A sourvey on content-based image retrieval/browsing systems exploiting semantic

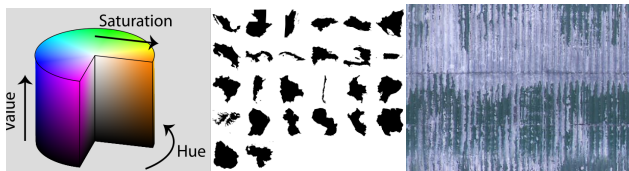Paolo Parisen Toldin

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Nowadays, we are surrounded by multimedia informations.

Figure: Audio, Video, Image, Text, etc...

The explosion of digital data in all of these forms has arisen a question about retrieve relevant information from repository that could be very large.

We can describe image by using its low level feature:

Color, Shape, Texture.

Image segmentation:

Figure: Example of segmentation of a picture. (the red lines divided the regions)
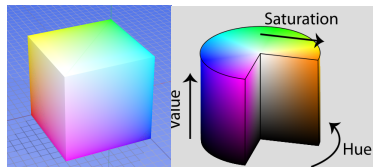
Color Model:

Figure: RGB and HSV color models

Shape: There's no universal definition of what a shape is.

Figure is the only existing thing that is found always following color -
Socrate

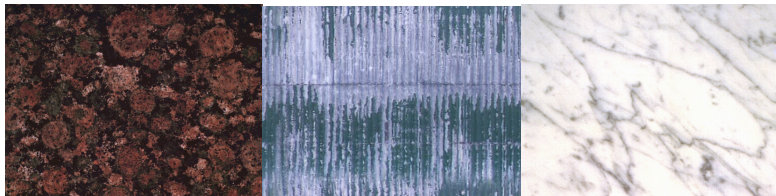Texture and Tamura feture: Coarseness, Contrast, Regularity. . .

Figure: Example of textures

Human perception cannot be simulated exactly by a computational machine. In order to measure similarity of images there are two ways:

- One-One Match: region of the query image is allowed to match with only one regions in the target
- Many-Many Match:region of the query image is allowed to match with one or more regions in the target

Color: not easy to compare all pixels. RGB 24 bits image has
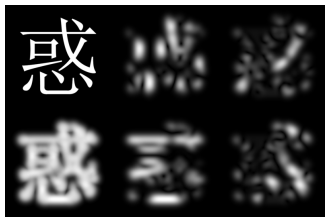$$2^{24} = 16777216 \text{ colors}.$$

Solution: compare histogram of images.
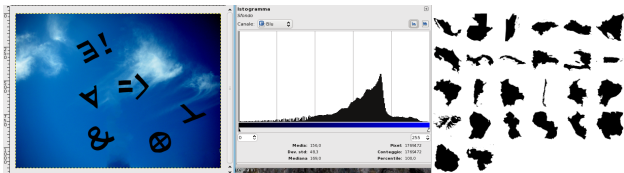
Shape: In literature there are a lot of edge detector algorithm.
how to encode them?

Solution: consider only the n most interesting points and compare them.

Texture: It is not so easy to compare two different texture

Solution: use Gabor Filter. Indeed it has been found that Gabor Filter are particularly appropriate for texture representation and discrimination.

Is it possible to elevate the image retrieval to semantic meaning?

- Create a vocabulary (*object-ontology*). "red", "sky", . . . what are them?
- Quantize the color. The "CNS" (Color Name System) use 627 distinct colors.
- What about texture? is it possible to quantize them?

Research in content-based image retrieval is a topic on which a lot of industries are investing their money.
Is it probable that in the near future we will see a lot of innovations.

The experience has established that low-level image feature cannot always describe high level semantic concepts.

The research is focusing on narrowing down the semantic gap between user's mind (and its richness semantic) and computational power of our computers.