Diseased Pancreas Segmentation

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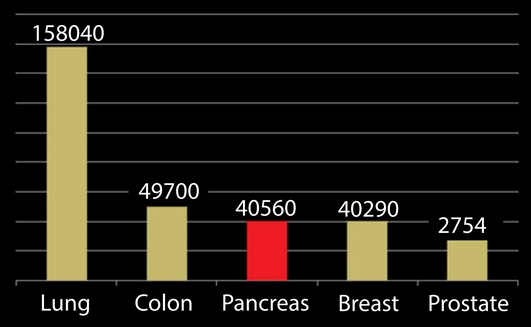
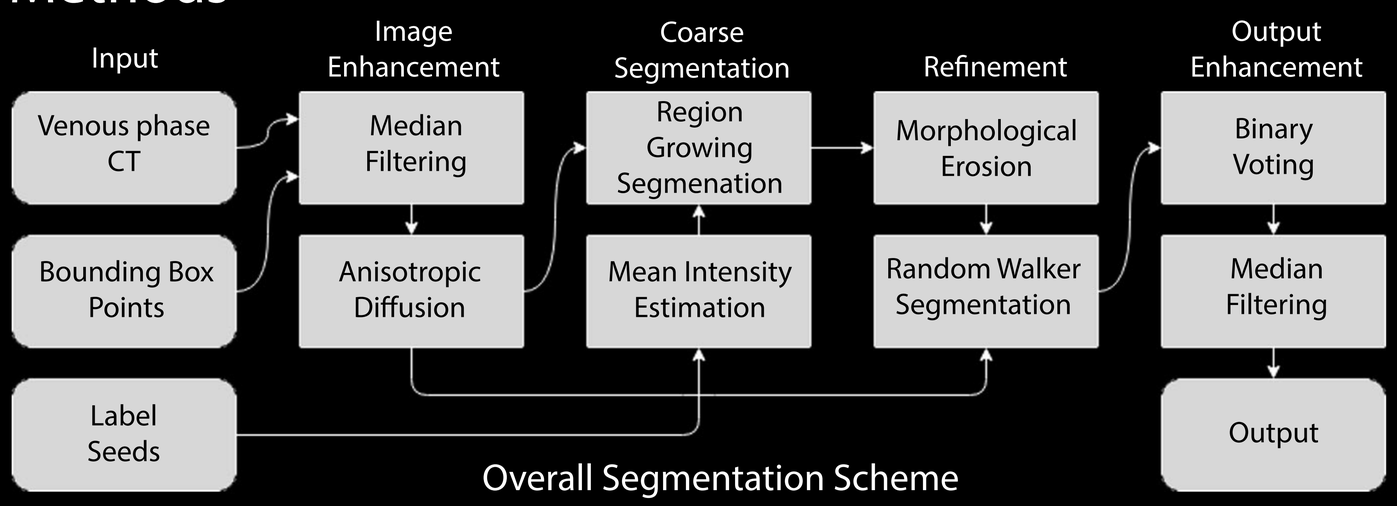
Purpose

The increased use of high-resolution computed tomography and recent improvements in imaging technologies have significantly affected the accuracy of pancreatic imaging. Being one of the deadliest of all the solid malignancies with a 7% five-year survival rate, pancreatic cancer has become the third leading cause of cancer-related mortality in the United States.



