

Image processing for analysis methane–air flame front dynamics

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Excessive NO_x emissions are a serious problem in modern combustion chambers. Using premixed mixtures with a low equivalence ratio is a promising technology used to reduce NO_x emissions. However, the premixed flame is less stable than diffusion flame. Therefore, it is necessary to develop methods that increase stability. To understand the instabilities nature first step is to study the flame front dynamics. There are various methods for its study [1], but the analysis of chemiluminescence flame images has advantages over others: high reliability and versatility. A universal effective technique for the flame front contour extraction as a 1-pixel continuous line is proposed using chemiluminescence flame images. The technique consists in the sequential application of filters. The effectiveness of the method was tested on the high-speed images analysis under various premixed flame parameters. The versatility is ensured by the automatic selection algorithm of the “Canny” filter parameters using the original image. The implemented filters helped to solve main processing problem caused by the inhomogeneity of the glow flame front intensity [2]. This paper presents the results of image processing with using this technique. Estimates of the flame front oscillations were obtained for various combustion modes. The present work was supported by a grant from the President of the Russian Federation (MK-3888.2021.4).

- [1] Souflas K, Psarakis E Z, Koutmos P and Egolfopoulos F N 2019 *Combust. Sci. Technol.* **191** 1123–1138
- [2] Krikunova A I 2019 *Phys. Fluids.* **31** 123607