quan_tech_exam_1_q_1

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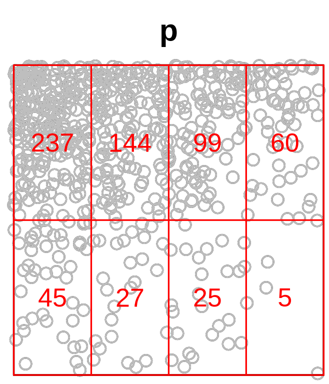
```
library(spatstat)
```

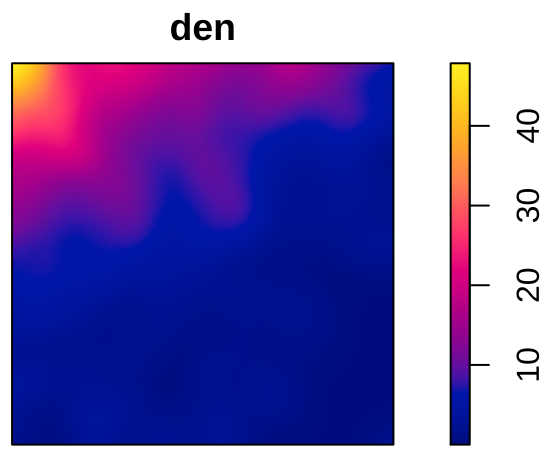
```
##
## spatstat 1.40-0       (nickname: 'Do The Maths')
## For an introduction to spatstat, type 'beginner'
```

```
dat <- read.csv("pattern.csv")

p <- ppp(dat$x, dat$y, window=owin(c(0,10),c(0,10)))

plot(p)

lambda <- summary(p)$intensity

q <- quadratcount(p, nx=4,ny=2)

plot(p)
points(p, col="gray")
plot(q, add=T, col="red")
```

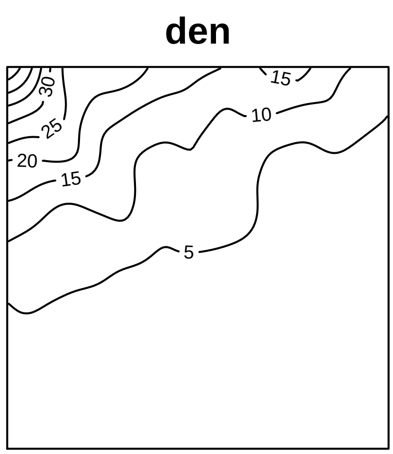


So this futher illustrates the fact that these points are not exhibiting CSR, there are more in the upper left corer then the lower right and they gradually decrease between those two corners.

```r
den <- density.ppp(p, sigma=.5, kernel='gaussian')

plot(den)
```




```r
contour(den)
```



this shows the variation over a smooth surface and reiterates the pattern observed above

