RADIOMETRIC CONFIDENCE CRITERION FOR PATCH-BASED INPAINTING

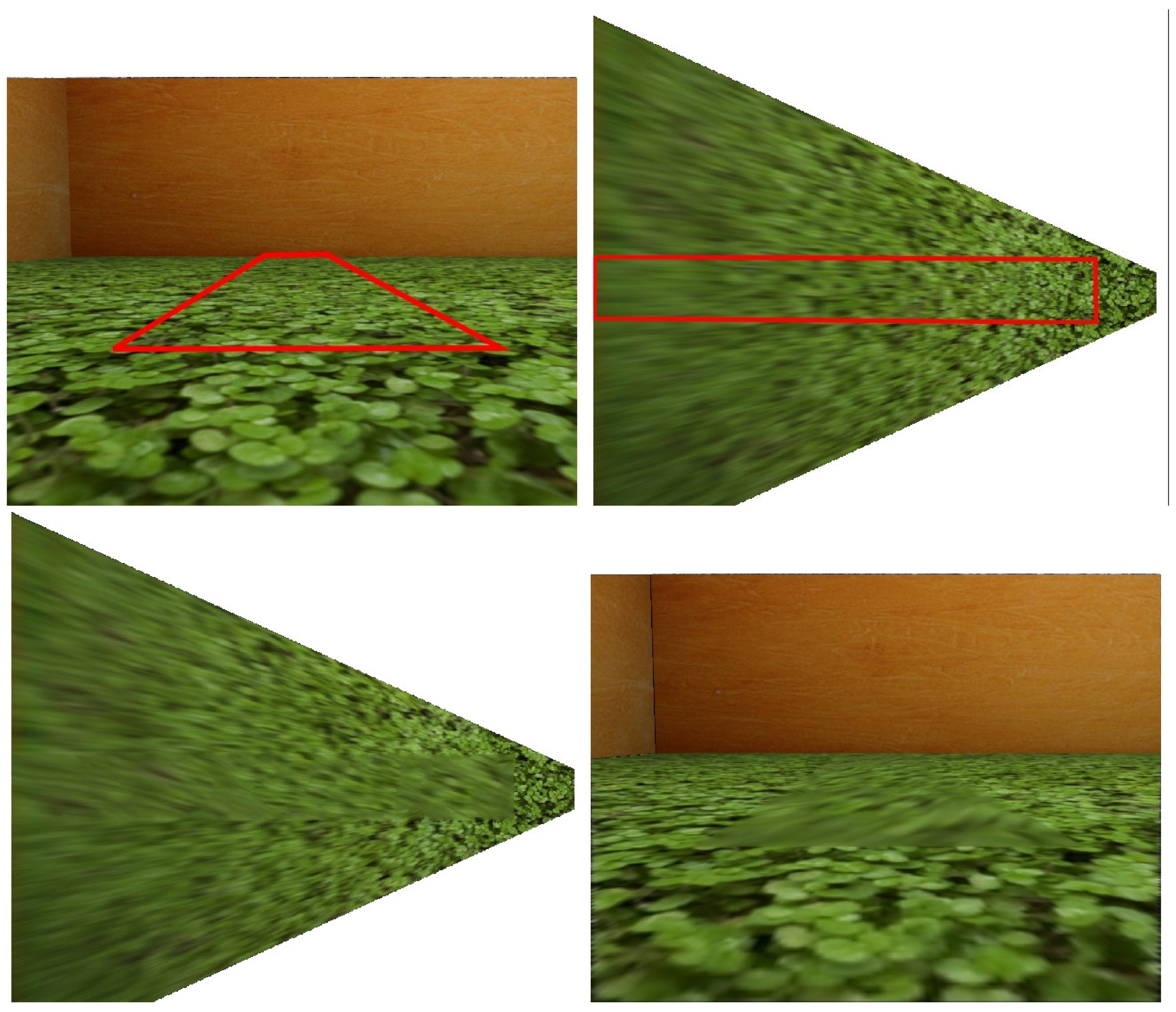
JULIEN FAYER[1,2], GERALDINE MORIN[1], SIMONE GASPARINI[1], MAXIME DAISY[2], BENJAMIN COUDRIN[2]
[1] UNIVERSITY OF TOULOUSE, TOULOUSE INP - IRIT [2] SAS INNERSENSE

