A RARITY-BASED VISUAL ATTENTION MAP
- Application to texture description -

POLYTECH.MONS
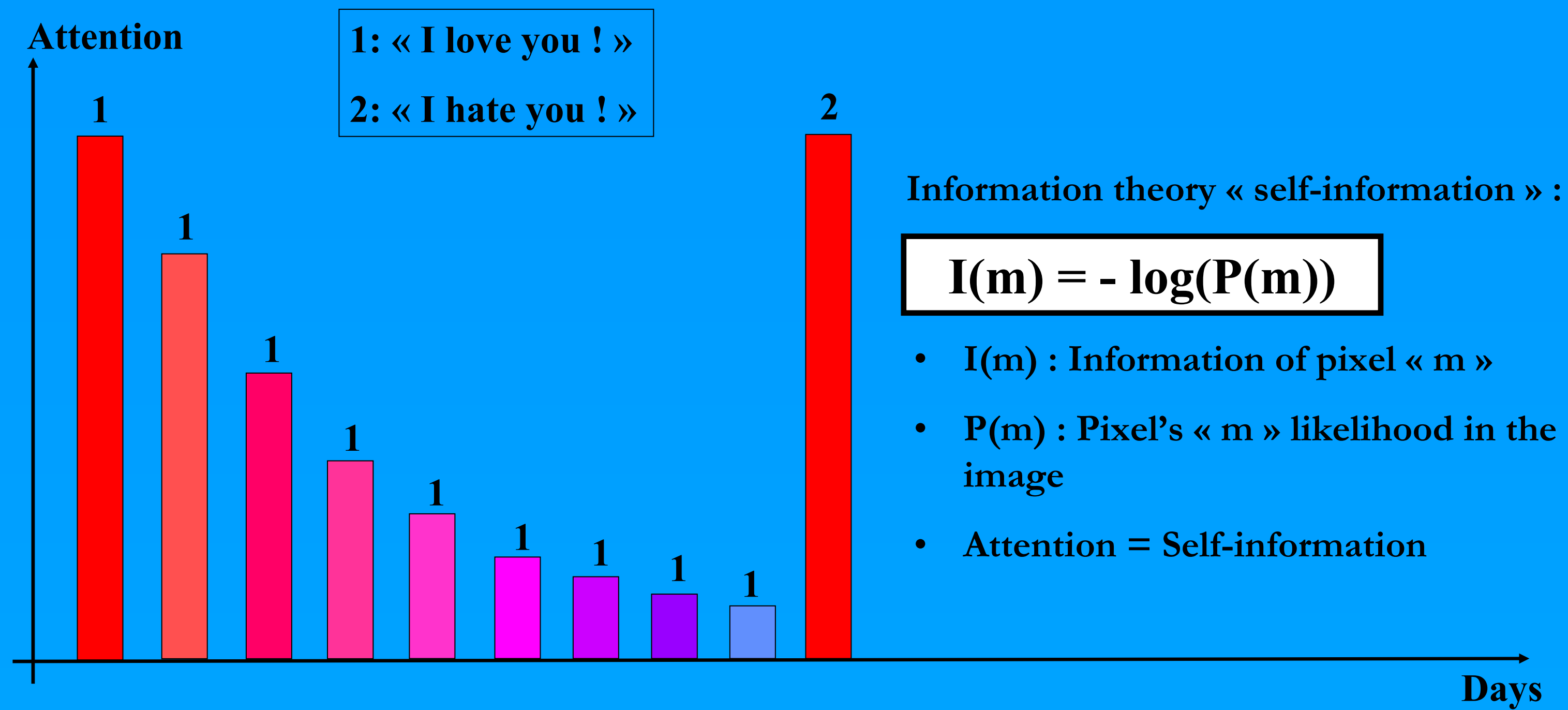
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Context

- _Our goal_ – Describe the regularity of a texture by using visual attention
- _Main idea_ – Saliency is inversely related to the texture regularity !