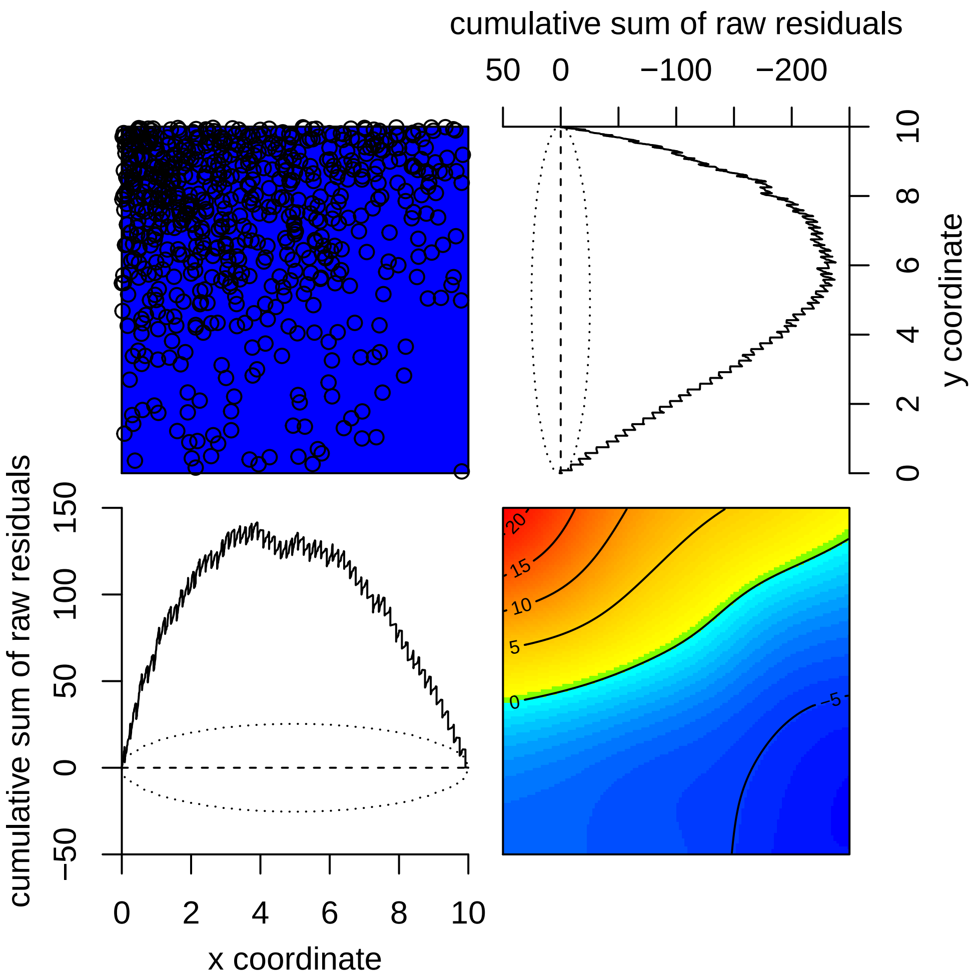
```
csr.test <- quadrat.test(p, nx=4, ny=4, method="Chisq")
csr.test
```

```
##
##  Chi-squared test of CSR using quadrat counts
##  Pearson X2 statistic
##
## data:  p
## X2 = 696.9657, df = 15, p-value < 2.2e-16
## alternative hypothesis: two.sided
##
## Quadrats: 4 by 4 grid of tiles
```

becuase of the very small p value we can reject the hypothesis that the points are exhibiting CSR and move on to trying to understand the pattern.

we do not have any additional covartiates that could be used to explain the intensity of these points but we can try a ppm

```
null <- ppm(p)
diagnose.ppm(null)
```



