



OPTIMAL CONTROL FOR MULTIDIMENSIONAL MICROSCOPY

Julien Roul, Otmane Bouchareb, Olivier Chanteux, Marc Tramier, Jacques Pécéréaux

► To cite this version:

Julien Roul, Otmane Bouchareb, Olivier Chanteux, Marc Tramier, Jacques Pécéréaux. OPTIMAL CONTROL FOR MULTIDIMENSIONAL MICROSCOPY. Focus On Microscopy 2017, Apr 2017, Bordeaux, France. 1p., 2017. hal-01549857

HAL Id: hal-01549857

<https://hal.science/hal-01549857>

Submitted on 29 Jun 2017

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.

OPTIMAL CONTROL FOR MULTIDIMENSIONAL MICROSCOPY

Julien Roul^{1*}, Otmane Bouchareb², Olivier Chanteux², Jacques Pécréaux¹, and Marc Tramier¹

¹ CNRS and Université Rennes 1, UMR 6290, Institut Génétique et Développement de Rennes, France

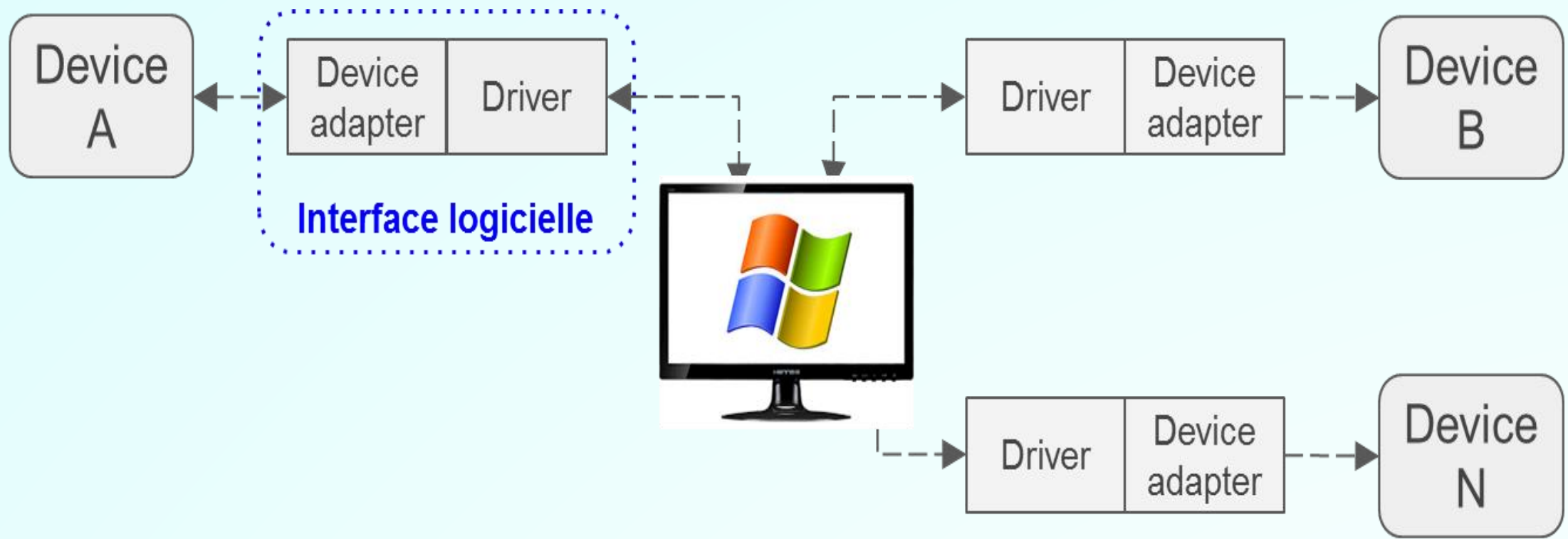
² Combo Microtech, Cesson-Sévigné, France

* Present address: LAAS-CNRS, Université de Toulouse, CNRS, UPS, Toulouse, France

