ND-US (1)

Authors: Peixian Liang

Email: pliang@nd.edu

Platform: Linux

Prerequisites: MATLAB 2018a (x64)

ND-US (1): SUMMARY

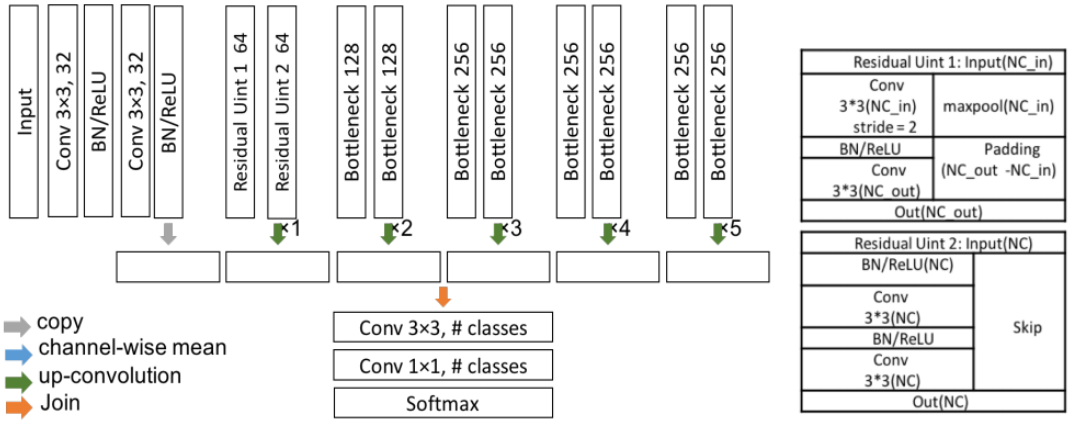
First, we use a deep-learning method to segment cells in all frames. Based on that, we design an *EMD* based matching model to finding the optimal matching between two consecutive frames.

ND-US (1): PREPROCESSING

No preprocessing step is carried out.

ND-US (1): SEGMENTATION

We adopt an FCN model [1] to perform segmentation. The architecture of the FCN model is shown below. The training image data is resized with the ratio of 0.5.



ND-US (1): TRACKING

We use an *EMD* based model to find the optimal matching between two consecutive frames. The EMD matching model is formulated as the following optimization problem:

$$EMD(P,Q) = \min \sum_{0 \le i \le n} \sum_{0 \le j \le m} D_{ij} f_{ij}$$

subject to

$$\sum_{0 \le i \le n} f_{ij} = 1, \forall 1 \le i \le n \quad \text{and} \quad \sum_{0 \le j \le m} f_{ij} = 1, \forall 1 \le j \le m$$

where P and Q are cells in two consecutive frames, D_{ij} is the ground distance which is determined by the distance between two cells p_i and q_j. f_{ij} is the amount of flow from p_i to q_j. By solving the above optimization problem, the cell correspondence can be interpreted from the resulting optimal flow.

ND-US (1): POST-PROCESSING

No post-processing is carried out after tracking.

REFERENCES

1. Liang P, Chen J, Brodskiy PA, Wu Q, Zhang Y, Zhang Y, Yang L, Zartman JJ, Chen DZ. A new registration approach for dynamic analysis of calcium signals in organs. In *Proceedings of the 15th IEEE International Symposium on Biomedical Imaging*, 934-937 (2018).