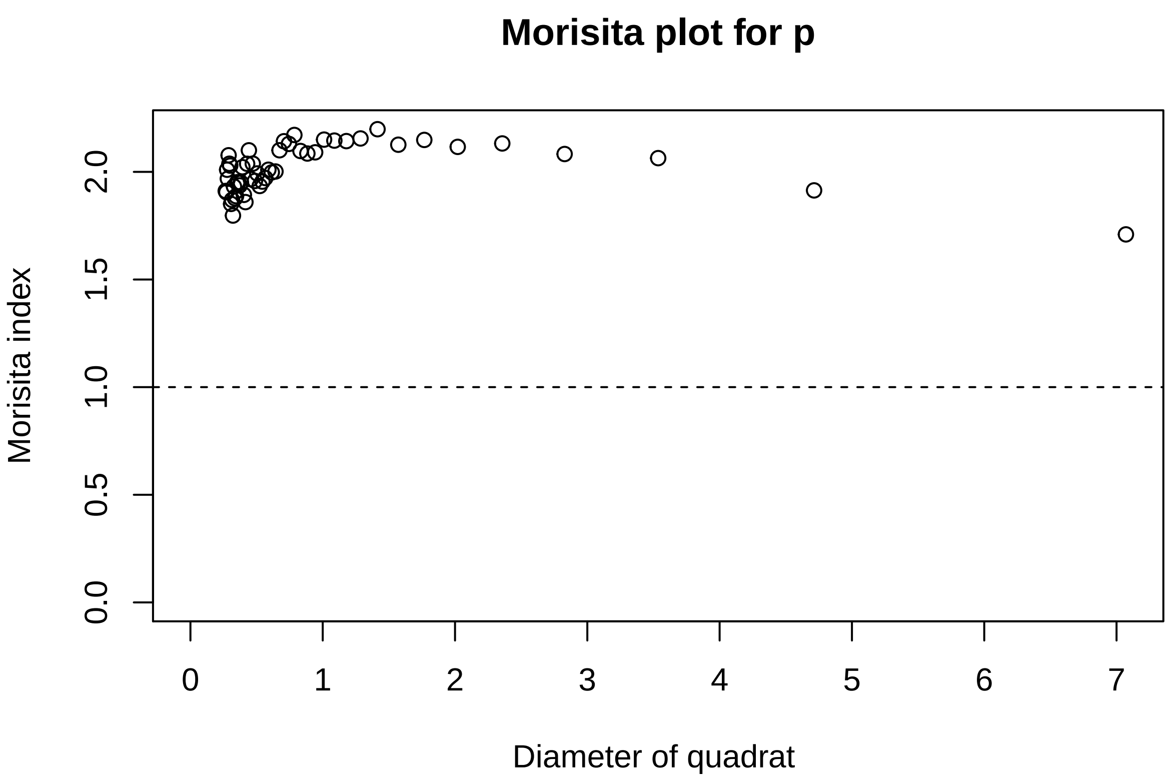

```
## Model diagnostics (raw residuals)
## Diagnostics available:
##  four-panel plot
##  mark plot
##  smoothed residual field
```

```
##  x cumulative residuals
##  y cumulative residuals
##  sum of all residuals
## sum of raw residuals in entire window = -5.568e-11
## area of entire window = 100
## quadrature area = 100
## range of smoothed field = [ -6.038,22.27 ]
```

this shows that the residuals are not evenly distributed and there is more variation in the data in teh upper left hand corner, so the model is not a very good fit. Which isn't surprising, it's a null model.

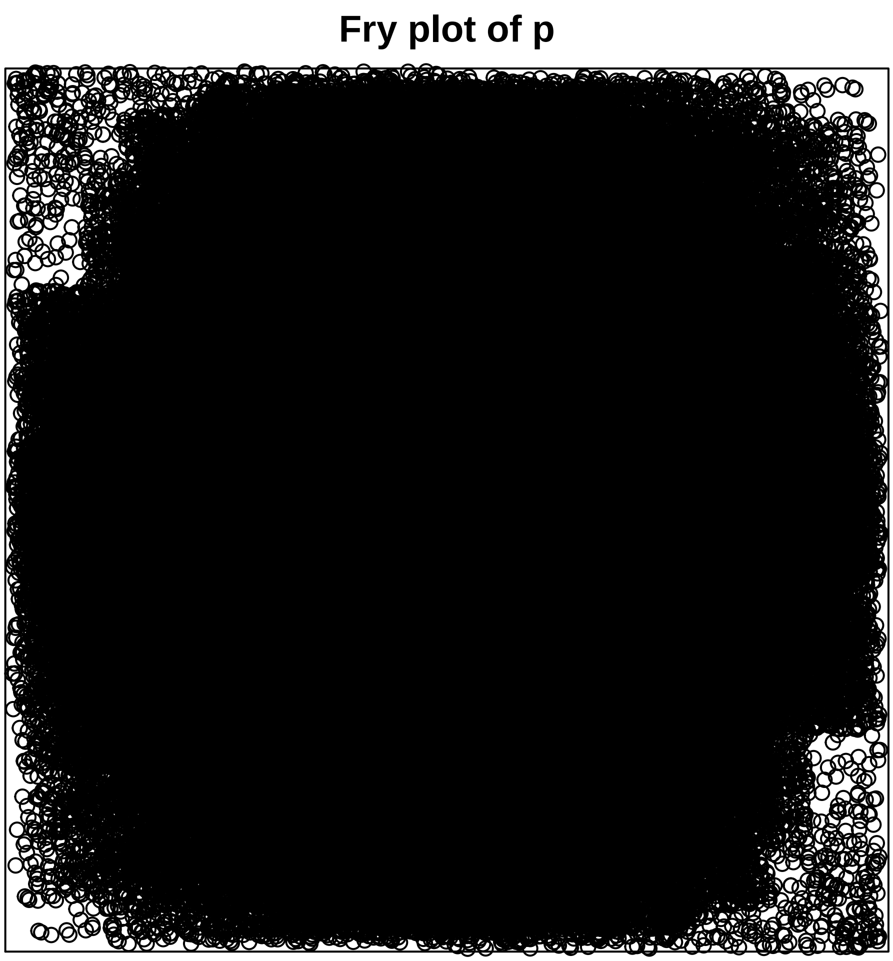
So now we turn to second order effects.

```r
miplot(p)
```



