notes

Files

Filename	What it does
sim1.R	fit variogram through WOLS on `meuse` data
sim2.R	fit variogram through REML on `meuse` data
sim3.R	fit variogram through WOLS on simulated random field
sim4.R	fit variogram through REML on simulated random field

Issues

1. Dimension of grid seems to lead to computational problem for *(i)* taking pps sample, *(ii)* estimating variogram through REML with all the data.

Some questions

1. Variogram/Covariogram

- Q1: The formulas in the paper are for the general case $U \in \mathbb{R}^d$ or for the case $U \in \mathbb{R}^2$?

R1: For the definition of G and C, this is the general case: $U = \mathbb{R}^d$

2. **Equation (5)**

$Y : \Omega \to (U \to \mathcal{Y})$ Gaussian random process

$X : \Omega \to U$

$n, m \in \mathcal{N}$, $x \in U^n, x^{'} \in U^m$

- Q2: $n \neq m$?

R2: not necessarily.

Expected value of signal $\mu : U \to \mathcal{Y}$, $x \to E\left[Y\left[x\right]\right]$ and covariance matrix between points $\mathbf{x}_1, \ldots, \mathbf{x}_n$ and $\mathbf{x}_1^{'}, \ldots, \mathbf{x}_m^{'}$ $\Sigma_{\mathbf{x},\mathbf{x}^{'},\theta} = Cov\left[Y\left[\mathbf{x}\right], \left[\mathbf{x}^{'}\right]\right]$.

In the paper we have

$$f_{Y\left[\mathbf{x}\right]}\left(\mathbf{y}\right) = \frac{1}{2\pi^{n/2}} \exp \frac{-(\mathbf{y} - \mu(\mathbf{x}))\Sigma_{\mathbf{x},\mathbf{x}}^{-1}(\mathbf{y} - \mu(\mathbf{x}))}{2}.$$

- Q3: Most likely I'm mistaken, but I was wondering if (i) in the first fraction the denominator has also the term $|\Sigma|^{n/2}$ where $|\Sigma|$ is the determinant of Σ, and (ii) the first $(\mathbf{y} - \mu(\mathbf{x}))$ is transposed, so that we have

$$f_{Y\left[\mathbf{x}\right]}\left(\mathbf{y}\right) = \frac{1}{2\pi^{n/2}|\Sigma|^{n/2}} \exp \frac{-(\mathbf{y} - \mu(\mathbf{x}))^T\Sigma_{\mathbf{x},\mathbf{x}}^{-1}(\mathbf{y} - \mu(\mathbf{x}))}{2}.$$

R3: You are right.

3. **Design/sample**

D is the random process for the design.

- Q4: D has domain equal to the power set of U^n, i.e. $P(U^n)$?

R4: we have made the assumption of a fixed size design, so in this case, $D(\omega)$ has domain equal to the power set of U^n, i.e. $P(U^n)$. D is a random variable: $D : \Omega \to$ the set of all probabilities on U^n, $\omega \mapsto D(\omega)$

- Q5: the codomain is the set of probability distributions on U^n, right? Can we indicate that with $\mathcal{P}_{U^n}$? R5: the codomain of D is the set of all probabilities distributions on U^n the codomain of $D(\omega)$ is $[0, 1]$

- Q6: If Q4 and Q5 are right, then we should have $D : P(U^n) \to \mathcal{P}_{U^n}$

R6: $D(\omega) : \mathcal{P}_{U^n} \to [0, 1]$

4. **Exchangeability condition**

- Q7: Why do we use it? (I guess to have property 2.3) R7: this is a way to ignore the order in which elements are selected. Adaptive sampling is a counter example

- Q8: It is verified in our case? I mean, it's just for SRS or not? R8: Yes, we limit ourselves to these cases. The selection proportional to size, this is also the case.