



City Research Online

City St George's, University of London

Citation: Reyes-Aldasoro, C. C., Akerman, S. & Tozer, G. (2007). Red Blood Cell Tracking and Velocity Measurement with a Keyhole Model of Movement. Poster presented at the British Microcirculation Society Annual Scientific Meeting and Symposium, 2–3 April 2007, Belfast, UK.

This is the accepted version of the paper.

This version of the publication may differ from the final published version. To cite this item please consult the publisher's version.

Permanent repository link: <https://openaccess.city.ac.uk/id/eprint/25609/>

Copyright and Reuse: Copyright and Moral Rights remain with the author(s) and/or copyright holders. Copies of full items can be used for personal research or study, educational, or not-for-profit purposes without prior permission or charge, unless otherwise indicated, provided that the authors, title and full bibliographic details are credited, a hyperlink and/or URL is given for the original metadata page and the content is not changed in any way. For full details of reuse please refer to [City Research Online policy](#).

RED BLOOD CELL TRACKING AND VELOCITY MEASUREMENT WITH A KEYHOLE MODEL OF MOVEMENT

C.C. Reyes-Aldasoro, S. Akerman and G.M. Tozer

University of Sheffield, CR-UK Tumour Microcirculation Group,
Academic Unit of Surgical Oncology, University of Sheffield, S10 2JF

A tracking algorithm is proposed to measure the velocity of red blood cells (RBC) in intravital microscopy of tissue microvessels. Intravital microscopy was carried out on tumours growing in transparent dorsal skin flap 'window chambers' in unanaesthetized mice. Fluorescently labelled RBCs (25 µg of DiI was used per 50 µl of packed red blood cells) were injected into a cannulated tail vein for tracking.

The tracking algorithm is based on a keyhole model that describes the probable movement of a segmented cell between contiguous frames in a video sequence. When a history of movements exists, past, present and a predicted landing position define two regions of probability with a keyhole shape. Pre-processing segments cells from background. The keyhole is used to determine if cells in contiguous frames should be linked to form tracks and also as a post-processing tool to join split tracks and discard links that could have been formed due to noise or uncertainty. Outliers are removed based on the distribution of the average velocities of the tracks. The algorithm presents several advantages over traditional methods such as kymographs or particle image velocimetry: manual intervention is restricted to the thresholding, many vessels can be analyzed simultaneously, the algorithm is robust to noise and a wealth of statistical measures can be obtained. Average velocities of 2 tumours were 207 ± 155 [µm/s] (mean±std) with a range 15-797 [µm/s], and 86 ± 60 [µm/s] with a range 5-300 [µm/s] respectively, which are consistent with the literature. Validation against a manual method is in progress.

Cancer Research UK funded this work.