

Instruction to run simulation

This instruction is for reproduction of figures and plots in the manuscript "A nonlinear multi-scale model for blood circulation in a realistic vascular system". The simulation can be performed in a standard personal computer using MATLAB 2019b (or probably a lower version as well). In order to run the full simulation, please compile code

Frog.m,

which includes all the basic simulation and all the numerical experiments in the manuscript.

Files and codes

- Image files :

Arteri.png	% the red-coloured artery network
frog_art_low.png	% binary image of the artery network
frog_domain_low.png	% binary image for the capillary domain
frog_vein_low2.png	% binary image for the vein network
vena.png	% the blue-coloured vein network

- Segmented vessel file :

frog_trees.mat	% Containing artery and vein network segmentation data
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- Codes:

Frog.m	% Main code to run simulation
Num_experiments.m	% The numerical experiments code (generating the table and figures)
Occlusions.m	% The occlusion experiments varying from 5% to 99% vessel occlusion
analyze.m	% Function to plot the pressure distribution in the capillary bed
analyzex.m	% Function to plot the pressure drop distribution in the capillary bed for occlusion experiments
Flux.m	% Function to compute flux in the capillary bed
FO_Capillary2.m	% Function to define coupling and solve the Darcy component
FO_Darcy3.m	% Function to load capillary domain and compute the transmissibility according to the Darcy's law
Frog_LinEq.m	% Function to solve the linear model (of the vascular network)
Frog_nonlinEq3.m	% Function to solve the non-linear models (three options)
Frog_parameter.m	% Function to define simulation parameters
PlotPressure.m	% Function to plot pressure distribution from artery to vein, including the capillaries
segOne.m	% Function to load the segmented vascular graph data