

Jean-Philippe TAREL  
 Jean-Philippe.Tarel@ifsttar.fr

A new way of performing pixel by pixel comparison between two images is proposed, taking advantage of interesting invariance properties with respect to illumination conditions and camera settings.

## IMAGE DIFFERENCE OPERATORS

- **Usual** Image Difference operator between images  $I(x)$  and  $J(x)$ , where  $d$  is a scalar distance:

$$UID(I,J)(x) = d(I(x), J(x))$$

- **Smooth** Image Difference operator, where  $F$  is an image filter:

$$SID_F(I,J)(x) = d(F(I)(x), F(J)(x))$$

- When  $F(K) = H_L(K)$ , where  $H$  is a guided bilateral filter on input image  $K$  with the help of the guide image  $L$ :

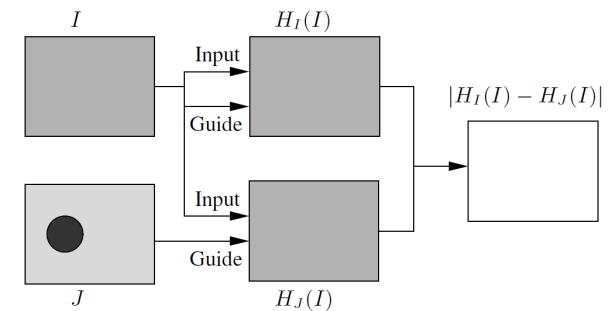
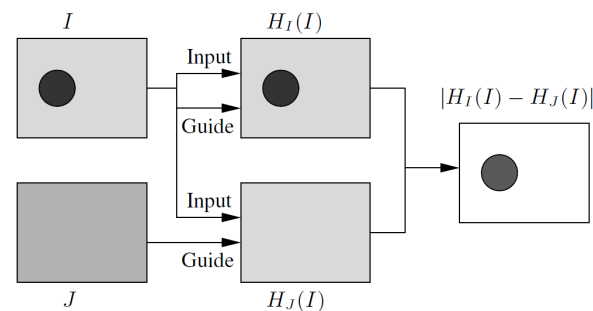
$$SID_H(I,J)(x) = d(HI(I)(x), HJ(J)(x))$$

- **New operator** named Guide Image Difference operator:

$$GID_H(I,J)(x) = d(HI(I)(x), HJ(I)(x))$$

## INTERESTING PROPERTIES

- $GID_H(I,J)$  is not symmetric w.r.t  $I$  and  $J$ , not a distance but a dissimilarity measure.
- Invariant w.r.t the addition of a constant on  $I$ , and covariant w.r.t. a factor product (not considering intensity saturation).
- Invariant w.r.t the addition on  $J$  of a piecewise constant function preserving  $J$  edges.
- Robustness to noise on  $I$ .



## BACKGROUND SUBTRACTION



$GID_H(I,J)$  after thresholding

