



**HAL**  
open science

## Optical Flow Estimation out of Infrared Image Sequences of Biogas

Ioana Barbu, Anthony Guibert, Philippe Loisel, Dominique Heitz

► **To cite this version:**

Ioana Barbu, Anthony Guibert, Philippe Loisel, Dominique Heitz. Optical Flow Estimation out of Infrared Image Sequences of Biogas. The 17th International Symposium on Flow Visualization, Jun 2016, Gatlinburg, Tennessee, United States. , 2016, 10.13140/RG.2.2.35868.28808 . hal-01416030

**HAL Id: hal-01416030**

**<https://hal.science/hal-01416030>**

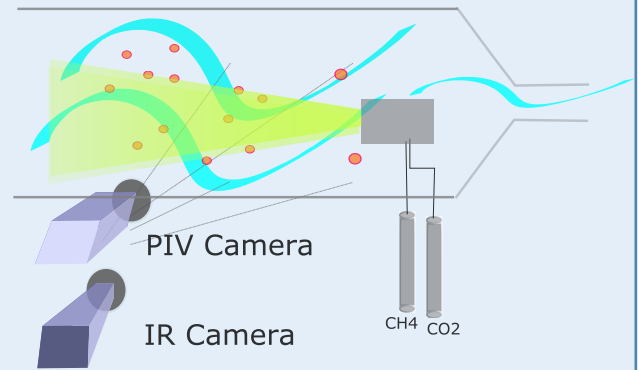
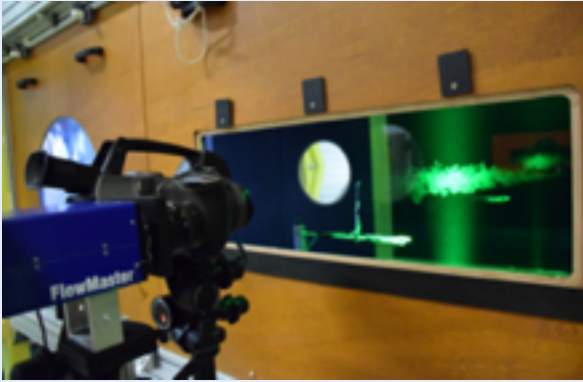
Submitted on 13 Dec 2016

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

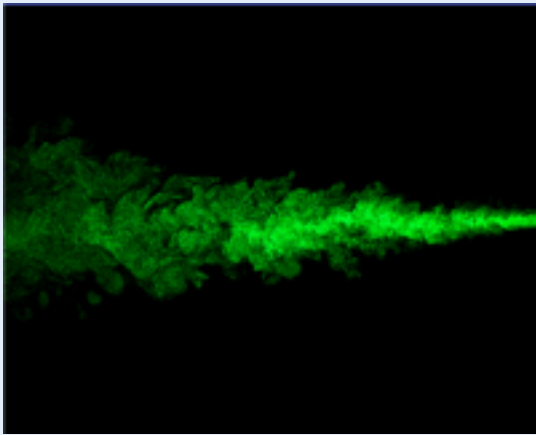
L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution - NonCommercial - NoDerivatives 4.0 International License



A mixture of CO<sub>2</sub> and CH<sub>4</sub> is introduced in the wind tunnel (Irstea Rennes, France). The gas plume is seeded with light tracers. The scene is simultaneously captured by a PIV and an Infrared (IR) cameras



Particle image



Infrared image

## Optical Flow Estimation out of Infrared Image Sequences of Biogas

Ioana BARBU<sup>1</sup>, Anthony GUIBERT<sup>1</sup>, Philippe LOISEL<sup>1</sup>, Dominique HEITZ<sup>1,2\*</sup> - <sup>1</sup>Univ Bretagne Loire, UR OPAALE Irstea, F-35000 Rennes, France. <sup>2</sup>Fluminance, Inria-Irstea, F-35042 Rennes, France.

Over the past years, agricultural mechanisation plants have known a steep emergence, encouraged, among other factors, by an estimated high environmental gain. However, the occurrence of the biogas leaks around the installations tends to depreciate the latter. The classical methane loss estimation techniques rely on ballpark figures and numerous simplifying assumptions; as a consequence, they are attached to a loose confidence score. Recently, such leakages have been detected and quantified with infrared (IR) sensors. In particular, optical flow methods have been used to estimate the flow out of the resulting IR image sequences. We address this problem in the current study; more explicitly, we tackle the question of the optical flow estimation out of IR images of biogas. For doing so we i) we build a benchmark mimicking with high-fidelity the outdoor conditions of a real methanisation plant ii) we reconstruct the projected velocity fields of the biogas plume with a technique with uncertainty evaluation iii) we validate our approach by assessing the reconstruction of the gas leakage 2D silhouette out of IR images against instantaneous fields estimated with high accuracy out of particle image velocimetry (PIV) measurements.