function Germinal Center Model

Set $t_{\mathrm{now}} = 0$.

Create an antigenic determinant sequence of length n_{key}.
Create a large (see text) list L_{seq} of antibody sequences of length n_{key} so that the distribution of binding energies between these sequences and the antigen sequence is as requested (see text).
Create a list of $n_{\mathrm{naïve}} \cdot n_{GC}$ naïve B cells with sequences drawn from L_{seq} and mutation count $m_{\mathrm{V}} = 0$.
Create a list of $n_{\mathrm{freemem}} \cdot n_{GC}$ unspecific B cells with sequences drawn from L_{seq} and $m_{\mathrm{V}} = \mathrm{UniformDistribution}[0, 40]$.
Create a list of n_{GC} empty waiting lists.

Calculate the time curve $Ag(t)$ of antigenic presence in the system (see text).
Calculate the time curve $LF(t)$ of limiting factor presence in the follicular sites (see text).
Open an empty event list for each GC to store events that are executed with a time delay.

while $t_{\mathrm{now}} < t_{\mathrm{max}}$ **do**

    Remove inactive naïve cells that are older than $t_{\mathrm{life,\ naïve}}$.
    if number of free naïve cells < $n_{\mathrm{naïve}} \cdot n_{GC}$ **then**
        Create naïve B cells with rate $n_{\mathrm{naïve}} \cdot n_{GC} / t_{\mathrm{life,\ naïve}}$.

    In each GC, remove waiting B cells that have been there for longer than $t_{\mathrm{life,\ GC}}$.

    % Events *consist of (event type, execution time, GC ID, list of cells concerned by the event)*.
    if event list contains events with $t_{\mathrm{execution}} = t_{\mathrm{now}}$ **then**
        for every one of these events **do**
            if event is of type 'Enter' **then**
                Distribute the cells randomly to the GC waiting lists.
            else if event is of type 'Divide' **then**
                Make two possibly mutated daughter cells from every mother (see text).
                Append the viable daughter cells to the GC's waiting list.
            else if event is of type 'Differentiate' **then**
                Append the cells to the free memory list.
            Discard event.

    if antigen is present in the system at t_{now} **then**
        Create empty list L_{act} for newly activated cells.
        for every cell in the free naïve and memory pools **do**
            Activate with probability $Ag(t_{\mathrm{now}}) \cdot p_{\mathrm{base}}$.
            if activation is successful **then** append cell to L_{act}
        Create event of type 'Enter' with $t_{\mathrm{execution}} = t_{\mathrm{now}} + t_{\mathrm{init}}$ and L_{act}.
        Append event to event list.

    if limiting factors are present in the follicles at t_{now} **then**
        for every GC **do**
            if there are B cells waiting for survival signals **then**
                Choose $LF(t_{\mathrm{now}})$ waiting cells for survival according to Boltzmann-distributed selection probabilities (see text).
                In order to incorporate double division after selection, directly make two possibly mutated daughter sequences from every mother (see text).
                Create event of type 'Divide' with $t_{\mathrm{execution}} = t_{\mathrm{now}} + 2t_{\mathrm{div}}$ and a randomly selected fraction p_{recycle} of the viable daughters from the first division round.
                Create event of type 'Differentiate' with $t_{\mathrm{execution}} = t_{\mathrm{now}} + t_{\mathrm{div}} + t_{\mathrm{diff}}$ and the remaining chosen cells.
                Append events to the event list.

    Set $t_{\mathrm{now}} = t_{\mathrm{now}} + t_{\mathrm{step}}$.