



INSTITUT NATIONAL  
DE L'INFORMATION  
GÉOGRAPHIQUE  
ET FORESTIÈRE

# MicMac – a global overview

E Rupnik, J-M Muller,  
M Pierrot Deseilligny

IGN

Technical seminar

## Introduction

### Tie points extraction

- Without a priori geometry

- With a priori geometry

- Reduction algorithms

### Image orientation

- SfM

- Collinearity-based BBA

- Structureless BBA

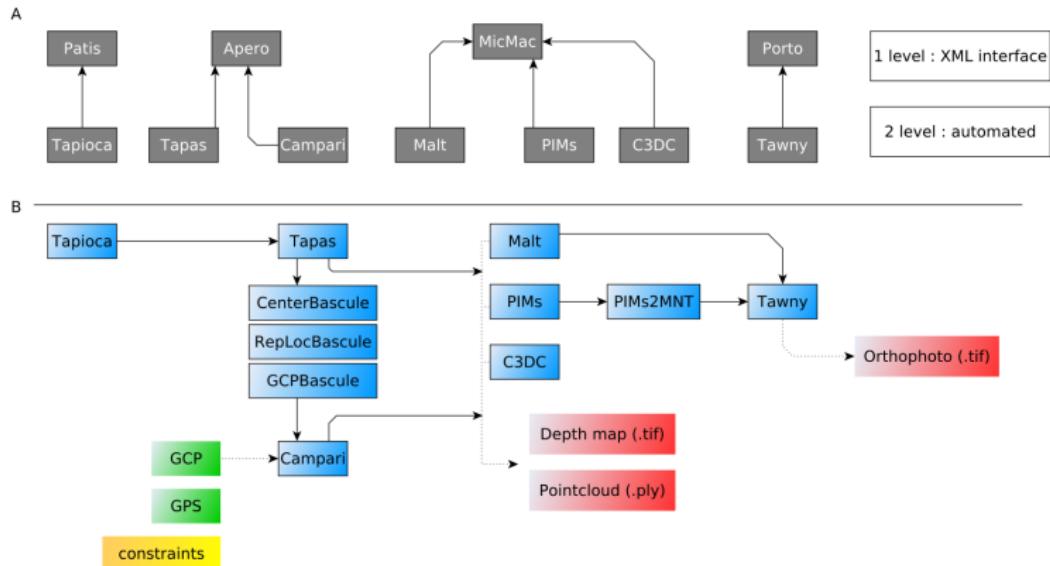
### Georeferencing



1

# Introduction

# Overview of the processing pipeline





2

Tie points  
extraction



# Tie points extraction

Without a priori geometry

## Tie points extraction Without *a priori* geometry

### Tie points detection

- ▶ SIFT : default
- ▶ Digeo : slightly faster, possibility to use only max or min
- ▶ AIME (presented by MPD during spotlight), under developpment; generally faster than SIFT

### Tie points Matching

- ▶ ANN (Approximate Nearest Neighbor)
- ▶ for a point in pic A, find best and second best points in pic B. The best point is accepted if his score is high and second best score is low.

## Tie points extraction Without *a priori* the geometry

Extraction organization : lists of pictures pairs

- ▶ All, MulScale, Line...
- ▶ from an orientation (GPS, approximate orientation)

**Tapioca** command. See §3.3 and §16 of documentation.

Tie points files format (binary and ASCII)

- ▶ Default : 1 file per pair, simple and universal
- ▶ New format : 1 file with points multiplicity, faster but only usable with few commands

**mm3d TestLib ConvNewFH** command. See §16.8 of documentation.



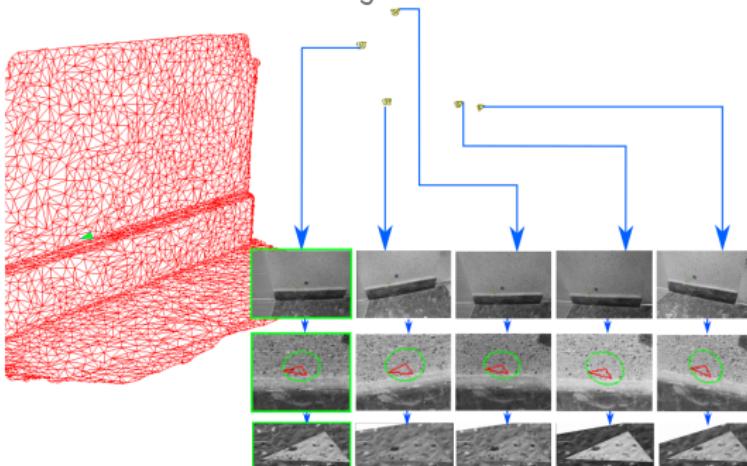
# Tie points extraction

With a priori geometry

## Tie points extraction With *a priori* geometry

- ▶ “Second iteration”: using camera orientations and a 3d mesh
- ▶ finds tie points with good repartition on pictures and 3d mesh
- ▶ use orientations for perspective corrections before correlation

**mm3d TiePTri** command. See §16.9 of documentation.





2

# Tie points extraction

Reduction algorithms

## Tie points reduction algorithms

Four tools are dedicated to Tie points reduction:

- ▶ **RedTieP / Schnaps** (generic case): only one point per picture part, favor manifold
- ▶ **OriRedTieP / Ratafia** (quasi-vertical case) : favor scene repartition





Image  
orientation

## Image orientation Approaches

1. no a priori, iterative (i.e. SfM)
2. with a priori, collinearity-based bundle block adjustment (BBA) when initial orientations are known
3. structureless BBA



# Image orientation

SfM

# SfM



# Image orientation

Collinearity-based BBA

# Collinearity-based BBA



# Image orientation

Structureless BBA

# Structureless BBA



# Georeferencing

## Mathematical model

- ▶ rigid spatial similarity transformation (SST)  
(i.e. 7-param trafo)
- ▶ "non-rigid" SST (i.e. 7-param and a polynomial)

# Georeferencing

## Mathematical model

- ▶ rigid spatial similarity transformation (SST)  
(i.e. 7-param trafo)
- ▶ "non-rigid" SST (i.e. 7-param and a polynomial)

## Possible input data

1. ground control points
2. GNSS perspective centers



INSTITUT NATIONAL  
DE L'INFORMATION  
GÉOGRAPHIQUE  
ET FORESTIÈRE

Thank you for your  
attention!

E Rupnik, J-M Muller,  
M Pierrot Deseilligny