CONTEXT

- Create a Diminished Reality process
- Needs to make planar rectifications onto the unknown zone which is completed by inpainting method [5, 6]

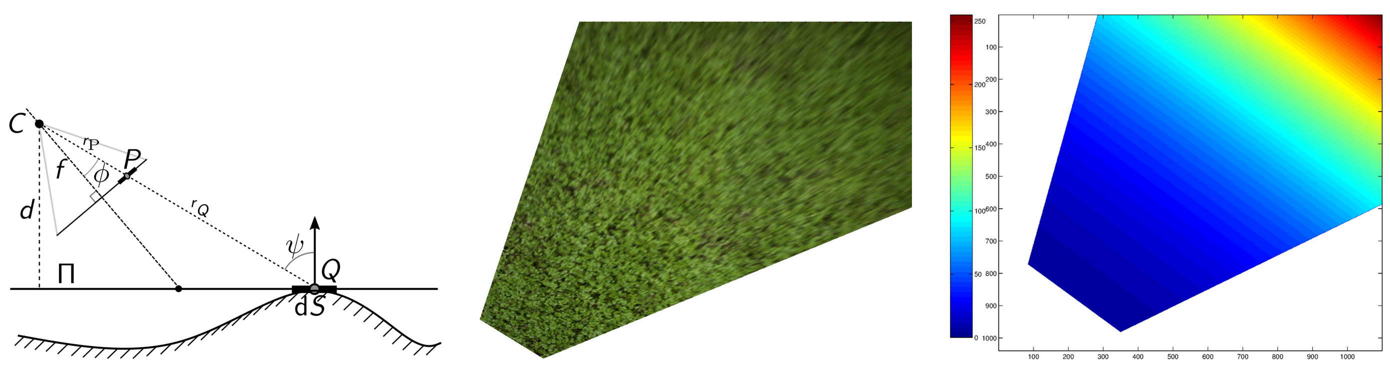
PROBLEM STATEMENT

- Non-uniform quality of data and possible interpolation artefacts
- Not handled in the state-of-the-art inpainting methods
- Creates a noticeable blur effect in the inpainted region



RADIOMETRIC CONFIDENCE CRITERION

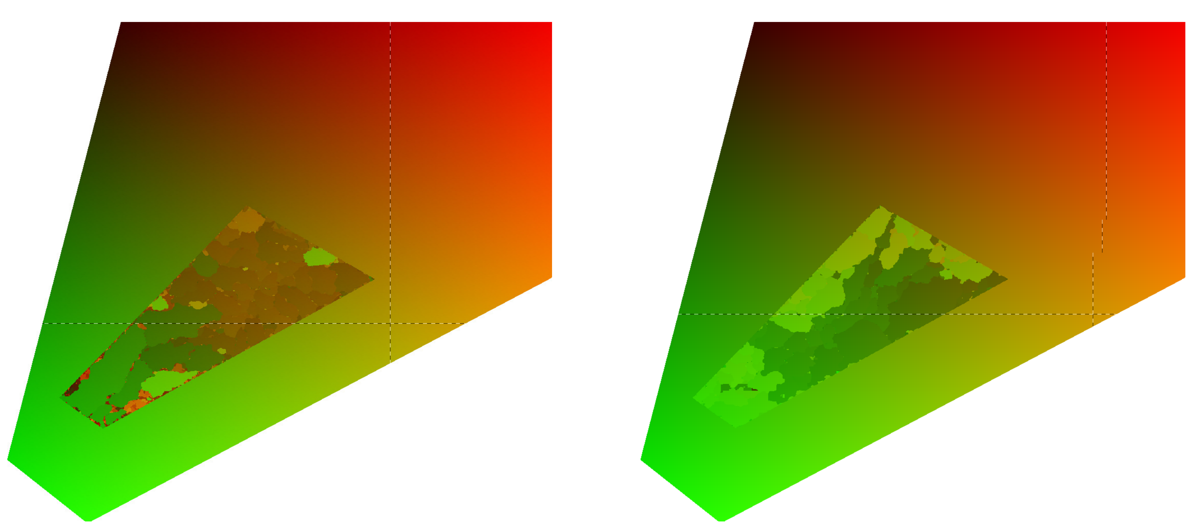
- A criterion that associates to each image pixel a score characterizing the quality of its projection
- Inspired from Bouguer's law : $dF = I.d\Omega = I.\frac{cos\theta}{r^2}dS$