Method

Visual attention

1: « I love you ! »
2: « I hate you ! »

Information theory « self-information » :

$$I(m) = - \log(P(m))$$

- $I(m)$: Information of pixel « m »
- $P(m)$: Pixel's « m » likelihood in the image
- Attention = Self-information

Algorithm

1. Introducing spatial information :
- I1 = Image (I) median filtering (modelizing tonic W-cells)
- I2 = Image (I) local variance (modelizing phasic W-cells)

2. I1 and I2 attention maps :
- Pixels likelihood P(m) = normalized histogram
- Attention computation on both images :
  A1 = -log(P(m1)) on I1
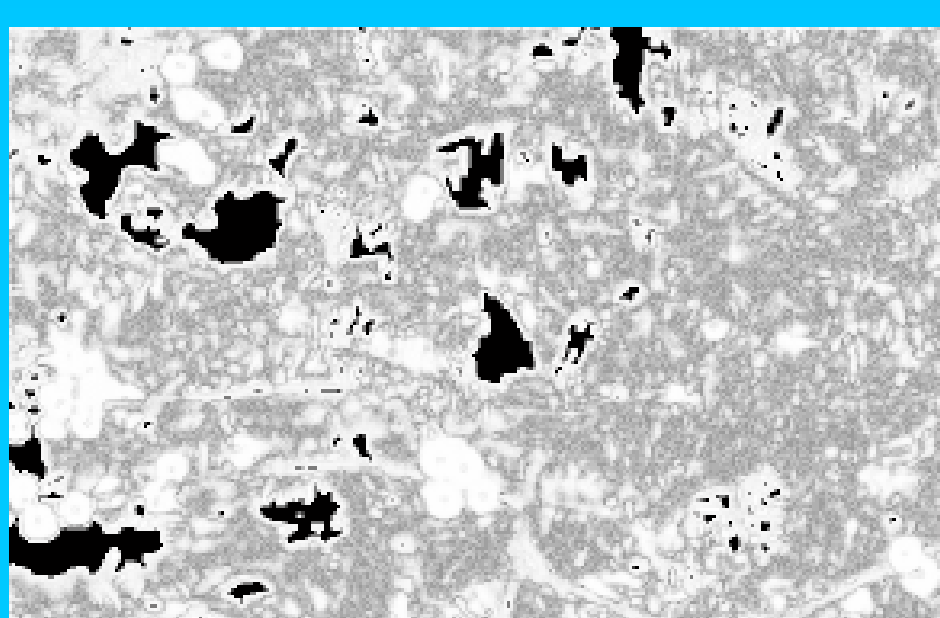 A2 = -log(P(m2)) on I2

