

中文摘要

經皮置管引流微創手術是現今急性胰腺炎手術治療常採用的治療方法，穿刺引流治療的成功關鍵在於 CT 影像是否能精準定位病灶區域，腹腔內有許多器官，再加上急性胰腺炎病患游離積液的分布，導致各器官與積液的界線很難準確地分割，在臨床治療中受到醫師的個人經驗和能力很大的影響。

CTSI 評分是目前在急性胰腺炎診斷中廣泛使用的影像評分系統，分析 CT 影像後得到的數值結論，是判斷此病人是否進行手術的重要指標。本研究開發一套系統，透過人工智慧及影像處理演算法掃描腹部增強 CT 並判斷影像中胰腺及積液區域，以立體空間的概念進行影像分析提升準確率。

本研究整理共 20 例病例的增強 CT 影像，並由醫師進行胰腺及積液的標準畫記，透過 Faster R-CNN 物件偵測建立模型，並且透過 Region Growing 及 Gaussian Filter 等影像處理技術來準確判斷 CT 影像中胰腺或積液的區域，重建 3D 影像及相關結構定位，計算胰腺壞死百分比、積液區域數量，進而計算 CTSI 評分結果。

本研究所提出的方法，為驗證其準確度及可靠性，實驗的結果以三部分進行分析，分別為(1)切片影像胰腺分割準確率分析：透過重合率(DICE)、體積重疊誤差(VOE)及相對體積誤差(RVD)三指標進行自

動分割區域與標準區域比對精準度評估，驗證此自動分割系統對 CT 影像的適用性。(2)積液區塊數量分析：透過 3D 重建計算積液區塊數量與醫師的評斷是否相符，驗證此系統的準確性。(3)CTSI 評分分析：由系統給出的自動化 CTSI 評分與醫師團隊綜合給出的評分，兩評分相比較確定此系統具有高度的可靠性。

本研究主要透過人工智慧影像特徵提取、影像處理與三維空間疊合，病兆區域立體可視化並計算出 CTSI 評分，提供醫師在術前擬定手術計劃有客觀分析作為參考，以提升執行插管手術時的準確性及安全性。

關鍵字—急性胰腺炎、CTSI 評分、人工智慧物件偵測、Faster R-CNN、影像重建

英文摘要

Minimally invasive surgery for percutaneous catheter drainage is a commonly used treatment for acute pancreatitis. The key to the success of puncture drainage therapy is whether CT images can accurately locate the lesion area, many organs in the abdominal cavity, plus acute pancreatitis. There is also a distribution of free effusion, which makes it difficult to accurately divide the boundaries between organs and effusions, and is greatly affected by the personal experience and ability of physicians in clinical treatment.

The CTSI score is an image scoring system widely used in the diagnosis of acute pancreatitis. The numerical conclusion obtained after the analysis of the image is an important indicator for judging whether or not the patient is undergoing surgery. This study developed a system to scan abdominal augmentation CT and determine the pancreas and effusion area in the image through artificial intelligence and image processing algorithms, and to improve the accuracy by using the concept of three-dimensional space.

This study collated augmented CT images of 20 cases, and the doctors performed standard pictures of pancreas and effusions, modeled by Faster R-CNN object detection, and accurately judged by image processing techniques such as Region Growing and Gaussian Filter. In the CT image, the area of the pancreas or effusion was reconstructed, and the 3D image and related structure were reconstructed. The percentage of pancreatic necrosis, the number of necrotic areas and the size of the area were calculated, and the CTSI score was calculated.

The method proposed in this study, in order to verify its accuracy and

reliability, the results of the experiment were analyzed in two parts, namely (1) single image accuracy analysis: through coincidence rate (DICE), volume overlap error (VOE) And the relative volume error (RVD) three indicators for automatic segmentation area and standard area comparison accuracy evaluation. (2) Analysis of the number of effusion blocks: The accuracy of the system is verified by calculating the number of effusion blocks and the judgment of the physician through three-dimensional reconstruction. (3) CTSI score analysis: The automated CTSI score given by the system and the score given by the physician team are combined to determine the system's high reliability.

This study mainly through artificial intelligence image feature extraction, image processing and three-dimensional overlapping, stereoscopic visualization of the disease area and calculation of CTSI score, providing physicians with an objective analysis of the surgical plan before surgery as a reference to improve the implementation of intubation surgery Time accuracy and safety.

Keywords - acute pancreatitis, CTSI score, artificial intelligence object detection, Faster R-CNN, image reconstruction