DISCUSSION FOLLOWING SESSION NO 2

Chairman: Alain Galli
Papers: Hegstad; Freulon

Gomez: Could you please explain for a layman where you would get all these $\pi^*$? How would you put this into practice to say simulate a sand shale?

Omre: The details are given in the paper.

Lantuéjoul: I have a problem with the simulated annealing method in the sense that it has been devised for optimising functions, whereas you are using it to simulate random functions. So could you tell me where the random part appears in the algorithm that you have presented?

Hegstad: It is in the construction of the Markov chain, in the transition probabilities.

Lantuéjoul: So randomness is used to find the minimum of the function. You also give the initial states; you start with a random function. So randomness is involved in two places: firstly, in the initial state and then to run the optimization algorithm. Earlier this morning Henning Omre said that it was very important to specify the underlying model. So I would like to ask you what it is here.

Hegstad: The model of the reservoir is given by the parameters $\eta$, etc.

At that point, the chairman stopped the discussion in order to allow enough time for the next presentation. After that was finished, the discussion started up on Freulon’s paper.

Jeulin: The technique described in your presentation looks like an alternative to filtering. Concerning the filtering, I have two questions. Firstly, in a real situation, you start out with a noisy image, and you have to go back to the underlying properties of the image which are not here. For example the histogram of the noisy image is not the same as that of the real one. Could you comment on this? Secondly, could you comment on the signal to noise ratio that you get, compared to other filters such as cokriging.

Freulon: In answer to your first question, there has been a lot of work on the inference of the underlying parameters. For example, for the Poisson
noise case, I used the results given in Colin Daly's thesis. In more general cases, there are some problems but I have not looked at them in detail. It was just to see how the simulation algorithm worked.

**Jeulin:** But you tried to replace the initial gaussian random function by something else.

**Freulon:** First I will reply to your second question on the filtering property of the conditional simulation before coming back to this point. I do not think that this is a filter. To construct a filter you would have to take the average of lots of simulations to get the conditional expectation. Or maybe we could change the temperature via simulated annealing to get an a posteriori maximum. We would then get a filter. But it was not the purpose of the method which was to produce images that respect certain constraints and with given statistical properties.

**Jeulin:** But it is very similar to a filter because...

**Freulon:** And of course, in this case, they are not optimal. To get an optimum filter, you have to add something. First I started using the Poisson noise case to construct the conditional expectation and Colin Daly suggested it could be a good by—product of this method.

**Jeulin:** It is not gaussian...

**Freulon:** Now coming back to your other point, instead of using a gaussian variable, I started with a mosaic model which is quite different and I compared it with a linear filtering given by disjunctive kriging. It worked as well as the other methods. So it seems quite robust. But you have to infer the right covariance. Of course the conditional simulation will be multigaussian rather than mosaic.

**Daly:** One of the really interesting things in this paper is the deconvolution because that has got huge potential applications for inverting seismic data. In practice seismic data that you see, has lost low frequencies. The convolution takes place not on the acoustic impedance but on the reflectivity, essentially on the derivative. Would your technique work just as well for inverting in that case?

**Freulon:** I think that you can compute the conditional distribution of the observed values given the gaussian one. It is more complicated but with a little bit more work it should be possible.

*The chairman then closed the discussion just on Freulon’s paper, in order to widen the scope of the discussion. To start it out, he asked Lantuéjoul to repeat the question that he had asked earlier.*