Estimated deaths from cancer for 2015.
American Cancer Society

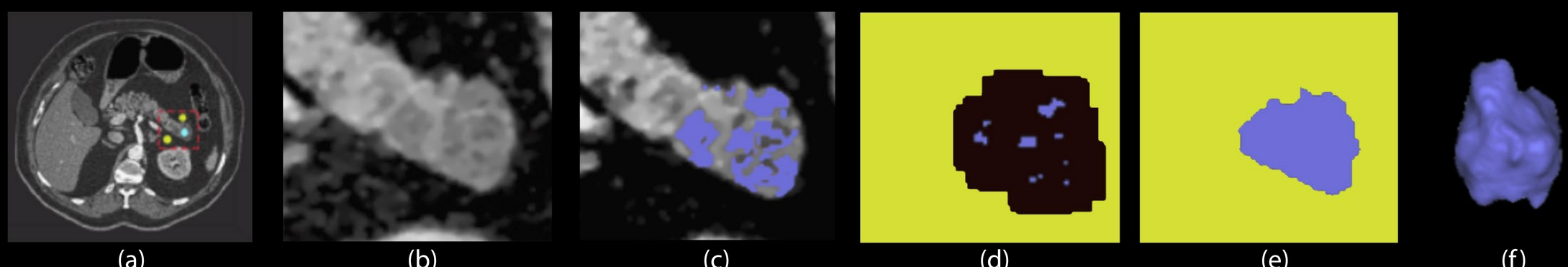
Methods



Overall Segmentation Scheme

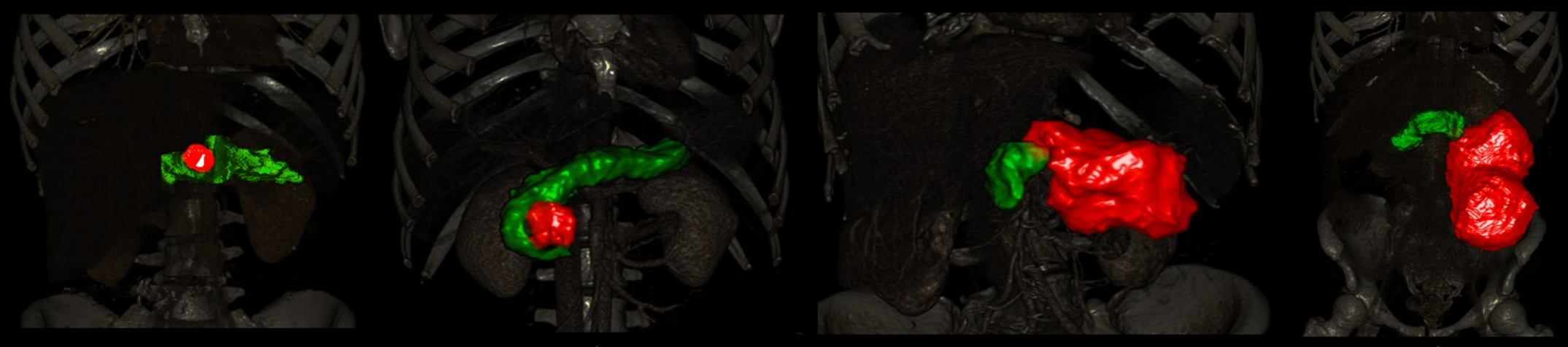
Challenges:

- High intrapatient varietion in size
- Location
- Low-contrast boundaries
- Lobulated shape
- Pancreatic masses



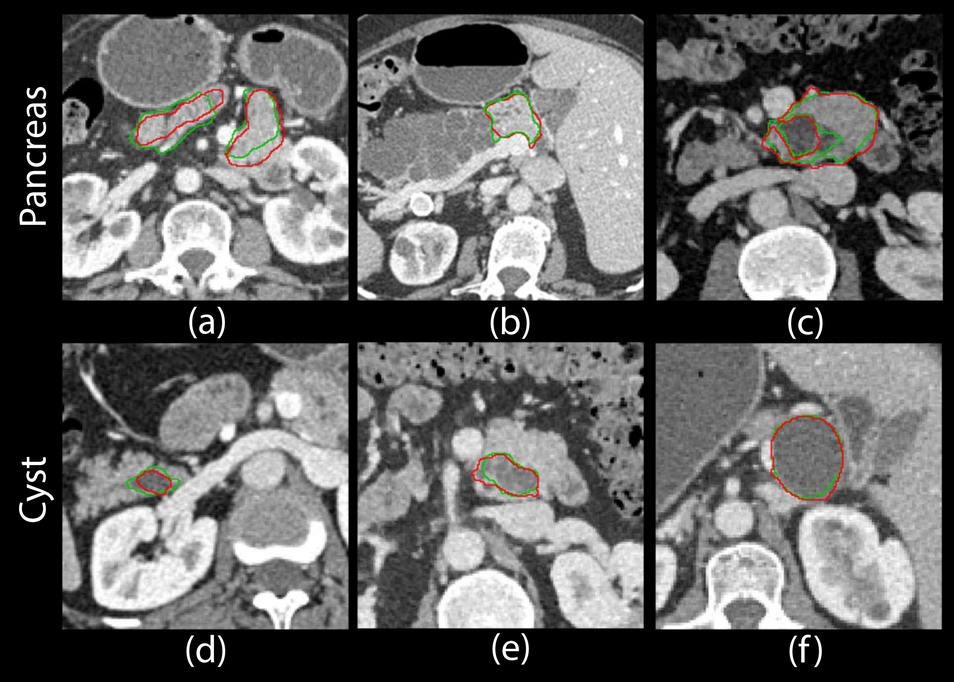
Example. (a) Bounding box and seeds selected by the user; (b) region of interest after the smoothing step; (c) coarse segmentation; (d) eroded markers; (e) 2D mask genereated after random walker segmentation; (f) 3D result.

Results



Segmentation results for different types of cysts (green - pancreas; red - cyst). (a) Solid Pseudopapillary Neoplasm; (b) Intraductal Papillary Mucinous Neoplasm; (c) Serous Cystadenoma; (d) Mucinous Cystic Neoplasm.

Evaluation



Examples of worst (a, d), average (b, e), and best (c, f) segmentation for the healthy pancreas tissue (top row) and cysts (bottom row). The manual segmentation is outlined in green, the result segmentation in red.

Tissue	Volumetric Overlap Error (%)	Dice coefficient (%)
Healthy pancreas	43.5±12.8	71.5±10.5
Cyst	30.6±12.8	81.4±8.5

Conclusion

The strength of the presented method is a high precision segmentation achieved by the user-directed input. Although further verification studies are required, the described segmentation method shows promise for pancreas and pancreatic mass segmentation.

Acknowledgements

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