Contact: marc.tramier@univ-rennes1.fr

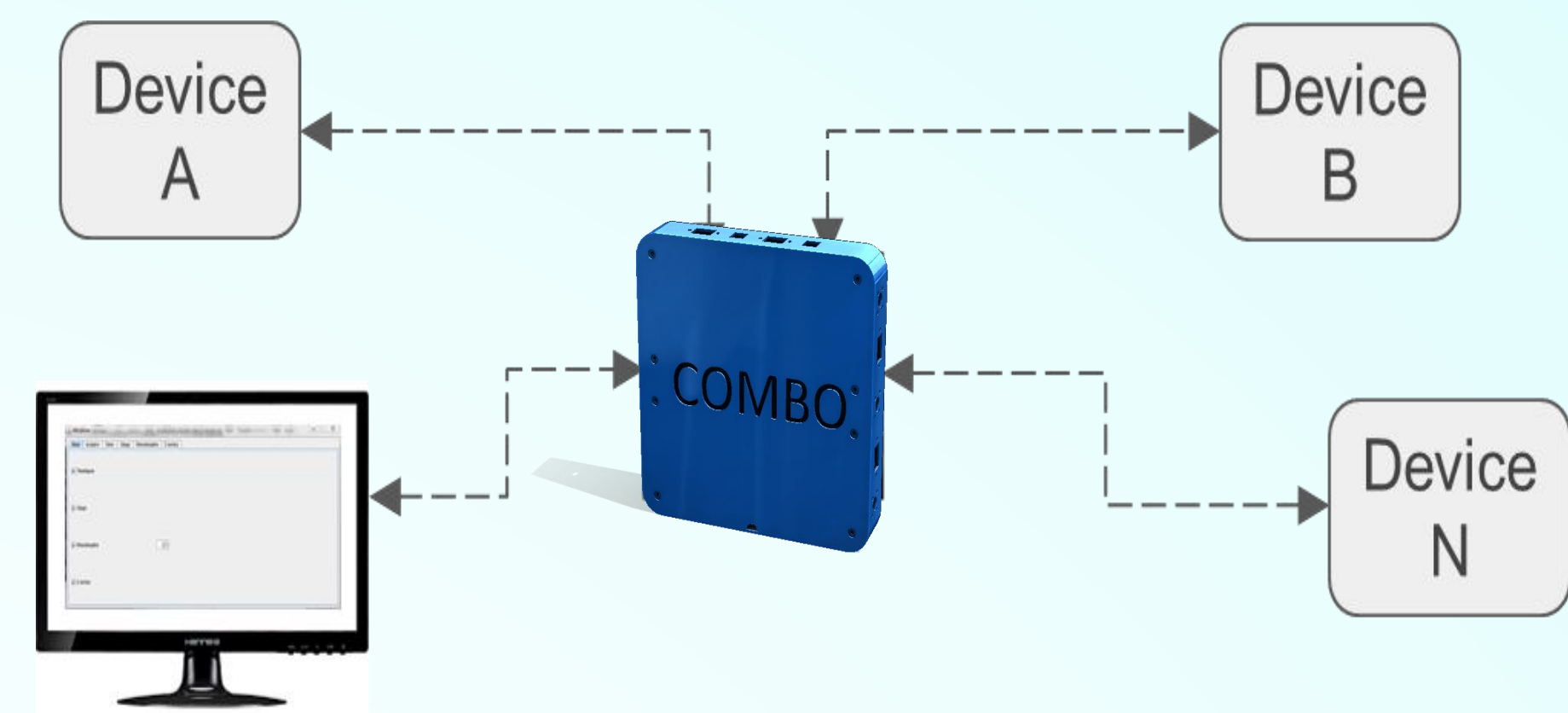
Project

From software solutions to control microscopes



How to optimize the acquisition speed?

