

SOURCE IDENTIFICATION OF CAPTURED VIDEO USING PHOTO
RESPONSE NON-UNIFORMITY NOISE PATTERN AND SVM CLASSIFIERS

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This dissertation is dedicated to my beloved parents and sister for their endless support and encouragement.

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ABSTRACT

Recent works have shown that passive capturing source detection methods based on Photo-Response-Non-Uniformity (PRNU) extraction are the most reliable ones in comparison with techniques that based on lens properties or compression artifacts. Some important issues in this field include: employing an effective method for extracting PRNU, calculating the similarity and categorizing videos according to source of camera. In this study, a comprehensive algorithm is proposed to compare and evaluate the performance of different source detection methods in terms of filters used and partitioning process applied for PRNU extraction coupled with SVM classifier. Moreover, in consideration of observations, a new method is proposed for sampling selection using SVM classifier. Furthermore, the capabilities of employing and combining the results of different color parts of videos are used instead of changing them to grayscale. The proposed algorithm is based on three essential steps: Firstly, fingerprint of each camera, which is regarded as reference PRNU, is calculated by extracting PRNU of blue-sky videos. Secondly, the PRNU similarities of sample videos with reference PRNU are measured by calculating cross correlation and Peak to Correlation Energy (PCE) metrics. Finally, the sample videos are classified based on calculated PCE with SVM classifier. Experimental results revealed that Zero-mean and Wiener filters have small influences on PRNU, thus they can be ignored. Experimental results also revealed that eliminating the partitioning step considerably increases the performance of detection success rate by 15%. Among SVM classifiers, “RBF” and “MLP” types have the best identification rate of 75%.

ABSTRAK

Pengkajian terbaharu telah menunjukkan bahawa kaedah pengesanan sumber rakaman pasif berdasarkan *Photo-Response-Non-Uniformity* (PRNU) adalah sangat boleh dipercayai berbanding dengan teknik yang berdasarkan sifat-sifat kanta atau artifak mampatan. Beberapa isu penting dalam bidang ini termasuklah penggunaan kaedah yang lebih berkesan untuk pengekstrakan PRNU, pengiraan kesamaan dan pengkategorian video menurut sumber kamera. Dalam kajian ini algoritma komprehensif dicadangkan bagi membandingkan dan menilai prestasi kaedah pengesanan sumber yang berbeza dari segi penapis yang digunakan dan proses pembahagian yang diterapkan untuk pengekstrakan PRNU. Selanjutnya, dalam pertimbangan pemerhatian kaedah baharu dicadangkan untuk pemilihan pensampelan menggunakan pengkelas *SVM*. Selain itu keupayaan menggunakan dan menggabungkan hasil video bagi bahagian-bahagian warna yang berbeza digunakan bukannya mengubah hasil video tersebut kepada skala kelabu. Algoritma ini berdasarkan tiga langkah penting: Pertama, cap jari setiap kamera dikira dengan pengekstrakan PRNU video langit biru. Kedua, kesamaan PRNU video sampel dengan cap jari kamera diukur dengan metrik korelasi tenaga *PCE*. Akhir sekali, video sampel dikelaskan berdasarkan *PCE* yang dikira dengan pengkelas *SVM*. Keputusan eksperimen menunjukkan bahawa penggunaan *zero-mean* dan penapis *Wiener* mempunyai pengaruh yang kecil kepada ketepatan PRNU dan boleh diabaikan. Sementara itu, langkah menghapuskan pembahagian secara ketara meningkatkan prestasi kadar kejayaan pengesanan sebanyak 15%. Tambahan lagi, antara jenis pengkelas *SVM*, "*RBF*" dan "*MLP*" memiliki kadar kejayaan yang terbaik, iaitu sebanyak 75%