



## Start of synthetic dataset for comparison of MTF measurement methods

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retour sur innovation

# Outline

Objectives

Shapes

Target features

Sensor features

Image simulation

MTF measurement results

Preliminary conclusion

Discussion and roadmap

# Objectives

## MTF measurement methods comparison

Level 1: share images and get the MTF discrepancy for each kind of method

Level 2: share images with known features (MTF, SNR)

→ need for creation of a reference dataset containing:

Actual images: to define in the coming discussion

Synthetic images: first generation

# Objectives

Generation of a synthetic dataset with known MTF in order to compare the measurement methods:

- different shapes for the different methods
- target characteristics
- sensor main performances

# Shapes

Learnt from the survey, most popular in-flight MTF measurement methods are:

- edge method using draughtboard (checkerboard for US) target
- line method using linear target such as bridge

Other methods:

- point sources method using stars for instance
- neural network using landscapes
- bi-resolution method using landscapes

# Shapes and target features

Starting with 2 shapes:

Draughtboard



Salon de Provence target features

Line

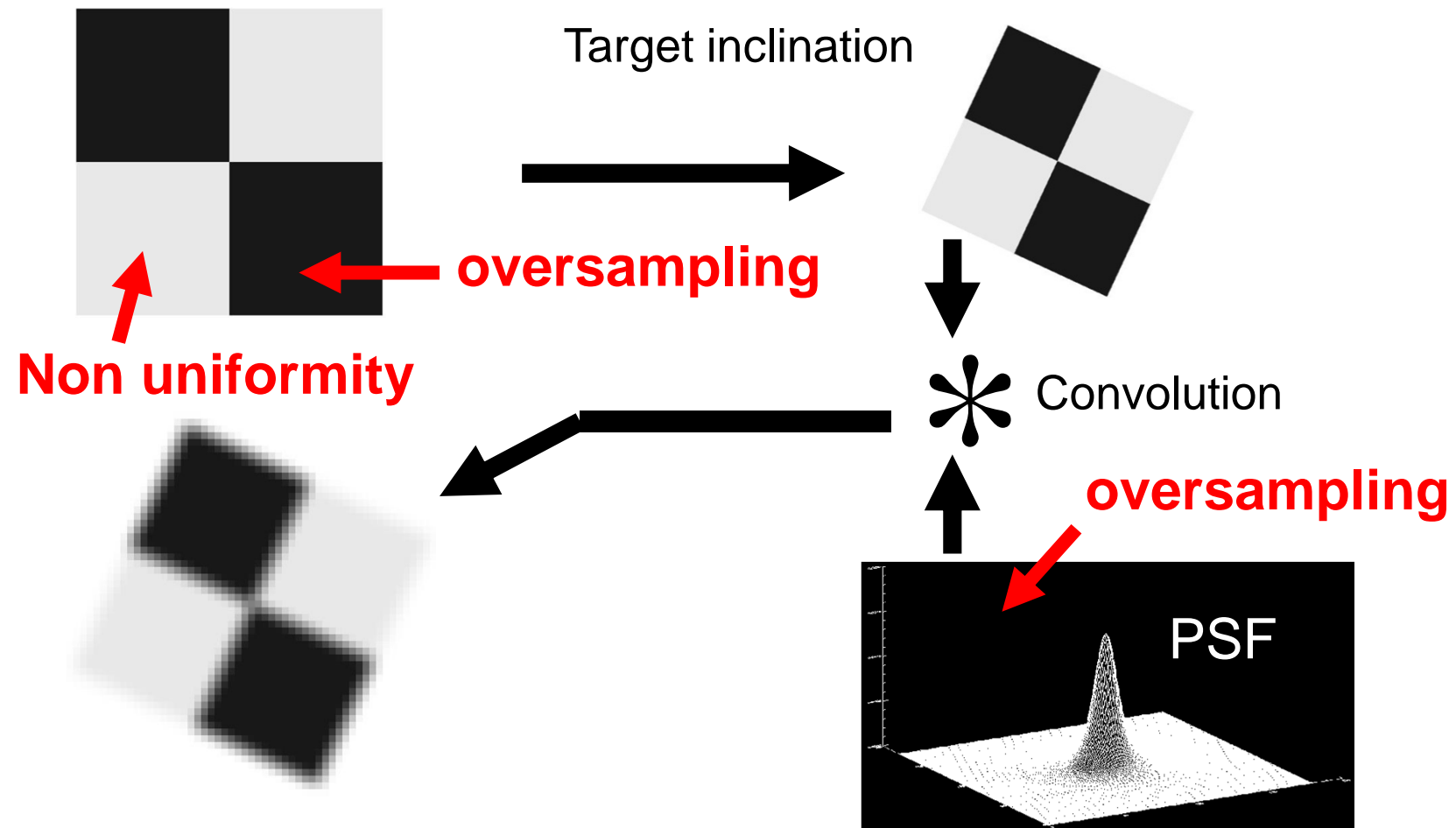
Features to be defined



# Sensor and target features

	MTF	SNR	Target contrast	Target non uniformity
Case 1	0.1 (model P)	-	Salon @ 600 nm	Salon@GSD =1m
Case 2	0.29 (model G)	-	Salon @ 600 nm	Salon@GSD =1m
New case to define				

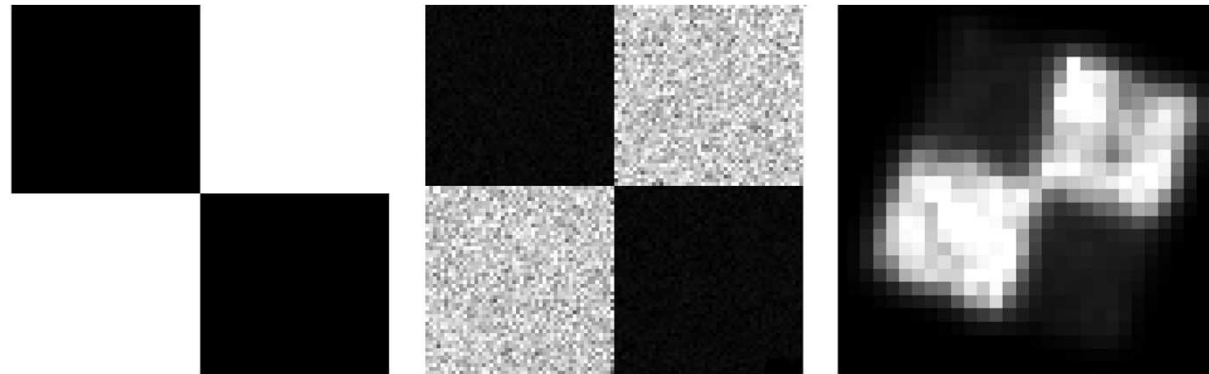
# Image simulation





# Image simulation

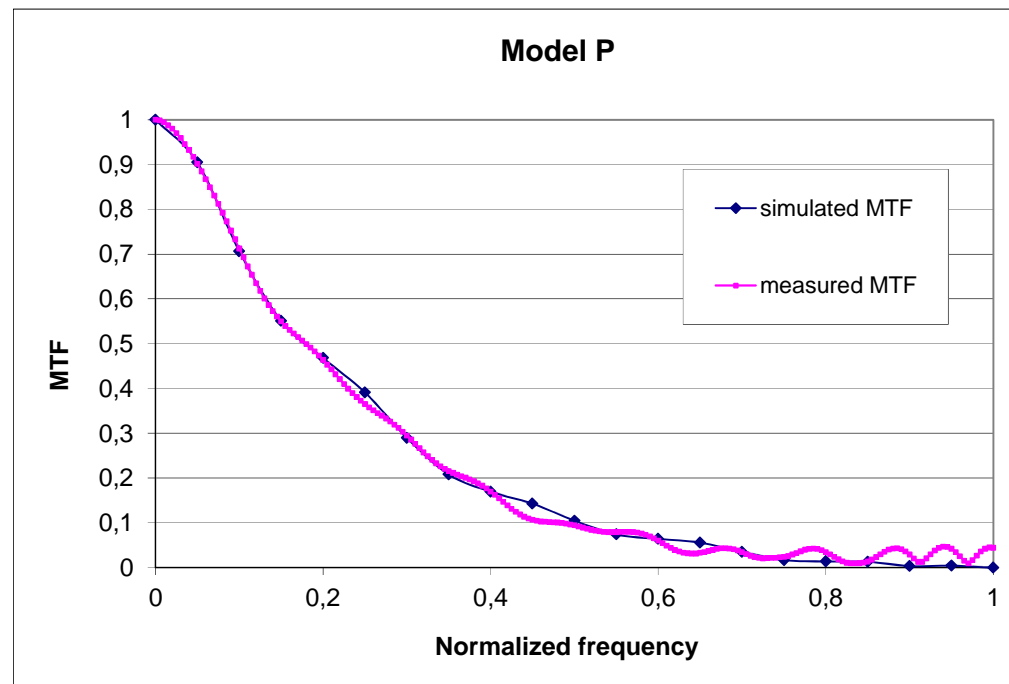
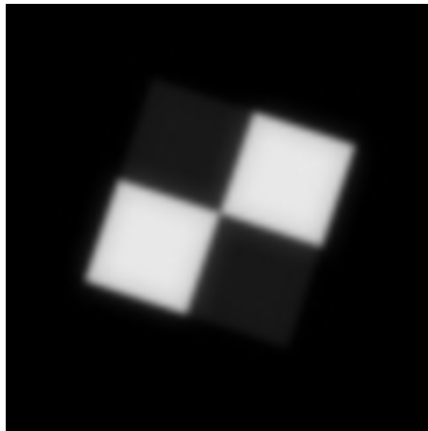
- Adjustment of the non uniformity added to the starting oversampled image in order to achieve the non uniformity required at the end



