

V. Vlasenko. Devising a fast median filtering procedure for aligning the noise background of a digital frame / V. Vlasenko, S. Khlamov, Z. Deineko, I. Levykin, I. Tabakova, O. Khoroshevskyi, I. Khoroshevska // Eastern-European Journal of Enterprise Technologies. – 2025, - vol. 2, - no. 2 (134). P. 39–46.

Abstract. The object of this study is the process of filtering astronomical frames that contain images of objects in the Solar System. In order to recognize the image of an object in contrast with the background of the frame, it is necessary to filter the image. It is proposed to use a modification of median filtering to reduce the dynamic range of the background substrate. This will lead to an increase in the signal-to-noise ratio of the entire image. However, the identified problem area of each image during filtering is the distortion of the image structure and artifacts. Therefore, to solve this problem, a fast median filtering procedure has been proposed to eliminate them. A new technique for sorting the brightness of pixels in the median filter window using a histogram has been proposed. For comparison, a classic median filter was chosen with a modification, namely, with the use of quick sorting. The disadvantage of this modification is the fact that during sorting, all the pixels that fall into the median filter window are used every time while sorting using a histogram makes it possible to add and remove from the histogram only those pixel values that appear when the window is shifted. The devised procedure of fast median filtering was tested in practice within the framework of the CoLiTec project. It was implemented at the stage of in-frame processing of the Lemur software. This study showed that the application of the fast median filtering procedure makes it possible to remove structural distortions and image artifacts, which leads to an increase in the signal/noise ratio by 3–5 times. Also, owing to sorting with the help of a histogram, the number of comparisons in the median filter window was reduced by 4–30 times, depending on the size of the window. As a result, this led to a decrease in the calculated time by 3–9 times.

Keywords: fast median filtering, brightness histogram, sorting, structure distortion, astronomical image .