

# Demonstration example for paper on Hybrid point processes

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This Sweave script is part of the online supplementary material for the paper

*Hybrids of Gibbs point processes and their implementation*  
Baddeley, Turner, Mateu and Bevan

This file runs a simple experiment to illustrate Lemma 6 of the paper.

## 1 Setup

Load the required packages and data.

```
> library(spatstat)
> if(versionstring.spatstat() < "1.34-1") {
+   stop("spatstat version 1.34-1 or later is required")
+ }
```

```
> sessionLibs()
```

Libraries loaded:

```
spatstat 1.34-1
polyclip 1.1-0
tensor 1.5
abind 1.4-0
deldir 0.0-22
mgcv 1.7-26
nlme 3.1-111
```

## 2 Experiment

We shall generate a simulated realisation from the piecewise-constant pairwise interaction model, equation (22) of the paper. The model will have first order term  $\beta = 300$  and interaction strengths  $\epsilon_1 = 0.8$  over the range  $[0, 0.03]$  and  $\epsilon_2 = 0.2$  over the range  $(0.03, 0.07]$ .

```

> set.seed(16)
> mod <- list(cif='lookup',
+           par=list(beta=300, r=c(0.03, 0.07), h=c(0.8, 0.2)),
+           w = square(1))
> X <- rmh(mod, nrep=1e6)

```

Checking arguments..determining simulation windows...Starting simulation.  
Initial state...Proposal points...Start simulation.

Next we fit the model using the piecewise constant pairwise interaction

```

> ppm(X, ~1, PairPiece(c(0.03, 0.07)))

```

Stationary Piecewise constant pairwise interaction process

First order term:

```

  beta
322.5788

```

Interaction: Piecewise constant pairwise interaction process

interaction thresholds: c(0.03, 0.07)

Fitted interaction parameters gamma\_i:

```

[0,0.03) [0.03,0.07)
  0.9691    0.2294

```

Relevant coefficients:

```

Interact.1 Interact.2
-0.03141703 -1.47243471

```

For standard errors, type `coef(summary(x))`

The output shows that the parameters  $\epsilon_1 = 0.8$  and  $\epsilon_2 = 0.2$  have been estimated fairly accurately.

Now we fit the same model as a hybrid of two Strauss interactions:

```

> ppm(X, ~1, Hybrid(Strauss(0.03), Strauss(0.07)))

```

Stationary Hybrid interaction

First order term:

```

  beta
322.5788

```

Interaction: Hybrid of 2 components: `HybridComponent1` and `HybridComponent2`

HybridComponent1:

Interaction: Strauss process

```

interaction distance:          0.03
HybridComponent2:
Interaction:Strauss process
interaction distance:          0.07

Fitted HybridComponent1 interaction parameter gamma:      4.225
Fitted HybridComponent2 interaction parameter gamma:      0.2294

Relevant coefficients:
HybridComponent1. HybridComponent2.
      1.441018          -1.472435

```

For standard errors, type `coef(summary(x))`

By Lemma 6, the interaction parameters of the Strauss components are  $\gamma_1 = 0.8/0.2 = 4$  and  $\gamma_2 = 0.2$ . The output shows that  $\gamma_1, \gamma_2$  have been estimated fairly accurately.

Thus, the two fitted models are consistent.

We thank one of the referees for this example.