Polarimetric Image Augmentation

Marc Blanchon[1*], Olivier Morel[1], Fabrice Meriaudeau[1], Ralph Seulin[1], Désiré Sidibé[2]

[1] ERL VIBOT CNRS 6000, ImViA EA 7535, UBFC, France
[2] IBISC, Univ Evry, France

*fr.marc.blanchon@gmail.com

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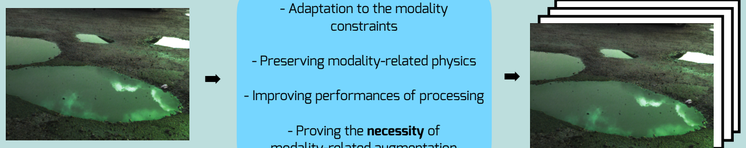
Ojective - Polarimetry adapted augmentation



Input Polarimetric Image (HSL colorspace)

- Adaptation to the modality constraints
- Preserving modality-related physics
- Improving performances of processing
- Proving the **necessity** of modality-related augmentation

Pre-processing

n images with correct physical properties

Usual approach

Interpolation / Transformation

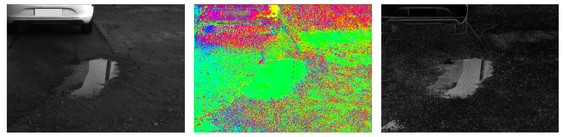
✅ Improve performance / avoid overfitting [1]

❌ Highly difficult to apply to physics-related image
↪ requires modality interpolability

Problem

❌ Polarimetry is hardly interpolable
❌ Angle of polarization is not invariant to pose changes

The three polarization representative images



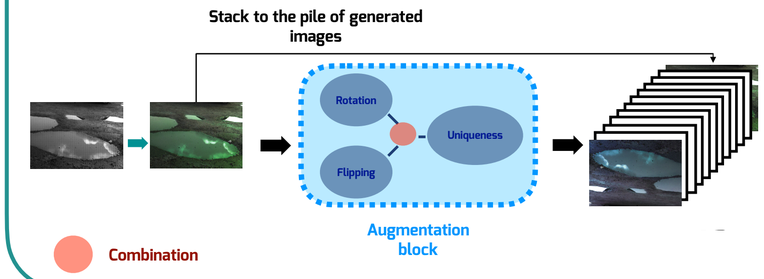
The proposal

$$I' = f(I)$$

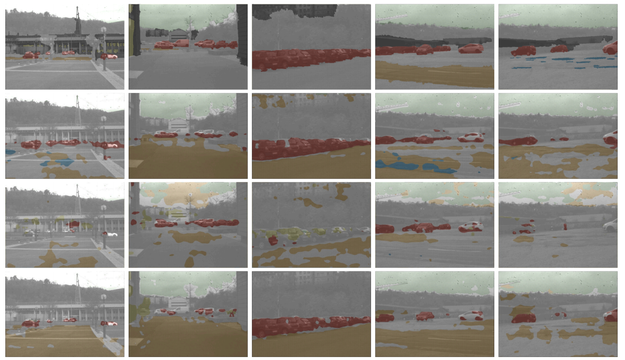
Transformed Image — Original Image

$f()$ is a physics-responsive transformation function composed of possible sub-transformation
Possible transformations are rotation and flipping

The pipeline



Comparative Results



In Brief

✅ A polarimetric physics-responsive set of transformations
✅ Increased performances on segmentation task
✅ Proof of necessity: data must be augmented according to the modality properties

❌ Very limited amount of possible transformations
❌ Augmentation cannot replace a consistent amount of data
❌ Necessits a considerable pre-processing

Reference

[1] Perez, Luis, and Jason Wang. "The effectiveness of data augmentation in image classification using deep learning." arXiv preprint arXiv:1712.04621 (2017).