Department of Electronic & Telecommunication Engineering University of Moratuwa



BM2102 - Modelling and Analysis of Physiological Systems

Assignment 2: Branched Cylinders
Dendritic Tree Approximations

T.L Abeygunathilaka 200003P

	60
	General solution for the membrane potential,
	V. (m) = A, 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
PARTY	Veich = Azi en = Bzien d Li Simil Lai
	No (1) - An e + Rose + 1 L, & me to (6)
.0)	Vet's connect boundary condition in equation (3)
	VON a o A of a ROM sold NEL (and) sold
	ed as pd-
	Comed (Vion) = a Aie + 2 Rex + 2 SeA
	dn
	loon and the continued (b)
	fron equation (s) wounthroo
	-d(v,w) 0 - (- >0.12-V 0 (-1)-V
	-4(v,ev) = -(v, x) = 1 = 1 = 1 = 1 = 1 = 1 = 1 = 1 = 1 =
	A,e" + 190" - Ass 6" - 49 2" = 0
	When 01=0
	-A. P CANDI I app (1) (2)
	Aue + Base + Base + Base 1
	o = Au=R = (4: NE), Iappe = dana
(0)	V21 (M) = Act et + Beien L & M & La
	A-2 - (-12) 24 -0
	When on a Let, daughter terminal is held at rest
	Done a fuel so
944 11 5 9	

V21 (tel) = 21 A e1 e - 121 + 021 e 1 = 00 V	
Azi e 1 + bzi et 20 A - 1000	
(3) V22 (7) = A22 e + Pro ex - 14 5 x 5 Lac	
current - how daughter terminal is held at rest	10.
)	
Ver(hu) + Anoeth fore to to	
Ans etu + Buch to = (vor) 6	
Ans 2 + One 2 = 0	
a harman of the moder and he	
(4) Membrane potentials at the noder must be continuous	
Commission (a) massing graph	
V((L1) = V30(L1)(1) - = (10,1)6	
1 -11 + 9, 24 = A = + 921 eh +	
A1et + B1et = A21et + B21et = 0	
0 = 10 nerly	
- M- V (1) - V-(1) 2 - A-	
Azie-1 + Bzie = Ane-1 + Bzie	
Aue + Biget - Ane - Breet =0	
V. (7) = Au C + B. c × L. S x & L.	(4)
when to had is terment restricted in held at many	

(6)	By anserration of currents
	-1 (-Ao++ 8,24) = -1 (-A2) = + 12,12) + (ride), (ande)21
	(Lige) ((dige) or
	- (-Ane-Lister)
	(ring)
	Me + 916, " - 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
	By solving the above equation us get.
	9-0-1-0-1-0-1-0-1-0-1-0-1-0-1-0-1-0-1-0-
	(tide) - Biel - Aneli - Biel + Aneli Bizel (mid) (mid) (mid)
0-0-	(mid (mid) (mid) (mid) (mid)
	20 (AM) 46 (AM) 46 (AM) 46 (AM) 60 (AM
	equation (1) is true
(from druss or squadous us con corners many
	nothering enclosing with in the
	An = b
	(1 -1 0 0 0 0 M) (m) 50
	o o eta o o Bi
	o o o atm atm An o
	oti 21 -ali -eli 0 0 821 2 0
	0 0 2" 2" -2" An 0
	att en ou -en en en pu
	mine, miny may come may may
	A1-0, a (mile), Tapp -0
	Aughu + Bergha = 0 -0
	And the Busher = 0 -0 And the Busher = 0 -0 And the Busher = 0 -0
4/3/19	

