input : initial time t_0, end time t_{end}, initial model state $\mathcal{M}_0$, inner *solver* instance
output: colection of model states $\mathcal{M}_0, ..., \mathcal{M}_{t_{end}}$

$Vol_0 \longleftarrow$ initial fracture volume;
$\mathcal{M}_{list} \longleftarrow$ new model collection;
add $\mathcal{M}_0$ to $\mathcal{M}_{list}$;
$\mathcal{M}_i \longleftarrow \mathcal{M}_0$;
$t \longleftarrow t_0$;
$\Delta t \longleftarrow$ default time step;
while $t < t_{end}$ **do**
  $\mathcal{M}_j \longleftarrow \mathcal{M}_i$;
  $\mathcal{M}_i \longleftarrow$ deep copy of $\mathcal{M}_i$;
  update $\mathcal{M}_i$ visibility and jacobian pattern matrices;
  use *solver* to advance $\mathcal{M}_i$ by Δt;
  $Vol \longleftarrow$ total volume of $\mathcal{M}_i$;
  $Q_0 \longleftarrow$ sum of $\int_t^{t+\Delta t} q_0 \; dt$ for all vertecis ;
  $Q_l \longleftarrow$ sum of $\int_t^{t+\Delta t} \int_0^1 q_l \; dx \; dt$ for all edges ;
  store relative fluid balance for $\mathcal{M}_i$ as $\frac{Vol - Vol_0 - Q_l}{Q_0}$
  if $\mathcal{M}_i$ *has overshoots* **then**
    $\mathcal{M}_i \longleftarrow \mathcal{M}_j$;
    $\Delta t \longleftarrow$ time to soonest overshot in $\mathcal{M}_i$;
  else if $\mathcal{M}_i$ *has valid collisions* **then**
    add $\mathcal{M}_i$ to $\mathcal{M}_{list}$;
    $\mathcal{M}_i \longleftarrow$ deep copy of $\mathcal{M}_i$;
    resolve collisions for $\mathcal{M}_i$;
  else
    $\Delta t \longleftarrow 2\Delta t$;
    $t_{col} \longleftarrow$ soonest forecasted time to collision for $\mathcal{M}_i$;
    if $t_{col} < \Delta t$ **then**
      $\Delta t \longleftarrow t_{col}$;
    end
    add $\mathcal{M}_i$ to $\mathcal{M}_{list}$;
end