- Defined as $trust(P) = \frac{(\frac{\mathrm{d}F}{\mathrm{d}S})(Q)}{(\frac{\mathrm{d}F}{\mathrm{d}S})(P)} = \left(\frac{f}{d}\right)^2 \left(\frac{\cos\theta}{\cos\phi}\right)^3$
- Confidence map of an image: $\mathcal{C}\colon U \times V \longrightarrow \mathbb{R}, p \longmapsto \mathcal{C}(p) = trust(P)$
- validation function $\text{validation}(p, q, \mathcal{C}, \alpha) = \mathcal{C}(q) \leq \alpha\, \mathcal{C}(p)$

APPLICATION 1: PATCHMATCH

- PatchMatch [1] finds matches between patches of an image by defining a correspondence map of nearest neighbour field (NNF)
- Update: in the propagation step, use validation to verify that the center pixel q of the candidate patch has a larger confidence than the mask pixel



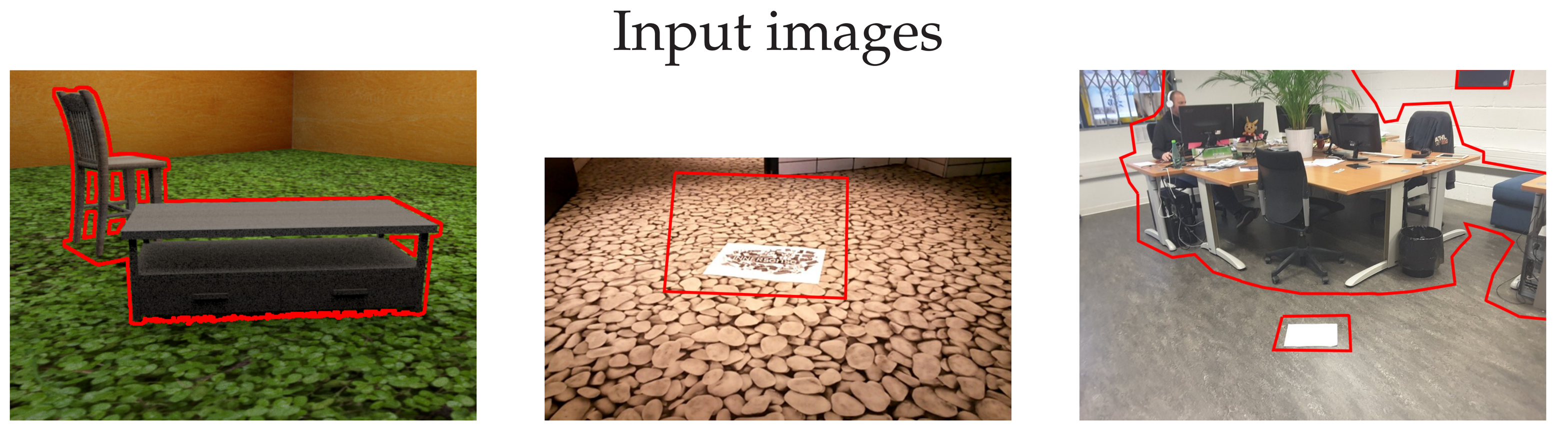
Correspondence maps
left: without criterion, right: with criterion