- $PSF = FT(\text{"MTF" model})$
- PSF extend = 10 pixels
- Oversampling rate = 20

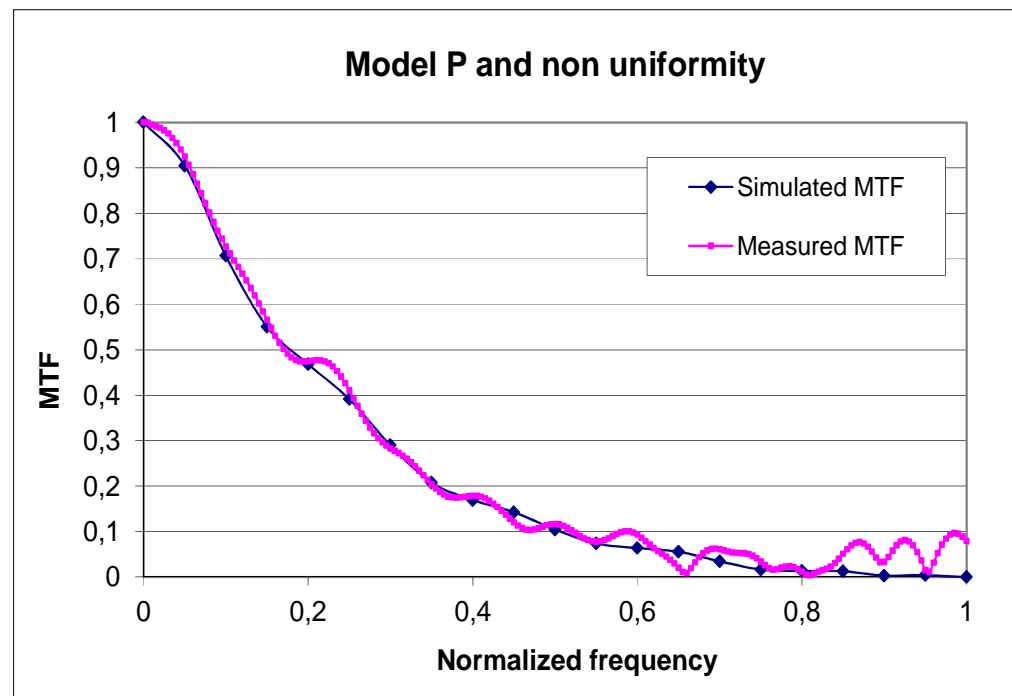
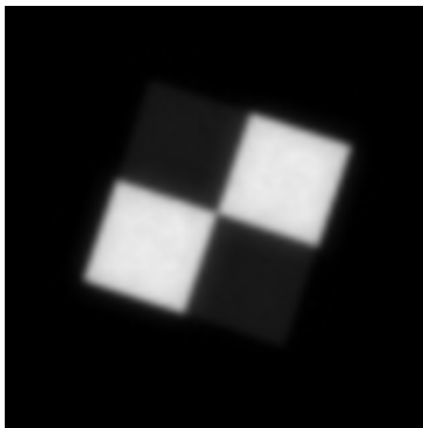
# MTF measurement results

