Kinetics of Classical Ideal Gas

- Gas consists of a large number of atoms.
- Motion of each atom is rectilinear with constant speed.
- Interactions are limited to collisions with walls or between atoms.
- Motion is randomized by collisions.
- Thermal equilibrium is characterized by uniform spatial distribution of atoms and by a velocity distribution $f(v)$ to be determined.

Position and velocity distribution in two dimensions.

Properties of velocity distribution $f(v)$:

- $\int d^3v f(v) = 1$ (normalization),
- $\int d^3v f(v) v = 0$ (symmetry),
- $\int d^3v f(v) \left( \frac{1}{2}mv^2 \right) = \frac{1}{2}m\langle v^2 \rangle = \frac{U}{N} = \frac{3}{2}k_BT$.

Pressure [tex49]: $p = \frac{1}{3V}N\langle v^2 \rangle = \frac{1}{3V}N3k_BT \Rightarrow pV = Nk_BT$. 