Estimation of the temperature of a flame with asymmetric profile

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ABSTRACT

The large number of projections needed for tomographic reconstruction makes prohibitive the use of algebraic methods for fast phase object reconstruction. However, for smooth and continuous phase objects, the reconstruction can be performed with few projections by using an algorithm that approximates the phase as a linear combination of gaussian basis functions. This work presents an accurate algebraic reconstruction of a flame temperature from two independent interferometers using a He-Ne laser (623.8nm).

Keywords: Optical tomography, Interferogram analysis, phase object

1. INTRODUCTION

Tomography is a technique that allows us to obtain an estimated image of a cross section of an object from its projections diagram[1,2] (Figure 1). A projections diagram is formed by one or more projections, all in the same plane and equally spaced in the range $[0, 2\pi)$. Each projection is formed by a ray assembly, equally spaced, that crosses the object[1,2]

Tomographic reconstruction methods can be classified in two great groups: The backprojection and algebraic.[2,3] In the backprojection methods, the reconstructed image is obtained by the accumulation of the rays sum that passes through the same point. In the algebraic methods, the image of the reconstructed cross-section can be approximated by a sum of basis functions distributed equally in the entire image.[1,3–6] In this work we used an algebraic method to reconstruct the temperature of a flame.

In section 2 we describe the interpolation of data using radial basis functions (RBF) and the tomographic reconstruction method. In section 3 we show some numerical results. Finally, in the last section we give some conclusions

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