Top: A1 and A2, Bottom : I and A

Adding color information
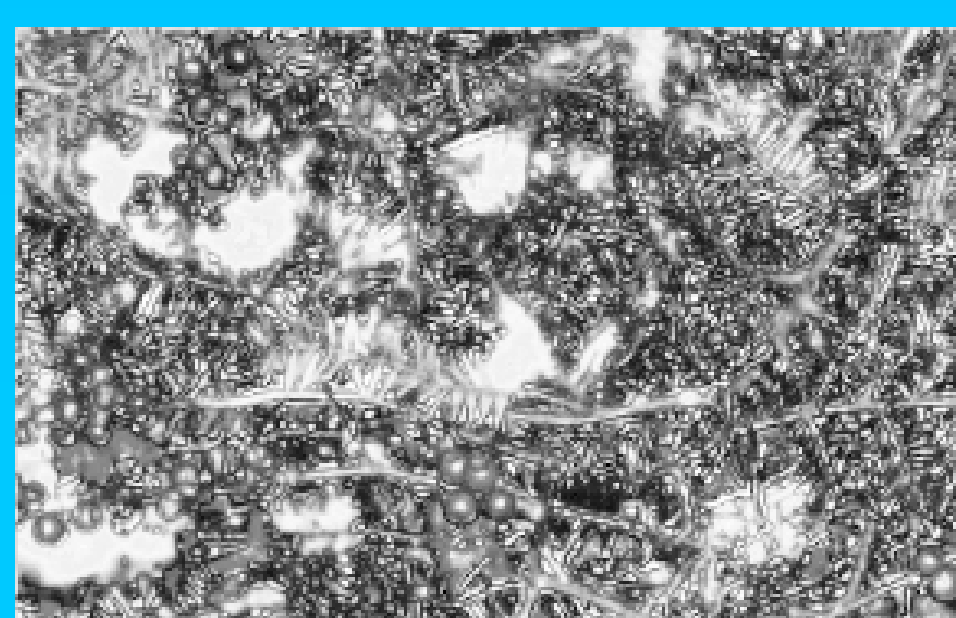
Color space :
- C1 = Luminance
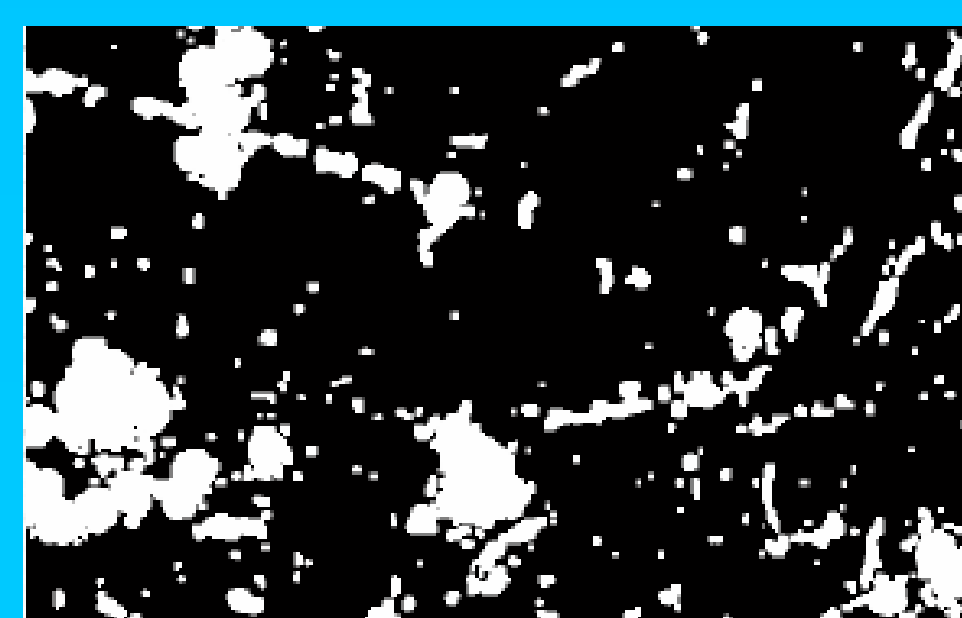- C2 = Red/Green opposition
- C3 = Blue/Yellow opposition

Initial color image

A1 = C1 attention map

A2 = C2 attention map

A 3 = C3 attention map

Final attention map: A=MAX(A1,A2,A3)

Relationship between texture and saliency

- Attention = rarity
- Texture = repeating patterns

Saliency = 1/(Texture regularity)

From top to down and left to right : Initial image and remaining areas after subtracting the most salient areas, the salient areas and the medium salient areas : remaining texture is more and more regular !

Results

Left column: initial images

Right column: textured areas after subtracting the most salient areas

Left column: initial images

Right column: textured areas after subtracting the most salient areas

Conclusion

- We described a novel texture regularity measure based on visual attention
- We can now answer to the question : « How much this area is a texture ? »
  - An homogeneous or very regular area is not rare, so its attention score is very low
  - A more irregular texture will be more salient
  - A very irregular texture, which actually is not really considered as a texture, as small particular areas, edges, etc… will be very salient !
- Our descriptor can be used to obtain an image only containing textures with a given regularity. Then texture segmentation and texture block-coding are easier.

Acknowledgements