Desiderata for a Typical Simulation Loop

- One wants to have
  - control of the total simulated time, T>0, to run
  - control of the smallest and largest possible time step,dt_min and dt_max. Observe 0 < dt_min << dt_max < T. Setting these are convenient for ensuring upper and lower bounds on the computing time.
  - control of the frame rate, fps, of any images generated to be able to produce movie playback running in simulated time. Observe that T > dt_max >= 1/fps >= dt_min.
- Hence, T, dt_min, dt_max and fps are user input parameters to be set/read from for instance a config file.

The Simulation Loop

- Algorithm simulation loop(T,dt_min,dt_max,fps)
  - T_left = T
  - while T_left > 0 do
    - dt_wanted = 1 / fps
    - dt_left = dt_wanted
    - while dt_left > 0 do
      - dt_adaptive = min(dt_left, compute_step_size(dt_left));
      - dt = min(dt_max,max(dt_min, dt_adaptive)
      - compute_time_step(dt)
      - dt_left = dt_left - dt
    - end
    - draw frame
    - T_left = T_left - dt_wanted
- end

- Notes
  - compute_step_size
    - This is a simulation specific function that will try and estimate and adaptive time step size. For instance using a CFL condition or some time integration error measure to reduce/enlarge the step size
  - compute_time_step
    - This is a simulation specific function that will advance the state of the simulation system with the specified time step.