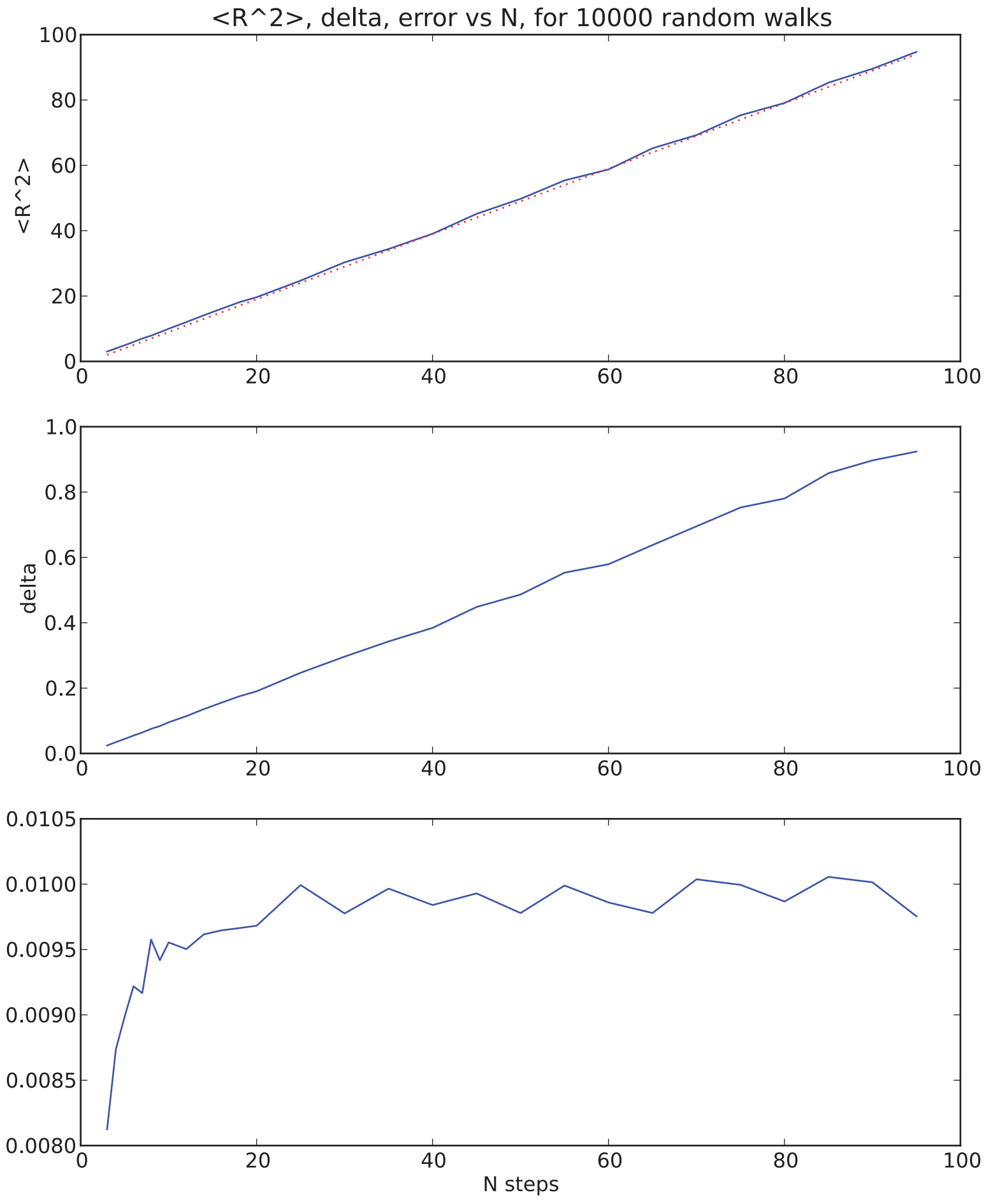
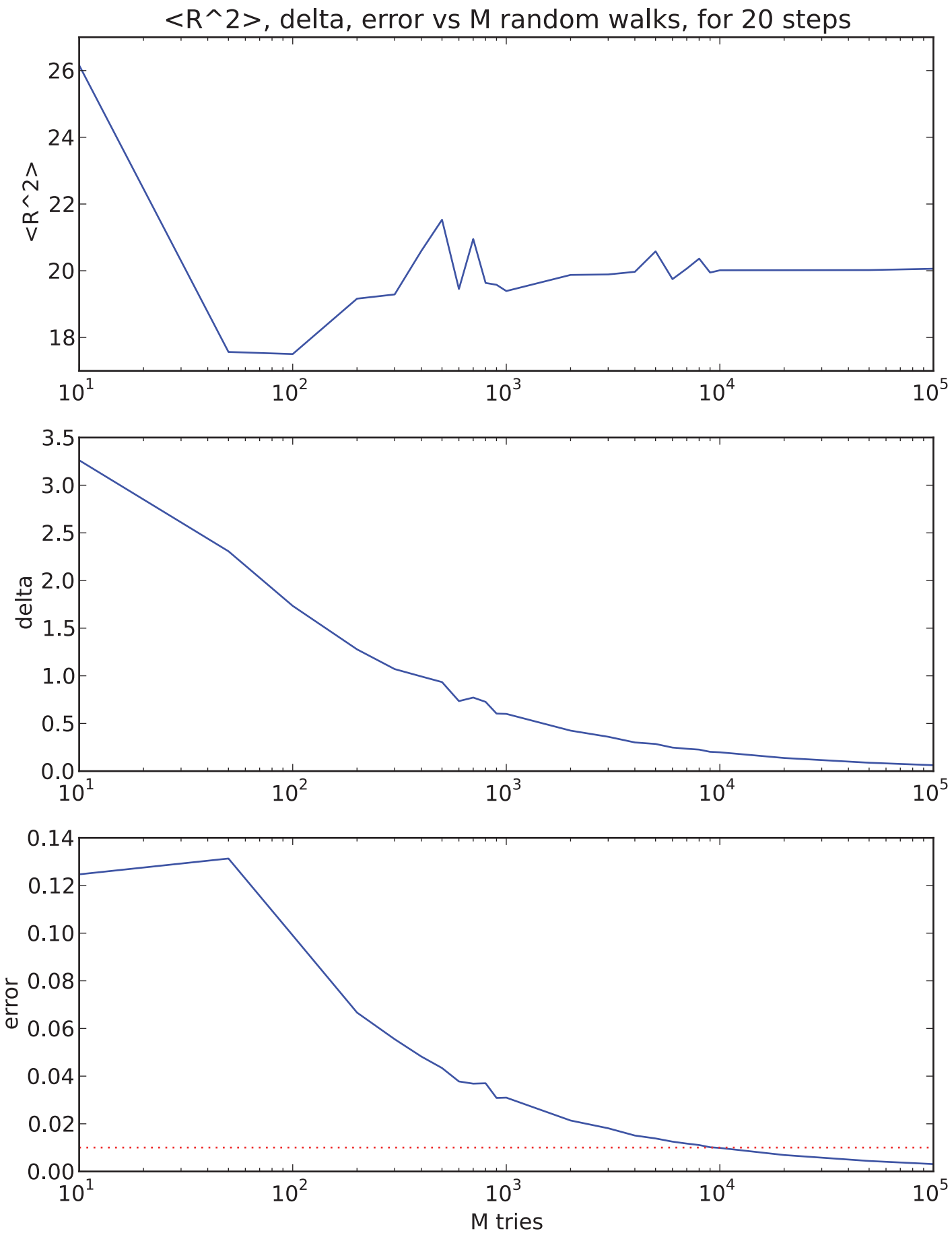
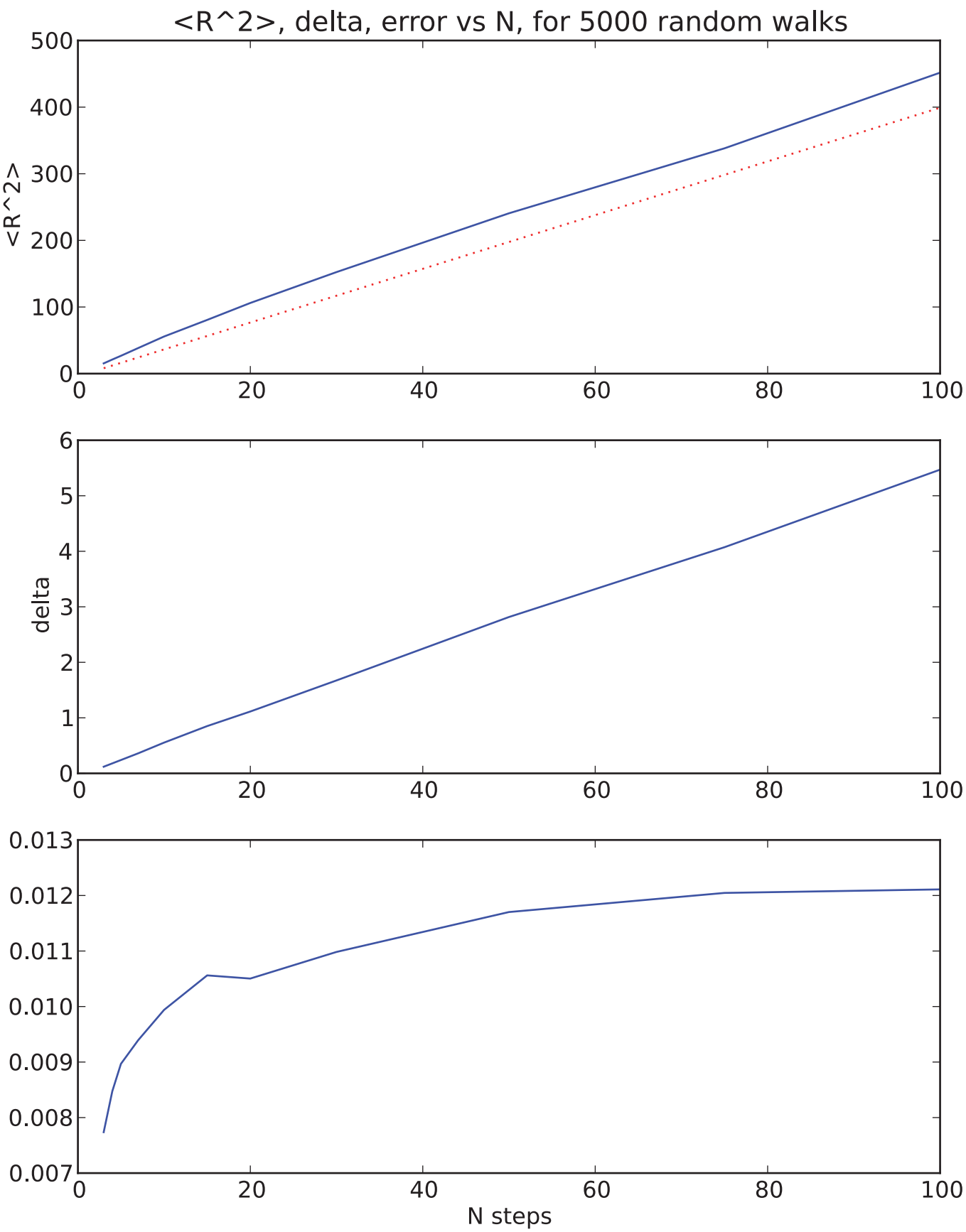
Ex09:

Task 1:
As seen in fig 1 on page 2 the simulated values (black solid line) for <R^2> lie really nice on the theoretical values (red dotted line). For an error of <= 1%, there are around 10'000 runs needed, as can seen on fig 2 on page 3.

Task 2:
in fig 3 on page 4 we can clearly see, that more distance is covered compared to the regular random walk. This is not much of a surprise, since the constraint of the non overlapping spheres leads to a bigger probabilitz of forward directions being chosen compared to going backwards, where the forbidden zone is.


<R^2>, delta, error vs N, for 10000 random walks
<R^2>
delta
N steps
0
20
40
60
80
100
0.0
0.2
0.4
0.6
0.8
1.0
0.0080
0.0085
0.0090
0.0095
0.0100
0.0105


<R^2>, delta, error vs M random walks, for 20 steps
<R^2>
26
24
22
20
18
delta
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
error
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
10^1
10^2
10^3
10^4
10^5
M tries


<R^2>, delta, error vs N, for 5000 random walks
<R^2>
delta
error
N steps
0
20
40
60
80
100
0
100
200
300
400
500
0
1
2
3
4
5
6
0.007
0.008
0.009
0.010
0.011
0.012
0.013