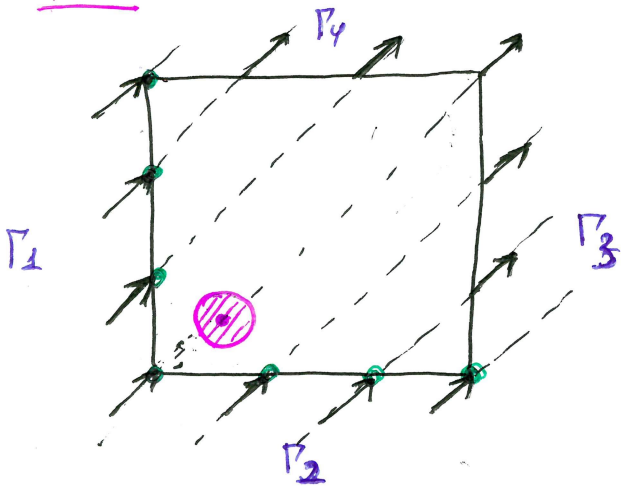
Test 2 Равномерное движение ц (0,0) в (1,1)



$\Gamma_1 \cup \Gamma_2 := \Gamma_{in}$

$(0,0) \cup (1,0) \cup (0,1) \in \Gamma_{in}$

$\Gamma_3 \cup \Gamma_4 = \Gamma_{out}$

$\rho(t,x,y) = 0 \quad (x,y) \in \Gamma_{in}$

$(u,v) = (a,a)$

Т.к. $\begin{cases} x^+_{0.5,0.5} = x_{0.5} - \tau a > 0 \\ y^+_{0.5,0.5} = y_{0.5} - \tau a > 0 \end{cases}$

$\left.\begin{matrix} x_{0.5} > \tau a \\ y_{0.5} > \tau a \end{matrix}\right\} = \begin{cases} \tau < \dfrac{x_{0.5}}{a} = \dfrac{h_x}{2a} \\ \tau < \dfrac{y_{0.5}}{a} = \dfrac{h_y}{2a} \end{cases}$

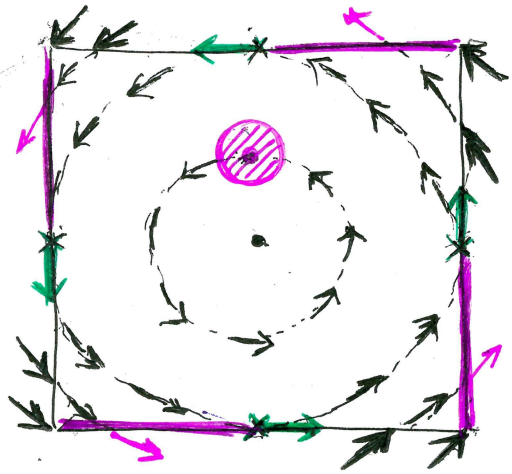
$\tau < \min\left\{ \dfrac{x_{0.5}}{a}, \dfrac{y_{0.5}}{a} \right\} = \min\left\{ \dfrac{h_x}{2a}, \dfrac{h_y}{2a} \right\}$

Начальное распределение плотности

$$\rho_{init} = \begin{cases} 1, (x-x_0)^2 + (y-y_0)^2 \le 2^2 \\ 0, \text{ в противном случае} \end{cases}$$

Пример $\begin{cases} x_0 = y_0 = 0.3 \\ r = 0.1 \end{cases}$

Тест 3 Равномерное круговое движение



$$! \begin{cases} x - x_0 = r\cos\varphi \\ y - y_0 = r\sin\varphi \end{cases}$$

$$\begin{cases} u := \dfrac{dx}{dt} = -r\sin\varphi \\ v := \dfrac{dy}{dt} = r\cos\varphi \end{cases}$$

$$\boxed{\begin{cases} u = -y + y_0 \\ v = x - x_0 \end{cases}}$$

Пример $! \; x_0 = 0{,}5; \; y_0 = 0{,}5 \Rightarrow u = -y + 0{,}5$

$v = x - 0{,}5$

$\Rightarrow$ 1) в (·) $(0{,}5; 0{,}5)$ $\begin{cases} u = 0 \\ v = 0 \end{cases}$

2) в (·) $(0{,}5; 0)$ $u = 0{,}5; \; v = 0$

3) в (·) $(1; 0{,}5)$ $u = 0; \; v = 0{,}5$

4) в (·) $(0{,}5; 1)$ $u = -0{,}5; \; v = 0$

5) в (·) $(0; 0{,}5)$ $u = 0; \; v = -0{,}5$

$$\Gamma_{in} := \{(0{,}5; 1]; \; y = 0\} \cup \{[0; 0{,}5); \; y = 1\} \cup$$

$$\{x = 0; \; y \in [0; 0{,}5)\} \cup \{x = 1; \; (0{,}5; 1]\}$$

$$\rho(t, x, y) = 0 \quad (x, y) \in \Gamma_{in}$$

$$\rho_{init} = \begin{cases} 1, & (x - x_0^*)^2 + (y - y_0^*)^2 < r^2 \\ 0, & \text{иначе} \end{cases} \qquad \begin{cases} x_0^* = 0{,}5 \\ y_0^* = 0{,}7 \\ r = 0{,}1 \end{cases}$$

$$x^{*}_{0,5,0,5} = x_{0,5} - \tau(-y_{0.5} + 0.5) \quad > 0$$

$$y^{*}_{0.5,0.5} = y_{0.5} - \tau(x_{0,5} - 0.5) \quad > 0$$

$$\tau < \frac{x_{0.5}}{-y_{0.5} + 0.5} = \frac{h_x/2}{\frac{-h_y}{2} + 0.5} = \frac{h_x}{-h_y + 1}$$

$$\tau < \frac{y_{0.5}}{x_{0.5} - 0.5} = \frac{h_y}{h_x + 0.5}$$ не имеет смысла!

→

~~Итого~~