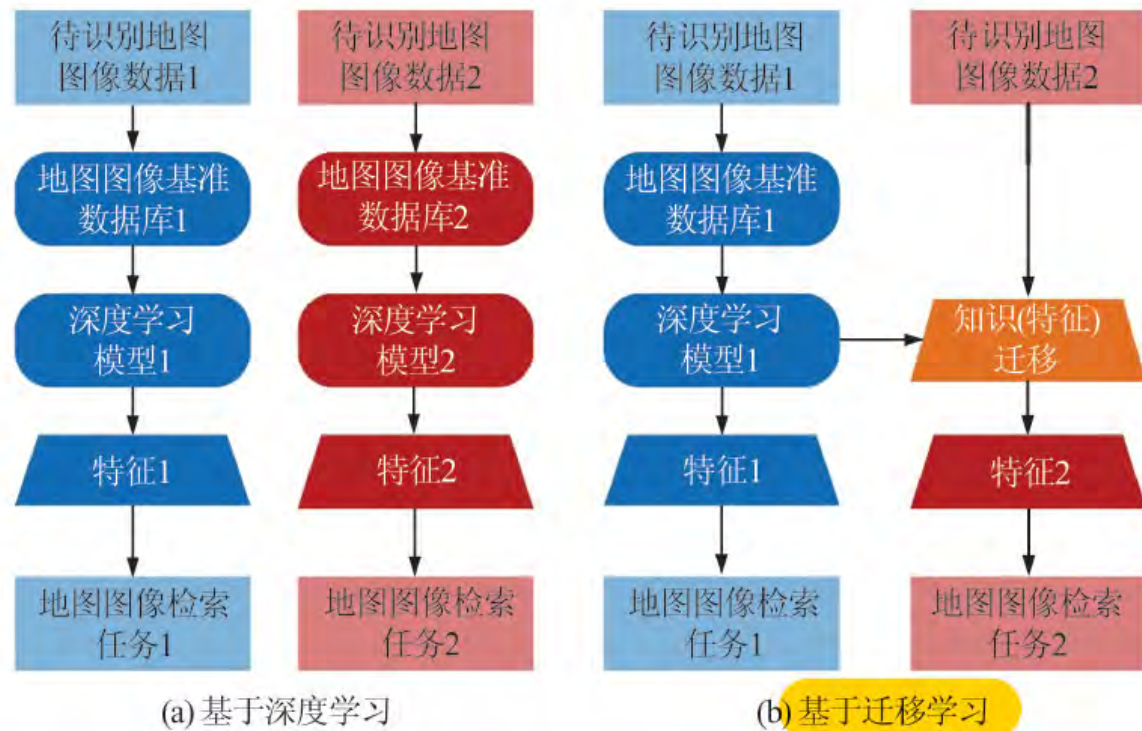
Experiments -

Fake 2017 Model Evaluate 2017 Data

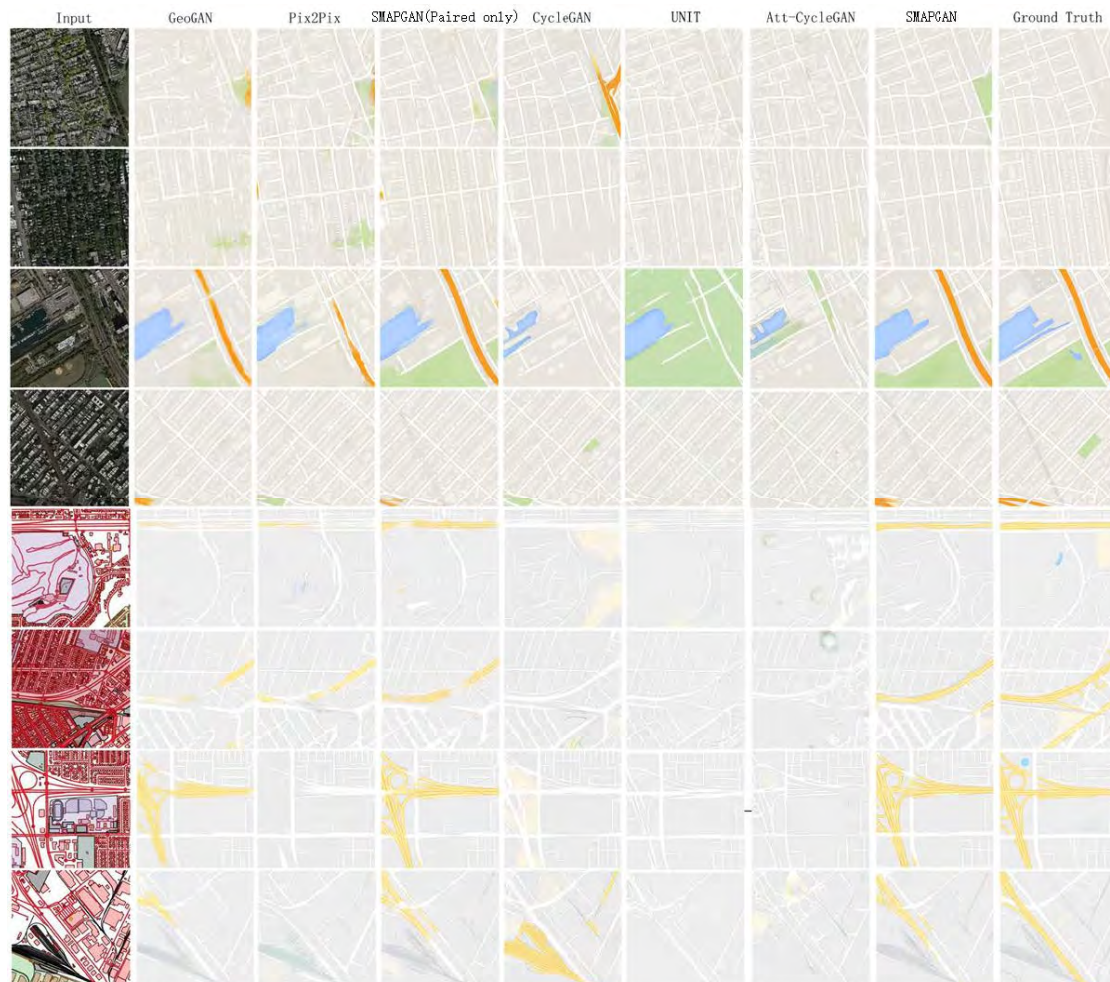
- Training data: fake 2001 maps
- Testing data: real 2001 maps
- PA: 0.8166
- mIoU: 0.4271



基於Transformer架構地圖辨識DL模型



周熙然, 李德仁, 薛勇, 汪云甲, 邵振峰. 地图图像智能识别与理解：特征、方法与展望[J]. 武汉大学学报 信息科学版, 2022, 47(5): 641-650. doi: 10.13203/j.whugis20210300



"SMAPGAN: Generative Adversarial Network-Based Semi-Supervised Styled Map Tiles Generation Method" by Xu Chen, Songqiang Chen, Tian Xu, Bangguo Yin, Jian Peng, Xiaoming Mei and Haifeng Li.