APPLICATION 2: STATISTIC + OFFSETS INPAINT

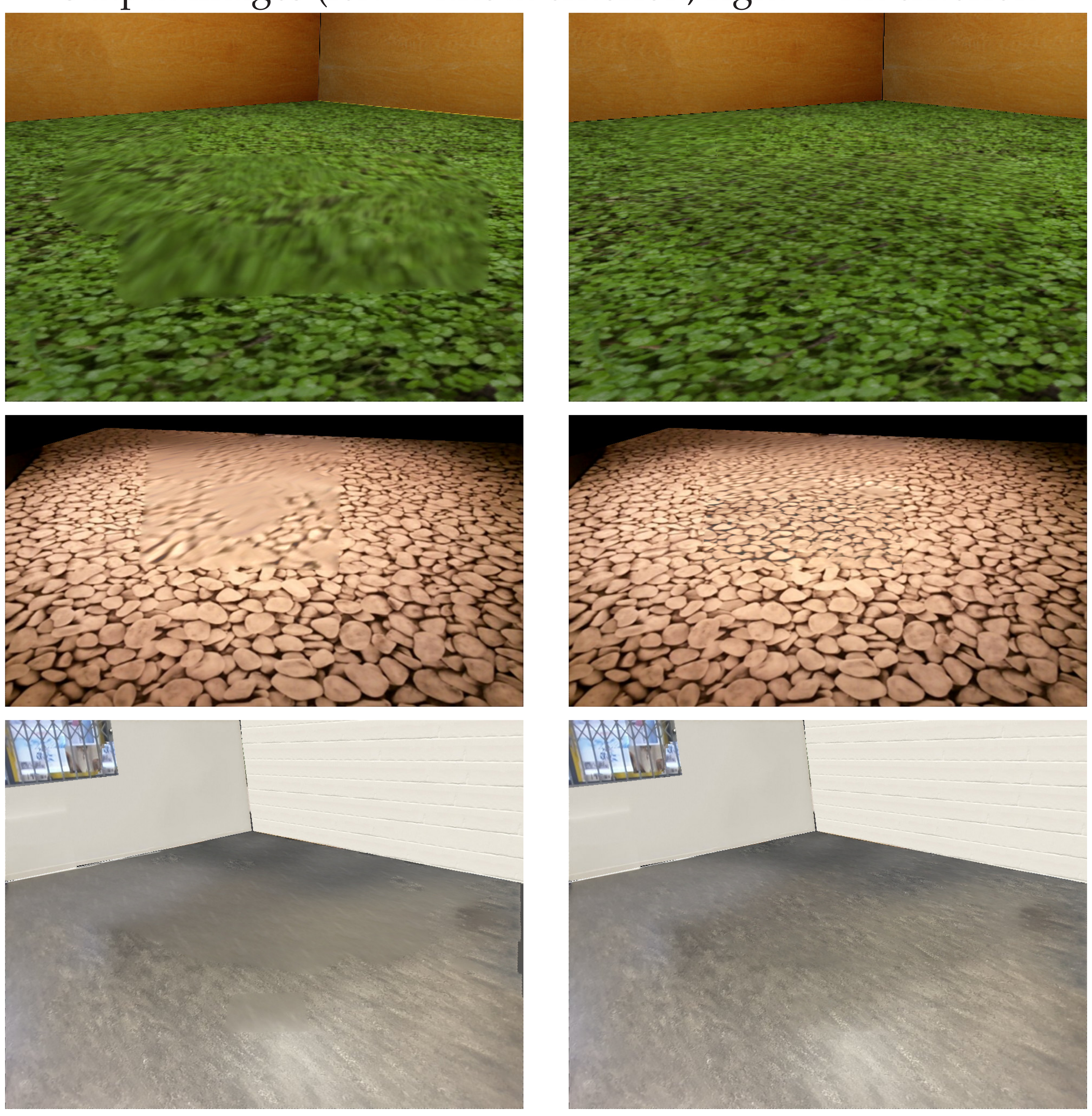
- *Statistic analysis* followed by *graphcut* [4] more adapted for inpainting textures with a regular pattern [2, 3]
- Aim: calculating for each patch of the known zone $I_{|M^C}$ its associated offset by minimizing $E = E_{data}(p, t) + E_{reg}(p, q, t_p, t_q)$
- Update: $E_{data}(p, t)$ is set to 0 if $p + t$ does not belong to the mask AND if $\text{validation}(p, p + t, C, \alpha) = 1$, otherwise it is set to $+\infty$

RESULTS

Input images



Output images (left: without criterion, right: with criterion



FUTURE WORK

- Extend to multi-view setting
- Set a trust based variable Gaussian blur for the output images

RÉFÉRENCES

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