

Image Processing Method for Detection and Description of Structures in the Histological Images of Placental Villi.

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Abstract

The placenta is an organ which connects the developing fetus to the uterine wall in order to allow nutrient uptake. An abnormal placental villi can be characterized by the presence of swelling, and impaired angiogenesis. Such pathology is connected with intrauterine fetal death [1] and histopathological examination of placenta is used for prenatal diagnosis[2]. This examination of placenta specimen is a method based on tissue evaluation, and it allows for the formulation of digital algorithms for image analysis. The purpose of this work is to design an image processing method for an automatic villi structures detection, vessels recognition, and grading of villi swelling in order to support the pathomorphological diagnostic procedure.

The studied images represent the placental villi from spontaneous miscarriage stained with the Hematoxylin and Eosin. The proposed methods are based on texture analyses, such as Local Binary Pattern and Unser features, mathematical morphology operations, region growing, and Support Vector Machine classification. Based on the proposed decision tree, the identification of trophoblast as a villi wall, vessels, fibrinoids, hemorrhages and swelling regions is performed. The image processing results were compared with the expert's manual annotations. The obtained accuracy is in the range of : 93-98 % -villi wall, 84-94 % -vessels, and 80-95 % - other structures.

The presented approach based on texture analysis, morphology, and classification offers a high accuracy tool for placenta image examination. It is characterized by short calculation time and repeatability of results. Presented method can be used as a support to traditional examinations, and for the definition of pathological indicators.

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References

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