

Re: background subtraction in x-rays

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- *From:* ImageAnalyst <imageanalyst@xxxxxxxxxxxxxxxx>
 - *Date:* Sun, 9 Mar 2008 10:59:41 -0700 (PDT)
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On Mar 9, 9:46 am, anujan <anujan...@xxxxxxxx> wrote:

hello all,

i am working on an assignment which is background subtraction in digital x-rays. i am working on MATLAB and am restricted to MATLAB as my platform.

i am having quite a few issues & am actually stuck in the assignment.

i am enlisting them -->

1. though background subtraction (BS) seems a very common topic there is no algorithm that is clearly mentioned. most of them are vague and strictly mathematical. i would be really grateful if some1 could point out an algorithm which will help me in this respect.

2. the main problem is that BS is primarily for surveillance and hence used for motion pictures. my images are however totally static. i am using a reference image as a x-ray without a patient and then another image as my operating image which is a digital x-ray. as a result background subtraction isn't actually giving me any noticeable results.

by reading the related papers i have tried to implement an algorithm viz. HEIKKILA & OLLI on my images. i have just started out with matlab programming and am a beginner in this respect. threshold value has been assumed on a trial & error basis as there is no standard mentioned value in the algo. the problem is that i am not getting any results.

perhaps possibly coz my image is monochrome or then the algorithm is not suited for such images. i am actually stuck with it and am at my wits end.

3. also what quality measures should i consider to show that i am actually enhancing the x-ray image? are there any standard parameters or then do i work on some of the statistical properties as my quality measures?

hoping that all you experienced people could perhaps have some

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guidelines for me or show me the way.

and worst part is that the submission time is just around the corner.

cheers,

ANUJAN.

ANUJAN:

1. Yes it is mathematical. It involves such mathematical complexities as $\text{subtractedImage} = \text{dataImage} - \text{backgroundImage}$. But before you do that you need to make sure the images are calibrated (e.g. same kVp, dose, etc.) And it can become more complex if you take into account the intensity linearity and spatial non-uniformity of the detector(s). But for your case, you might just gloss over that. Write out the equations for x-ray transmission (Beer's Law) and assume a linear detector. Then assume a log detector (like x-ray film with its H-D curve). You will understand better how to do the math once you've done some simple cases for yourself.

2. Background subtraction is used for surveillance. That doesn't in any way affect you or make your problem more difficult. Also, being monochrome does not introduce any additional difficulties into the problem. In fact, quite the opposite: it makes it easier. Think what additional problems might occur if it were a color image. Just subtract and manually threshold. This might be fine for your class project. You can come up with some standard (Otsu, etc.) or ad-hoc automatic thresholding method if you must have an automatic method.

3. You would look at dynamic range. After subtraction, you should have a better dynamic range than before and you should be able to see your blood vessels easier. You could image a phantom with a known object embedded and then show how the contrast between the object and its surrounding neighborhood has increased. Perhaps you could also look at detectability of the lesions or whatever you're looking for and create some ROC curves (http://en.wikipedia.org/wiki/Receiver_operating_characteristic). I can't do anything about your submission time but don't fret. It's not too difficult to make a book report on this subject in a day, just doing internet research, including doing a simple MATLAB macro to subtract images and plot histograms. This doesn't have to be a huge project. Don't worry, you'll get it done because it's not that difficult (at least as far as a class project goes because of course some people make a career out of digital subtraction angiography).

Regards,
ImageAnalyst

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