Introduction to Computational Physics
Excersices

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1 Task 1

see `ex1.cpp`

1.1 square test

square plot, see fig 1
max number of points:

1.2 3d plot

cubeplot, see fig 2 and `ex12.cpp`
with n = 100000; c = 3; p = 31; $x_{seed} = 1$
created with matlab `plot3(rnd3d(:,1),rnd3d(:,2),rnd3d(:,3),'.')`

1.3 other random number generator

see `ex12.cpp`, fig 3 and fig 4

2 Task 2

skech of idea, using cartesian coordinate system:

- generate a pair of homogeneous random points (x_1, x_2), with $x_i \in [-1, 1]$
- if $x_1^2 + x_2^2 <= 1$, then return the point, otherwise reject it and try again
- if necessairy, transform to polar coordinate system

see `ex1task2.cpp` and plot 5.

3 Task 3

see `ex12.cpp`, used $k = 10$ bins, $n = 1000$ binned random numbers.

- $c = 3$; $p = 31$; $x_{\text{seed}} = 1$: $\chi^2 = 0.1$
- $c = 1017$; $p = 8191$; $x_{\text{seed}} = 154$: $\chi^2 = 5.54$
- built in `rand()` (using init. `srand(670706)`) $\chi^2 = 13.74$

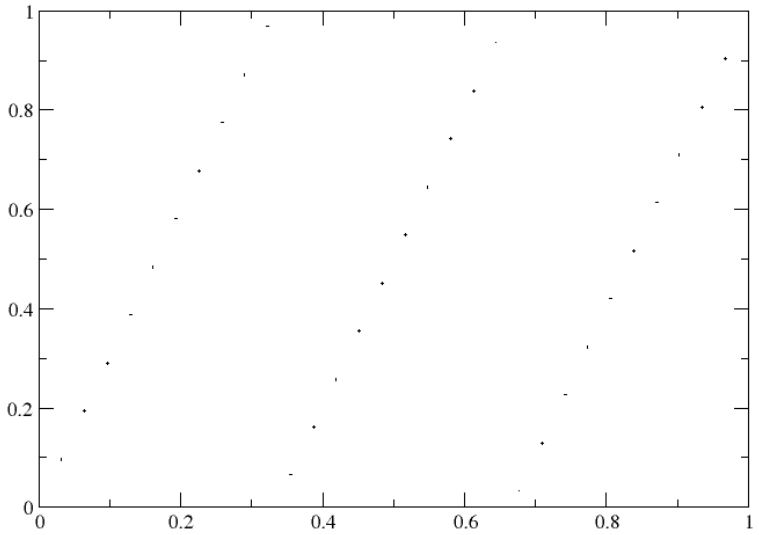

Figure 1: squareplot

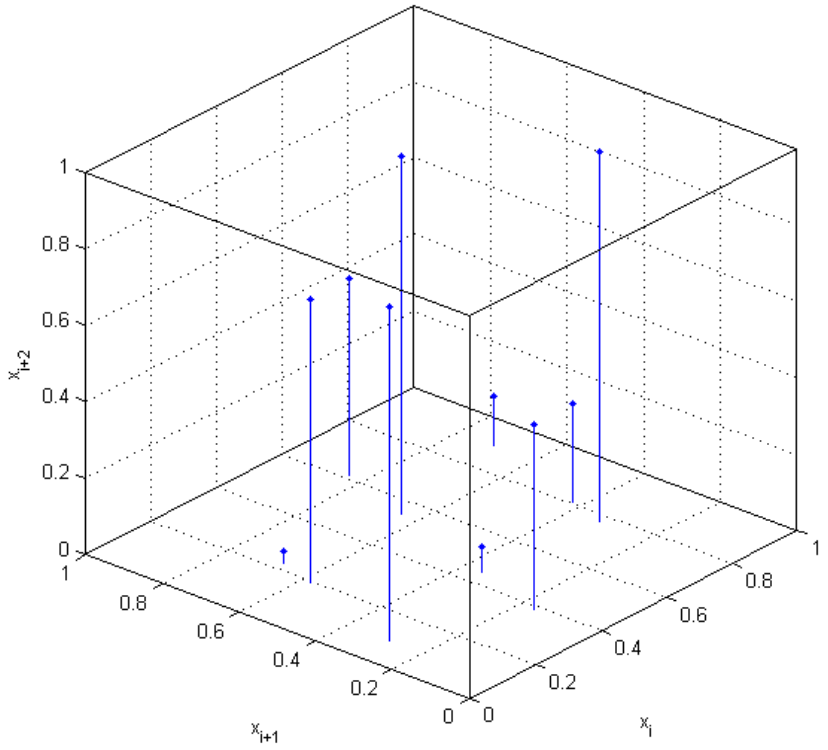

Figure 2: cubeplot

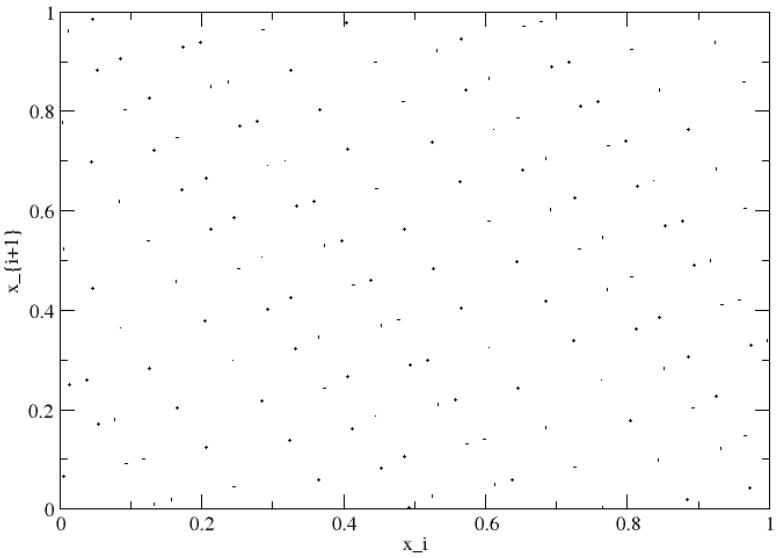

Figure 3: squareplot with

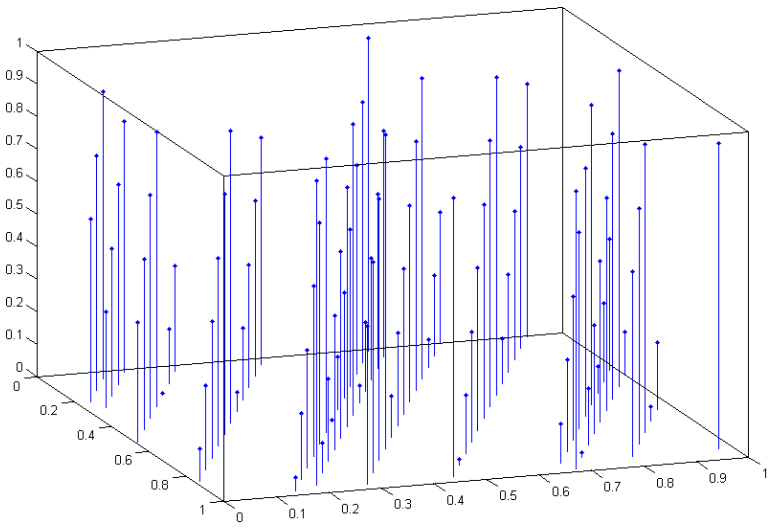

Figure 4: cubeplot with

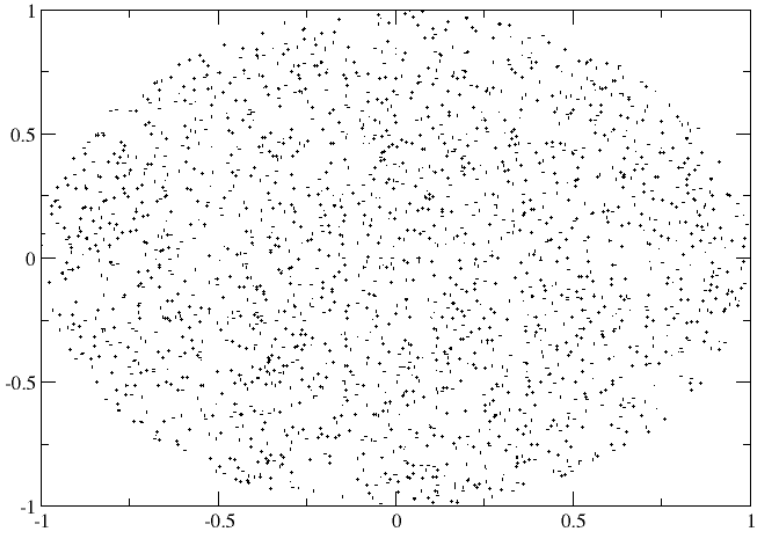

Figure 5: cubeplot with