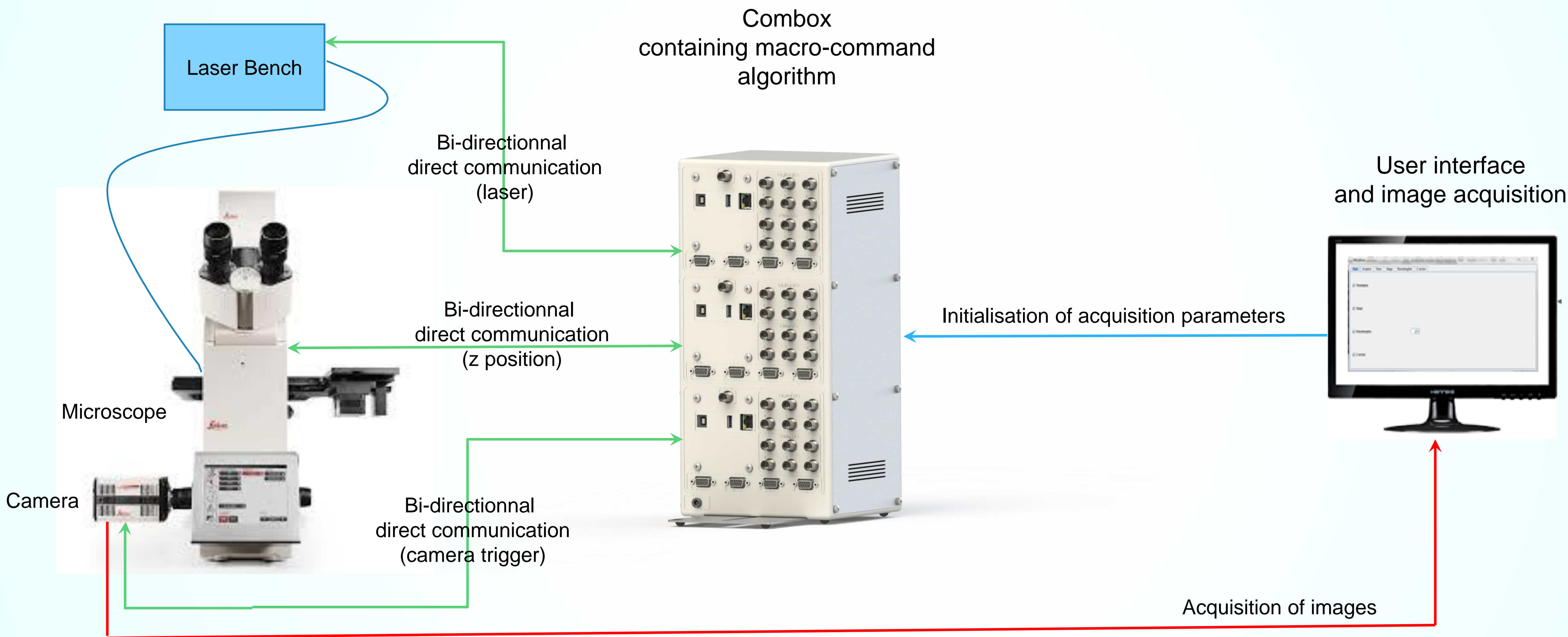
To microcontroller solution to control microscopes



