Automated Searching of Illicit Drug Logos and Imprints

by

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A thesis submitted for the Degree of Doctor of Philosophy (Science)
2015

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Certificate of Original Authorship

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Ping Hei Ronnie Ng
Acknowledgements

I would like to thank the University of Technology, Sydney for providing me this opportunity to carry out my own research in the forensic science discipline. In particular, the following people have given me a lot of guidance and help throughout the project. This project would not have been so successful without them.

1. Dr. Brian Reedy: He has given me a lot of assistance and help throughout this research. I enjoyed interpreting and discussing this project with him. His insights have inspired me with new ideas in numerous occasions. His patience and encouragement throughout this period means a lot to me. He has also dedicated a lot of his personal time for my project, especially the time spent in reading and giving me valuable comments on my literature review and my thesis.

2. Dr. Mark Tahtouh: He offered this interesting project to me. He provided me access to the AFP instruments (macrosopes, twin swan lights and ring lights etc), a genuine pill press and different kinds of dies for pressing and photographing my own tablets. The images that were processed in this project were therefore collected as they would have been in real forensic examination work.

3. Martin Lopatka: Thank you for your idea about matching side profiles of tablets and your suggestions for my MATLAB scripts.

4. The Australian Federal Police: Thank you for providing funding for my project.

5. Joshua Abraham: Thank you for your help in MATLAB programming and suggestions for various image processing methods, transformations and operations.

6. Mum, Dad and sis: I have unlimited support from all of you. I would not be here without you.
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Abstract

This thesis describes solutions for the automation of illicit tablet image searching based on tablet logos, colour and edge profiles. An original aim was to develop or exploit algorithms for searching images in an existing Australian Federal Police (AFP) drug tablet database. However, the pre-existing images were found to be inadequate for use with accepted logo extraction methods, due to poor illumination and insufficient contrast between the tablet surface and the logos. Extracting a complete logo from them was difficult. New “high contrast” images were taken in a way such that the contrast between the tablet surface and the logo was maximised. This was achieved by lowering the ring light that was attached to the macroscope very close to the tablet, resulting in a very shallow angle of illumination.

An in-house algorithm was designed to select the most appropriate threshold for each of these “high contrast” images to be converted to black-and-white (BW) images. Morphological and logical operations were used to segment the logos from the tablets. The final images contained only the silhouettes of the logos.

The logo silhouettes were encoded by calculating the Zernike moment invariants with the Kintner method, followed by the normalisation approach. The best chance of finding matching logos in the database was by ranking these invariants using the Euclidean distance.

Matching illicit tablets by colour was also investigated. The best method found involved changing the RGB colour values of the tablet photos to the CIE L*a*b* coordinates and then comparing these coordinates using the Normalised Inner Product.

The side profiles of tablets were suggested as an extra feature for comparison. Although there were limitations that remained to be solved (namely the symmetry problems for the positioning of tablets with asymmetric side profiles), results were promising when comparing the derivatives of symmetric side profiles using the Euclidean distance.

All of the algorithms developed or used in this project have been compiled into executable files such that any tablet database computer can run the scripts for searching.
logos and side profiles. In addition, the scripts can provide measurements of a tablet’s
diameter and thickness in millimetres.