Open problems in SMC, according to AMJ

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16 June 2021

Adam's take on the current cutting edge of the field, as shared with us in the last episode of the SMC reading group on 16/6/21.

- High-dimensional filtering
- How to specify the sequence of distributions for an SMC sampler where you only care about the final distribution: e.g. large steps with multiple MCMC steps between vs. small SMC steps with few MCMC steps between; should be possible to do a systematic analysis...
- Genealogies of multi-level splitting algorithms: easier problem than SMC genealogies; but probably no one cares
- How to do exact simulation using SMC: rejection sampling + upper bound on g; regeneration + conditional SMC
- Unbiased estimation of arbitrary integrals, rather than just normalising constants
- Look-ahead methods: in theory they could give perfect samples from the posterior; how to construct good approximations to that?
- Smooth particle filters in dimension > 1: Mike Pitt did it in dimension 1; Anthony Lee's PhD thesis had a go
- Online Bayesian parameter estimation, i.e. without the cost growing in time: might be impossible since the problem gets harder over time.