- MTF created =  $FT(PSF)$
- MTF measured = MTF measured with the ONERA edge method code
- Case 1a (without non uniformity):



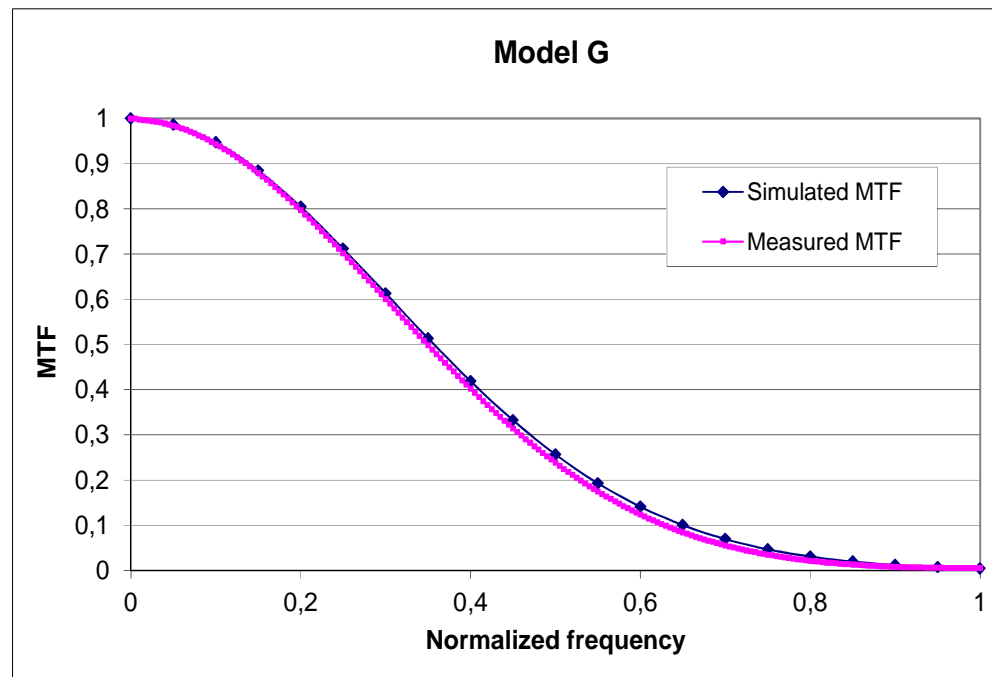
# MTF measurement results

- MTF created =  $FT(PSF)$
- MTF measured = MTF measured with the ONERA edge method code
- Case 1 (with non uniformity):