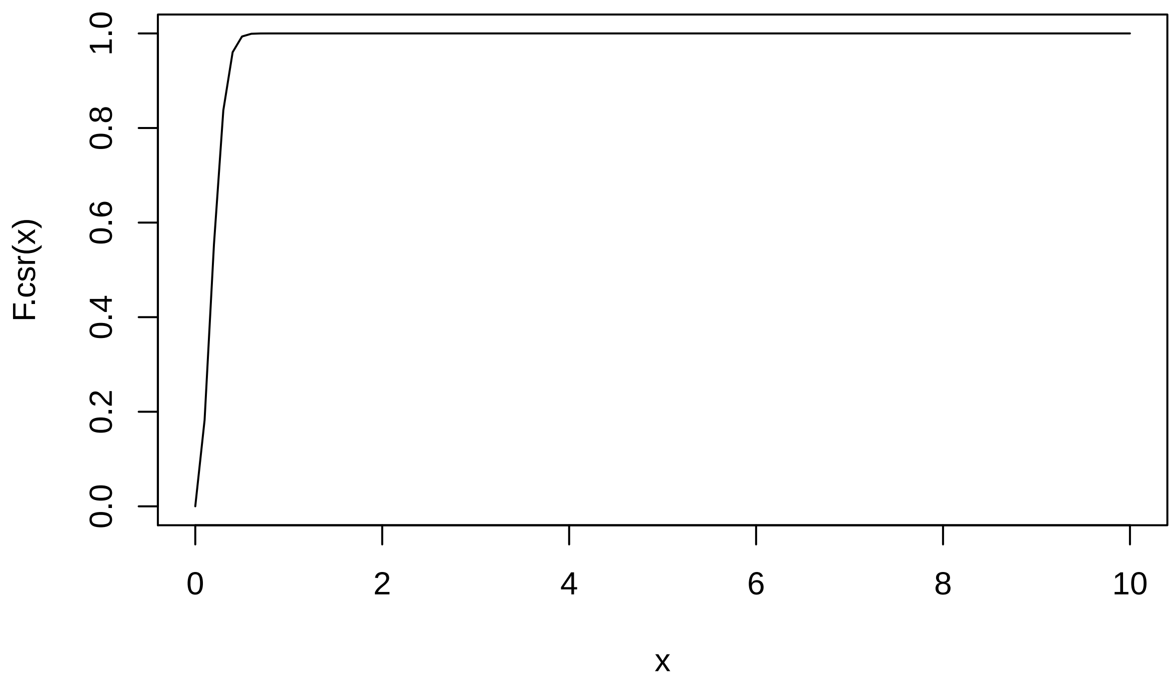
regardless of the size o the quadrat, we have some form of clustering, but there is more clustering when the quadrats are smaller.

```r
fryplot(p)
```