			4 (4K10)		. (1617)	
Au	etu + 5			· one			
-		126	X (T)				
^	-0-LI + BI			Bue 1 = 0	- 0		
14					ext. emply	2 1,09	
Α.	g-let =	p_eu_	A.eli	- Buell -	o - ®		
9	THE T	524	Pos	11-	12 18 2 11	-a.A-	
A 15	Arral b	04	120-4	CHE SEL	Ane - b	1604	- 0
-1916	+ 2	Tik)	(Aux	- mixel	(13)35 (mx)	-0 -6
(L' VC) ()((myc)	and and	(T) romand	110/20	
				3000	(1) Nowship		
Con	an has		-3	0.00	Lerios eq	Landing (2	
					20 14	amana (s	,
r.c	m the	prestor	a Staduo				
					do wh		
		0	0	0	1		
0 10	0	0	0.40	2	0	0	
0 AA	0	O	0.46	10	0	0	
o AA	o mig		0	19	9	0	
o nA	0	· · · · · · · · · · · · · · · · · · ·	0 20	0 1461-	9 9 13 2	0	
An E O	o Ha	0 PTQ-	12 m	145 L	9 13 2 0	0 0 0	
o HA	o Ha	0 PTQ-	0 20	145 L	9 9 13 2	0	
An E O	o Ha	0 PTQ-	12 m	15- 15- 16- 16- 16- 16- 16- 16- 16- 16- 16- 16	9 13 2 0	0 0 0	
0 11A	o Ha	0 PTQ-	12 m	115- 116- 116- 116- 116- 116- 116- 116-	0 102 0 1400	o de de la composition della c	
An a a An a	o Ha	0 PTQ-	12 m	115- 116- 116- 116- 116- 116- 116- 116-	0 0 0 0	o de de la composition della c	

```
% Dimensions of compartments
      5
      6
               d1 = 75e-4;
                                       % cm
      7
               d21 = 30e-4;
                                     % cm
      8
               d22 = 15e-4;
                                       % cm
               %d21 = 47.2470e-4;
                                     % E9 cm
      9
               %d22 = d21;
                                         % E9 cm
     10
     11
               11 = 1.5;
                                 % dimensionless
     12
               121 = 3.0;
                                 % dimensionless
     13
               122 = 3.0;
                                 % dimensionless
     14
     15
               % Electrical properties of compartments
     16
     17
                                  % Ohms cm^2
               Rm = 6e3;
     18
                                 % Ohms cm
               Rc = 90;
     19
               Rs = 1e6;
                                   % Ohms
     20
     21
2*/Dc*Dm\\\(1/2\)/pi
   Command Window
    New to MATLAB? See resources for Getting Started.
      X =
          0.0007
          0.0000
          0.0011
         -0.0000
          0.0011
```

${\bf T} herefore,$

$$A1 = 0.0007$$

$$B1 = 0$$

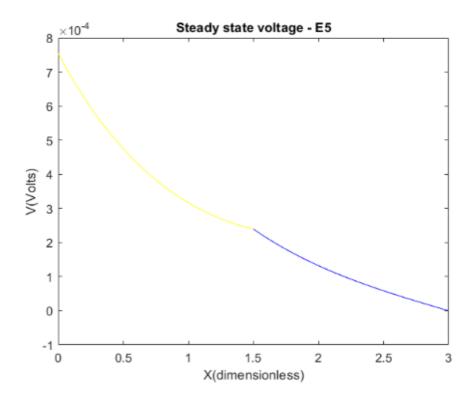
$$A21 = 0.0011$$

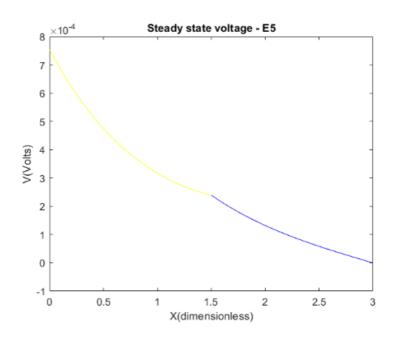
$$B21 = 0$$

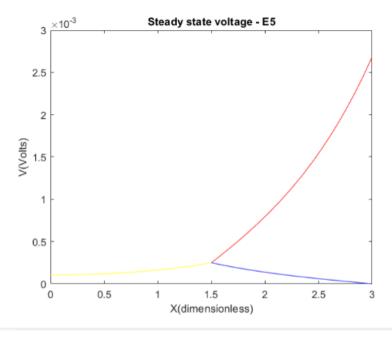
$$A22 = 0.0011$$

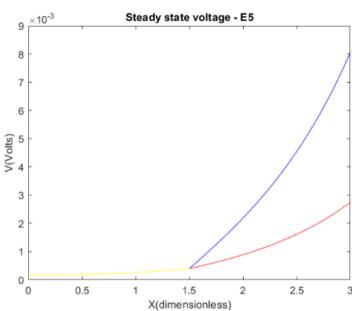
$$B22 = 0$$

-0.0000









The positive right-hand sides represent impulses flowing from ends of daughter branches to starting of the month

The electrical impulse is received in the initial node of the parent cell, leading to a negative voltage gradient. Conversely, the terminal nodes of the two daughter branches

transmit the electrical impulse to other neurons or branches, resulting in a positive voltage gradient.

Question 6

Recalculated coefficients,

 $A_1 = 0.7189$

 $B_1 = -0.0014$

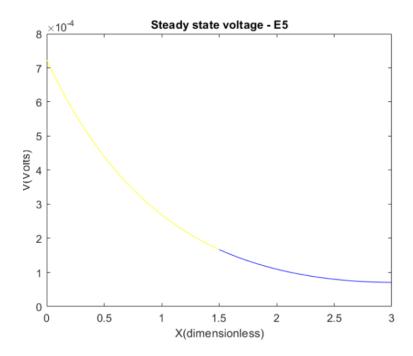
 $A_{21} = 0.7275$

 $B_{21} = -0.0018$

 $A_{22} = 0.7275$

 $B_{22} = -0.0018$

Steady state voltage of (b)



Steady state voltage profile of (d)