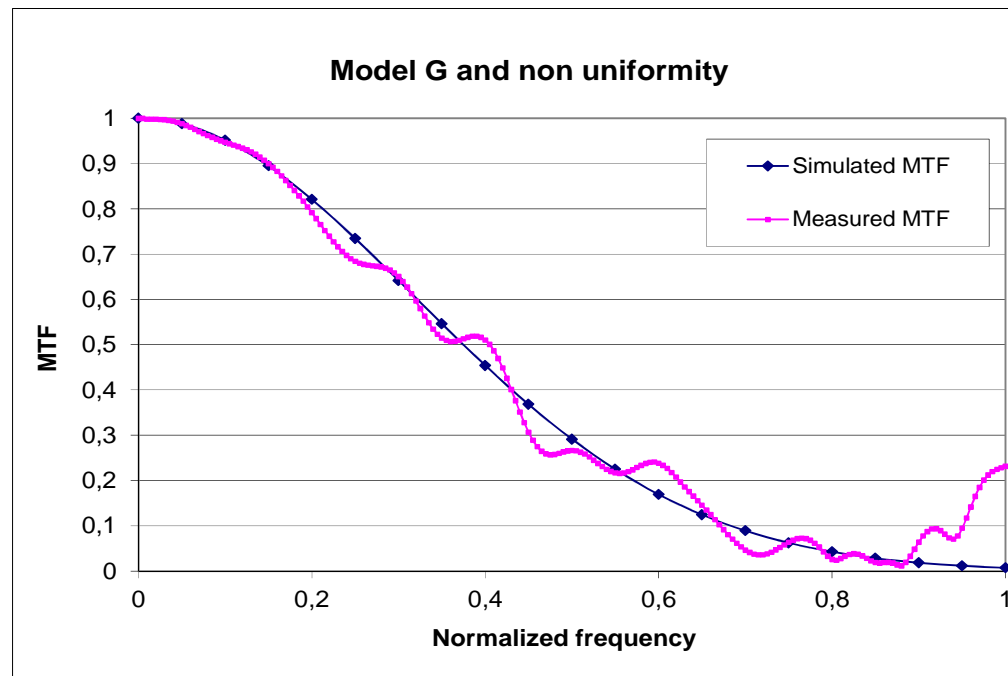
# MTF measurement results

- MTF created =  $FT(PSF)$
- MTF measured = MTF measured with the ONERA edge method code
- Case 2a (without non uniformity):



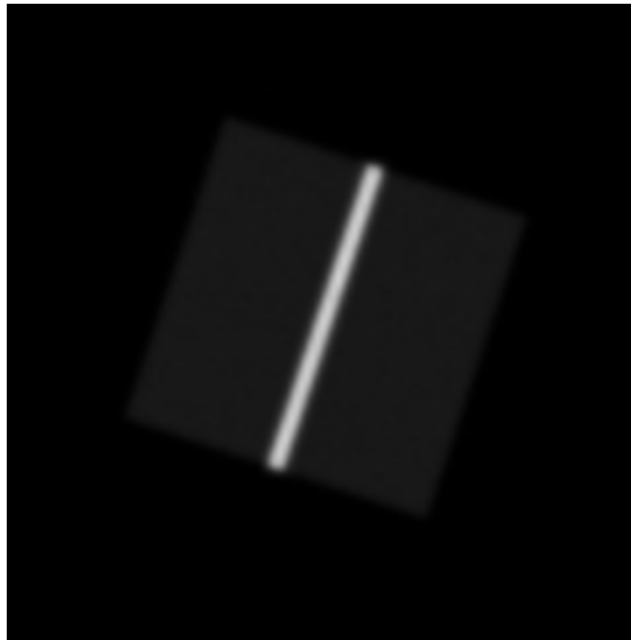
# MTF measurement results

- MTF created =  $FT(PSF)$
- MTF measured = MTF measured with the ONERA edge method code
- Case 2 (with non uniformity):



# Linear target

- Only an example:





# Preliminary conclusions

- First step for synthetic image simulation
- Sensitivity to the MTF model and to the way of computation (PSF model or MTF model)

⇒ **A need for various simulations with the same sensor features**

All the codes may behave fairly the same for ideal cases but may have different sensitivity to defaults

⇒ **A need for simulations with potential defaults (geometry for instance)**

Still a lot of work to do ...

# Roadmap

- Who is ready to contribute to the simulation effort?
- Which kind of target?
- Definition of simulation:

Name	Target contrast	Target defaults	MTF (value & model)	SNR	Geometry
Airbus DS	SdP		tabled data 0.1 & 0.3	150 (high level) 30 (low level)	Angle (leading to non integer oversampling rate)
CNES					

# Roadmap

- Who is ready to contribute to the simulation effort?
- Which kind of target?
- Definition of simulation:

Name	Target contrast	Target defaults	MTF (value & model)	SNR	Geometry

# Roadmap

- Who is ready to contribute to the reference dataset through actual images?
- Which kind of image?

<i>Name</i>	<i>Target/Landscape</i>	<i>Sensor</i>
<i>Digital Globe</i>	<i>checkerboard</i>	<i>worldview3</i>
<i>CNES</i>	<i>checkerboard</i>	<i>Pleiades L0</i>
<i>KARI</i>	<i>checkerboard</i>	<i>Kompsat3 &amp;3A</i>
<i>AIRBUS DS</i>	<i>checkerboard</i>	<i>S6/7</i>

# Roadmap

- Who is ready to process data from the reference dataset?

Name	Target & method	Case/Sensor	Date
CNES			
Digital Globe			
AIRBUS DS			

# Roadmap

- Who is ready to process data from the reference dataset?

Name	Target & method	Case/Sensor	Date
KARI			
CSIR			
TPZ			



# Roadmap

- Who is ready to process data from the reference dataset?

Name	Target & method	Case/Sensor	Date
ONERA			
SDSU			

# Roadmap

- Please send me your remarks and/or results:

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