



Using Standard Profile Band Information to Classify Microscopic Images in the Metaphase Stage

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ABSTRACT

Introduction: An automatic analysis system is needed to perform karyotyping in less time and with more accuracy. Various methods have been proposed for the classification of chromosomes, including length, centromeric position, and light and dark bands (band profile). Considering the importance of band profile information in clinical diagnosis, the proposed method for classification based on chromosome profile band and using IdioGram images was designed for high-accuracy classification.

Methods and Materials: In this research, we provided a suitable method for extracting and correcting the chromosome profile band using a machine learning algorithm to classify chromosomes automatically. In this regard, we extracted information on the position width, and sequence of white and dark bands from the standard IdioGram of chromosomes. To avoid excessive complexity and intended clinical application, the subject of the present study was limited to group E chromosomes.

Results: The performance of the presented algorithm for classification was evaluated on 50 cells. The results obtained based on the minimum error for identifying chromosomes 16, 17, and 18 using the accuracy criteria were equal to 78%, 100%, and 96%, respectively.

Conclusion and Discussion: According to the results, the proposed method can help check the profile band directly in diagnostic applications. The results of this research provide the basis for creating an automatic karyotype system with proper accuracy.

Keywords: Classification, Karyotype, Machine learning