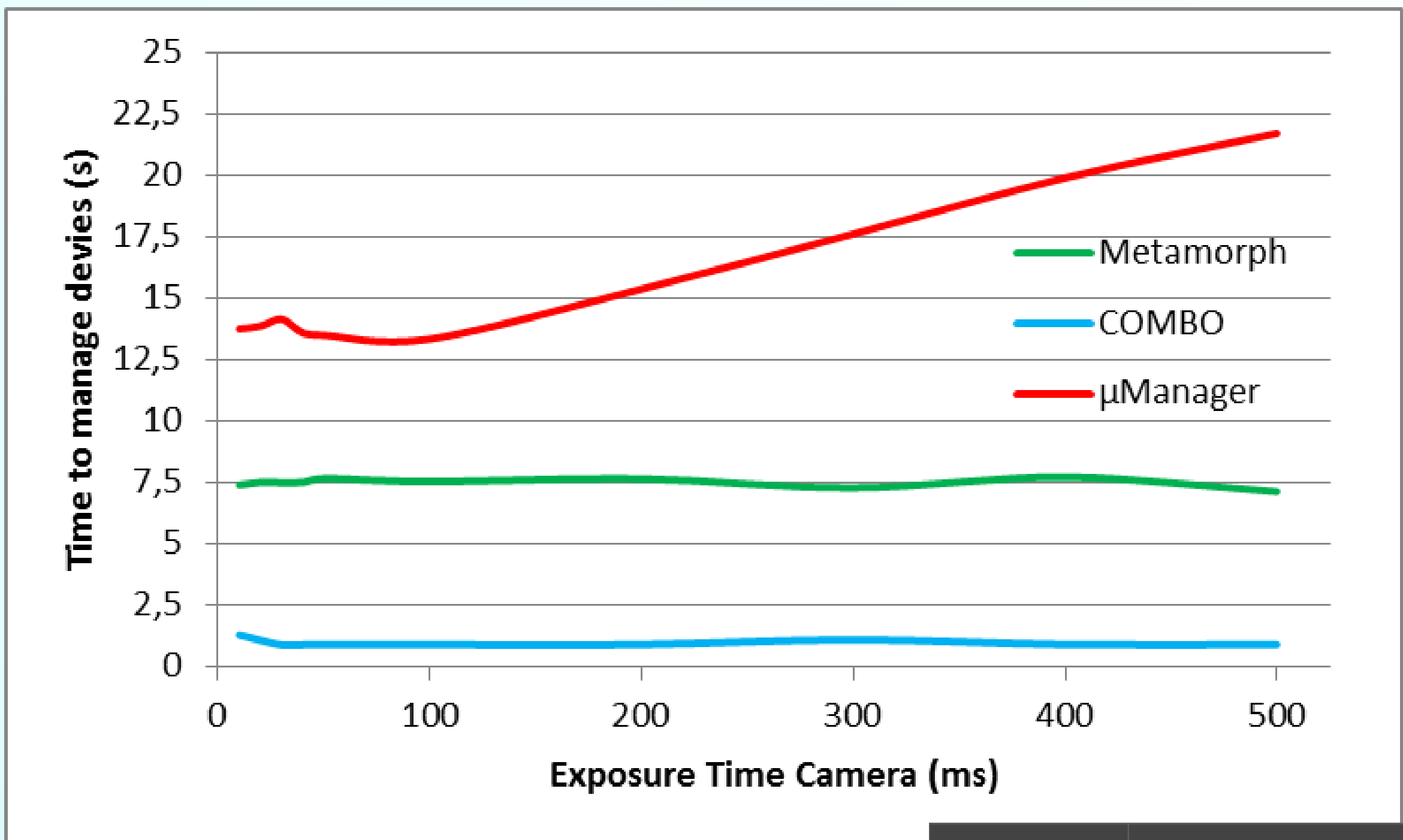
- (i) the device controlling process is centralized, the CPU cannot completely focus entirely on multidimensional acquisition process;
- (ii) the acquisition software calls a software driver for each device which is directly dependent on OS version has to be constantly upgraded;
- (iii) during acquisition process, communication between the software and all devices is sequential, the software cannot communicate with two or more devices in parallel.

- (i) microcontroller entirely dedicated to multidimensional acquisition process;
- (ii) direct communications which do not require any device software driver to operate and provides various types of interfaces (COM, TTL, and USB) with the possibility to add many others;
- (iii) bidirectional communication and parallel management based on state machine.

How it works?