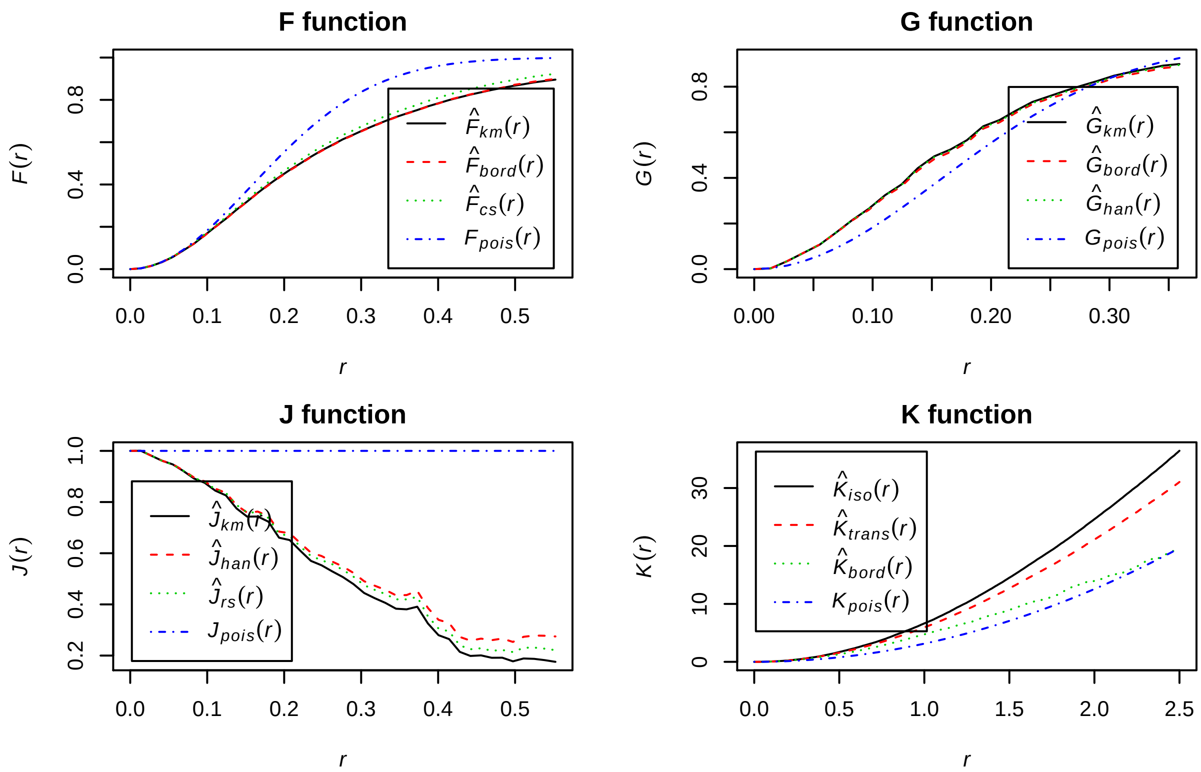
Now that is just cool looking, and shows some kind of clustering.

```
D.pairwise <- pairdist(p, squared=F, periodic=T)
D.nn <- nndist(p, k=1)
D.esd <- distmap(p)
F.csr <- function(r){1-exp(-lambda*pi*r^2)}
curve(F.csr,0,10)
```




```
F.bei <- Fest(p)
G.p <- Gest(p)
K.p <- Kest(p)
L.p <- Lest(p)
plot(allstats(p))
```

allstats(p)


F function
$\hat{F}_{km}(r)$
$\hat{F}_{bord}(r)$
$\hat{F}_{cs}(r)$
$F_{pois}(r)$
$F(r)$
r
G function
$\hat{G}_{km}(r)$
$\hat{G}_{bord}(r)$
$\hat{G}_{han}(r)$
$G_{pois}(r)$
$G(r)$
r
J function
$\hat{J}_{km}(r)$
$\hat{J}_{han}(r)$
$\hat{J}_{rs}(r)$
$J_{pois}(r)$
$J(r)$
r
K function
$\hat{K}_{iso}(r)$
$\hat{K}_{trans}(r)$
$\hat{K}_{bord}(r)$
$K_{pois}(r)$
$K(r)$
r