SOFTWARE FOR ACCURATE SEGMENTATION OF CELL NUCLEI IN BREAST TISSUE

SUMMARY

The Office of the Director, National Cancer Institute is seeking statements of capability or interest from parties interested in collaborative research (using the Cooperative Research and Development Agreement (CRADA) or Material Transfer Agreement (MTA) to further develop, evaluate, or commercialize the software for accurate segmentation of cell nuclei and FISH signals in tissue sections. Collaborators working in the field of quantitative and automated pathology may be interested.

REFERENCE NUMBER

E-106-2010

PRODUCT TYPE

- Software

KEYWORDS

- Software
- cancer
- pathology
- screening

COLLABORATION OPPORTUNITY

This invention is available for licensing.

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DESCRIPTION OF TECHNOLOGY

The Office of the Director, National Cancer Institute is seeking statements of capability or interest from parties interested in collaborative research (using the Cooperative Research and Development Agreement (CRADA) or Material Transfer Agreement (MTA) to further develop, evaluate, or commercialize the software for accurate segmentation of cell nuclei and FISH signals in tissue sections. Collaborators working in the field of quantitative and automated pathology may be interested.

Automatic segmentation of cell nuclei is critical in several high-throughput cytometry and pathology applications (1), such as spatial analysis of genetic loci by fluorescence in situ hybridization ("FISH"), whereas manual segmentation is laborious (2). Current automated segmentation methods have varying

performance in the presence of distortions introduced during sample preparation, non-uniform illumination, clustering of the individual objects of interest (cells or cell nuclei), and seldom assess boundary accuracy.

Researchers at the National Cancer Institute-Frederick, NIH, have developed an automatic algorithm to segment cell nuclei (3) and FISH signals from two-dimensional images of breast tissue. This automated system integrates a series of advanced image processing methods to overcome the delays inherent to current manual methods for segmenting (delineating) individual cell nuclei in tissue samples. The system automatically selects a subset of nuclei that with high likelihood are accurately segmented. This system has been validated using both simulated and actual datasets that have been accurately analyzed by manual methods. The system generalizes to independent analysis of many spatial parameters useful for studying spatial gene positioning in interphase nuclei, and potentially has a wide range of diagnostic pathology, cytological and high throughput screening applications.

POTENTIAL COMMERCIAL APPLICATIONS

- Investigations on genomic organization (nuclear architecture and non-random gene positioning) in the individual nuclei in tissues.
- Other pathology and cytological and high throughput screening applications requiring precise, quantitative analysis of a subset of cell nuclei in the sample.

COMPETITIVE ADVANTAGES

- Automatic
- Efficient, robust and effective in extracting individual nuclei with FISH labels
- Facilitates reproducible and unbiased spatial analysis of DNA sequences in interphase nuclei

INVENTOR(S)

Tom Misteli (NCI)

DEVELOPMENT STAGE

- Discovery (Lead Identification)

PUBLICATIONS

(1) Prabhakar R. Gudla, J. Collins, K. Nandy, K. J. Meaburn, T. Misteli, S. J. Lockett. A High-Throughput System for Segmenting Nuclei Using Multiscale Techniques. Cytometry, 73A,5, pp: 451-66, 2008.
(2) Karen J. Meaburn, Prabhakar R. Gulda, Sameena Khan, Stephen J. Lockett and Tom Misteli. Disease-specific gene repositioning in breast cancer. Journal of Cell Biology. Dec 14, 2009; 187 (6), pages 801-812.
(3) Kaustav Nandy, Prabhakar R. Gudla, Karen J. Meaburn, Tom Misteli and Stephen J. Lockett. Automatic Nuclei Segmentation And Spatial FISH Analysis For Cancer Detection. Engineering in Medicine and Biology Society, 2009. EMBC 2009. Annual International Conference of the IEEE 3-6 Sept.

2009 Pages: 6718-6721.

PATENT STATUS

- **Not Patented:** Research Tool. Patent protection is not being pursued for this technology.