Proof of concept



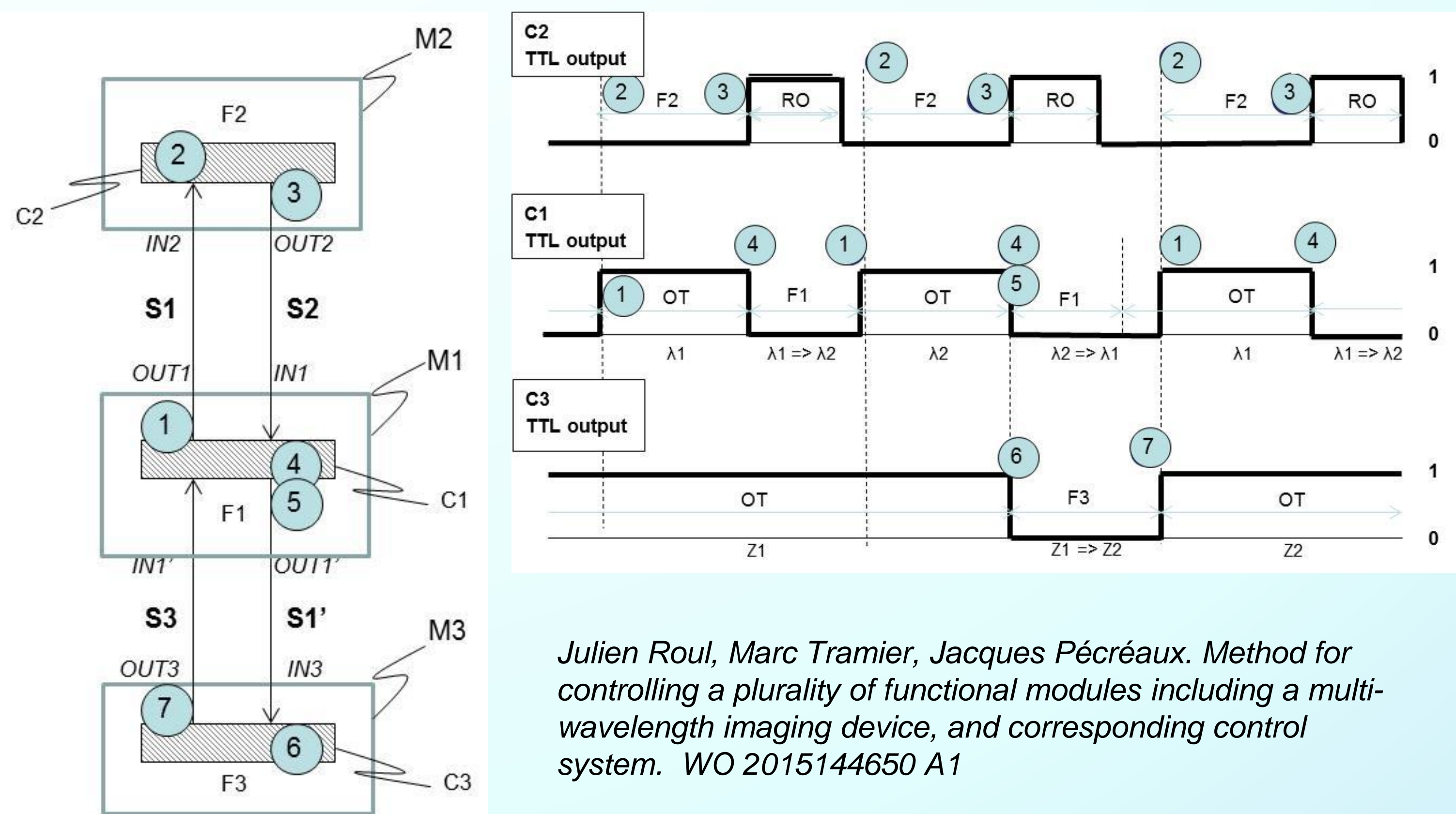
The figure represents the time to manage devices during an acquisition of 22 images for 2 illumination settings and 11 Z-stack.

The time to manage devices is calculated by subtracting the total exposure time to the total acquisition time.

Microscope	Leica DMIRBE
Camera	PCO.edge 4.2
Piezo Controller	PI E-709.SRG
Light Source	Fianum whitelase SC480
Shutter	Uniblitz VMM-D1, Lambda SC
Wavelength Selector	Based on PI controller C-867.260

Innovation

- Optimizing the communication between the the different devices
- Parallelized bidirectional asynchronous communication



Julien Roul, Marc Tramier, Jacques Pécréaux. Method for controlling a plurality of functional modules including a multi-wavelength imaging device, and corresponding control system. WO 2015144650 A1

FOM, April 9th-12th 2017



OUEST
VALORISATION
Ressources d'innovation

