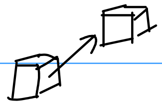
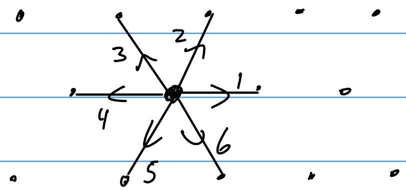
Lattice Boltzmann.

$n(\underline{r}, \underline{v}, t)$. $\rho(\underline{r}, t) = \int n(\underline{r}, \underline{v}, t)\, d^3 v$.





7 velocities
$c_0 (=0)$ $c_1, \ldots, c_6$.

Time step Δt.

$n_i(\underline{r}, t)$ $i = 0, 1, \ldots, 6$

$n_i(\underline{r} + c_i t, t+1) = n_i(\underline{r}, t)$ + relaxation to equilibrium

Continuum: $n(\underline{r}, v, t) = n_0\, e^{-\beta \frac{m}{2}(\underline{v} - \underline{u}(t))^2}$ $\beta = 1/k_B T$

eq. distr. determined by $\bar{n}$, $\underline{u}$

av. density

$$n_i^{\mathrm{eq}}(\mathbf{u}) = w_i \frac{\rho}{m}\left(1 + \frac{4}{c^2} u_\alpha e_{i\alpha} - \frac{2}{c^2} u_\alpha u_\alpha + \frac{8}{c^4} u_\alpha u_\beta e_{i\alpha} e_{i\beta}\right)$$

weight

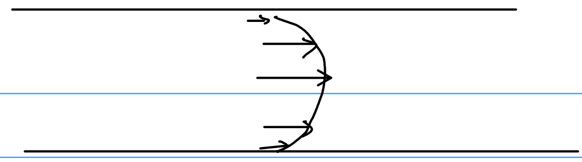
α, β Cartesian components
c : constant

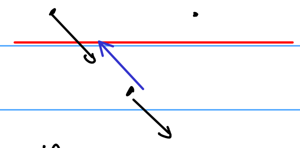
$w_i = 1/2$ $i = 0$
$1/12$ $i = 1, \ldots, 6$

$$n_i(\mathbf{r} + c\Delta t \mathbf{e}_i, t + \Delta t) = n_i(\mathbf{r}, t) - \frac{1}{\tau}\left[n_i(\mathbf{r}, t) - n_i^{\mathrm{eq}}(\mathbf{r}, t)\right].$$

1

↳ related to viscosity ν.





n_i