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AUTOMATED LOCATION OF DYSPLASTIC FIELDS IN COLORECTAL HISTOLOGY USING IMAGE TEXTURE ANALYSIS

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SUMMARY

Automation in histopathology is an attractive concept and recent advances in the application of computerized expert systems and machine vision have made automated image analysis of histological images possible. Systems capable of complete automation not only require the ability to segment tissue features and grade histological abnormalities, but must also be capable of locating diagnostically useful areas from within complex histological scenes. This is the first stage of the diagnostic process. The object of this study was to develop criteria for the automatic identification of focal areas of colorectal dysplasia from a background of histologically normal tissue. Fields of view representing normal colorectal mucosa (n=120) and dysplastic mucosa (n=120) were digitally captured and subjected to image texture analysis. Two features were selected as being the most important in the discrimination of normal and adenomatous colorectal mucosa. The first was a feature of the co-occurrence matrix and the second was the number of low optical density pixels in the image. A linear classification rule defined using these two features was capable of correctly classifying 86 per cent of a series of training images into their correct groups. In addition, large histological scenes were digitally captured, split into their component images, analysed according to texture, and classified as normal or abnormal using the previously defined classification rule. Maps of the histological scenes were constructed and in most cases, dysplastic colorectal mucosa was correctly identified on the basis of image texture: 83 percent of test images were correctly classified. This study demonstrates that abnormalities in low-power tissue morphology can be identified using quantitative image analysis. The identification of diagnostically useful fields advances the potential of automated systems in histopathology: these regions could then be scrutinized at high power using knowledge-guided image segmentation for disease grading. Systems of this kind have the potential to provide objectivity, unbiased sampling, and valuable diagnostic decision support.

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No. of Figures 6. No of Tables 2. No. of References 14.

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