Digital Image Processing

Exercise 01

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Presentation of our program solution

1. Functional description:

Implement Image defogging based on a dark channel process algorithm, In Dip1::doSomethingThatMyTutorIsGonnaLike() function .

Input: Foggy Image
Output: No-Fog Image

2. Background:

There is a widely used foggy image expression formula in the field of computer vision and computer graphics.

$$I(x) = J(x)t(x) + A(1 - t(x))$$

Where I(x) represents the graph to be processed (fog map), J(X) represents the real graph (no fog map) which is the image we want, t(X) stands for transmittance, and A stands for global atmospheric light.

Mathematical definition of dark channels:

$$J^{dark}(x) = \min_{c \in (r,g,b)} \left(\min_{y \in \Omega(x)} J^c(y) \right)$$

And Transformed

$$J(x) = \frac{I(x) - A}{max(t(x), t_0)} + A$$

3. Operation steps:

Step 1: compute the dark channel of the original image

First find the darkest channel value in each pixel, and finally perform the minimum filtering. Minfliter is the minimum filter function

Step 2: computer the atmospheric light A

Input: dark channel map, original image, window size (must be odd)

Output: atmospheric light value A, a one-dimensional array header containing three elements

Step 3: computer transmission t(X)

Step 4: compute the scene radiance J(X)

Answers of theoretical questions

Part I : Theory

1. A digital image is a numeric representation, normally binary, of a two-dimensional image. A digital image is a representation of a real image as a set of numbers that can be stored and handled by a digital computer. In order to translate the image into numbers, it is divided into small areas called pixels (picture elements).

2. bottom-up processing:

   (1) image acquisition scene → image

   (2) preprocessing image → image(low level)

   (3) segments image → features(mid level)

   (4) recognition / evaluation features → objects(high level)

   Perceive the individual parts and organize them into a whole, if possible. Information available in the stimulus itself. Relies on properties of the stimulus such as patterns of light and dark areas.

3. Optical, EM-Waves, Infra-red, X-Ray, Synthetic Aperture Radar