

I have to solve a diffusion equation:

$$\text{MatrixL} * \text{Csim}(:,i+1) = \text{MatrixR} * \text{Csim}(:,i) + \text{BC}$$

where Csim = concentration, j = location, i = time.

I use Dirichlet boundary conditions (Csim = 5 at j = 1, Csim = 0 at j = end).

The first and last row of the matrices are therefore composed like:

```
MatrixL(1,1)      = 1;  
MatrixL(1,2)      = 0;  
MatrixL(end,end-1) = 0;  
MatrixL(end,end)   = 1;
```

```
MatrixR(1,:)      = 0;  
MatrixR(end,:)    = 0;
```

```
BC(1)              = c0;      %c0 = 5;  
BC(end)            = cD;      %cD = 0;
```

To solve the equation, i would like to use the [Thomas algorithm](https://en.wikipedia.org/wiki/Tridiagonal_matrix_algorithm)
(en.wikipedia.org/wiki/Tridiagonal_matrix_algorithm). Therefore the equation should be written
as: $\text{MatrixL2} * \text{Csim}(:,i+1) = \text{Csim}(:,i)$

So $\text{MatrixL2} = \text{inv}(\text{MatrixR}) * \text{MatrixL}$

However, it is not possible to calculate $\text{inv}(\text{MatrixR})$ when

$\text{MatrixR}(1,:) = \text{MatrixR}(\text{end},:) = 0$.

So I tried to describe the boundary conditions in the following way :

Matrices, first line: $(1 \ 0 \ 0 \ \dots) * \text{Csim}(:,i+1) = (1 \ 0 \ 0 \ \dots) * \text{Csim}(:,i)$

Matrices, last line: $(\dots \ 0 \ 0 \ 1) * \text{Csim}(:,i+1) = (\dots \ 0 \ 0 \ 1) * \text{Csim}(:,i)$

After that i made in the for-loop $\text{Csim}(1,i)$ at each time to be equal to c_0 ,

and $\text{Csim}(\text{end},i+1)$ to be equal to c_D :

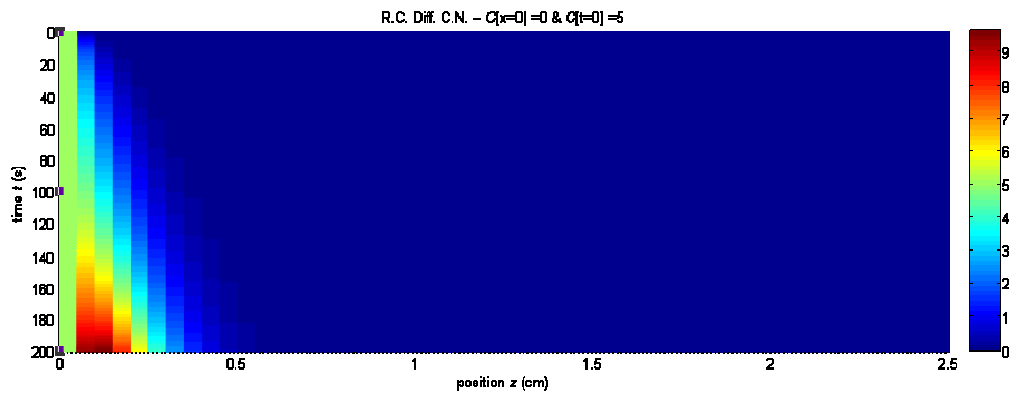
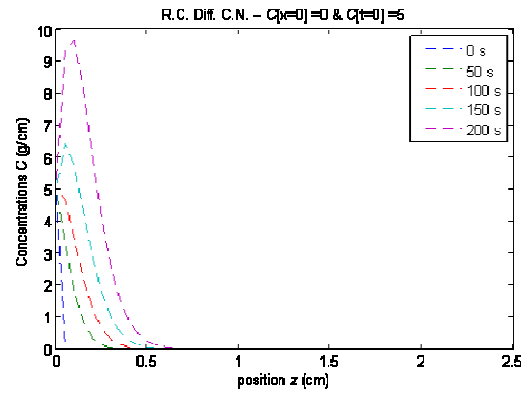
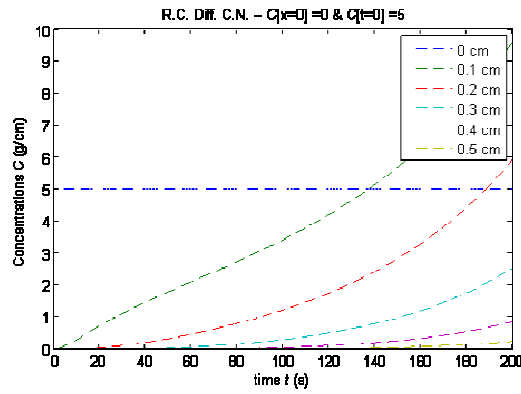
```
for i = 1:Nt-1  
    Csim(1,i) = c0;  
    Csim(end,i) = cD;  
    Csim(:,i+1) = THOMASsolver(a,b,c,Csim(:,i));  
end
```

In this way, I thought that for every time step the following equations would apply

Matrices, first line: $(1) * \text{Csim}(1,i+1) = (1) * \text{Csim}(1,i) = c_0$ and

Matrices, last line: $(1) * \text{Csim}(\text{end},i+1) = (1) * \text{Csim}(\text{end},i) = c_D$

But that cat won't jump, according to the next results:



These should be equal to:

