Generating 2D random unit steps
Comment on the algorithm n. 5 (p. 39 of the slides)

Indicating with x and y the individual displacements,

$p(x) = \dfrac{1}{2\sqrt{2}}$ for $|x| < \sqrt{2}$ and 0 otherwise; the same for $p(y)$;

the average step size is:

$$\sqrt{\langle x^2 + y^2 \rangle} = \int_{-\sqrt{2}}^{\sqrt{2}} \int_{-\sqrt{2}}^{\sqrt{2}} (x^2 + y^2)\ p(x)\ p(y)\ dx\ dy = ... = \frac{2}{\sqrt{3}}$$

Therefore, with x and y generated in this way, the behaviour of the simulated $\langle \Delta R_N^2 \rangle$ should be $\dfrac{4}{3}N$ (since $\langle \Delta R_N^2 \rangle = N\ell^2$).

In which extension you should generate x and y in order to have on average a unitary step size?