04/10/2022

Now I’m trying to understand how the left and right contractility of the heart is calculated in the model.

It looks like the parameters that get into the heart model are: **sigCl** and **sigCr**

Text

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**For the equations of Helds thesis**

Graphical user interface, Word

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**Where E\_es is Elestance of end systolic, is that changes over time based on sympathetic feedback.**

**In our case the left ventricle end systolic elastance is 1/sigCl and…**

**The right vertical end systolic elastance is 1/sigCr.**

According to Held’s thesis:

Graphical user interface, application

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In terms of Compliance, Right Ventricular end-systolic elastance is:

1/1.3 = 0.769 ml/mmHg

In the C code:



This checks out.

In terms of Compliance, Left Ventricular end-systolic elastance is:

1/2.5 = 0.4ml/mmHg

In the C mode.:



This checks out.

Here is the par that is confusing:

E\_es changes: as contractility

Based on the Thesis:

Diagram

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Graphical user interface, text, application

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In the C code:

initialization.c

24 tmp -> vec[12] = 0.021\*0.0; // ABR RV contractility gain

25 tmp -> vec[13] = 0.007\*0.0; // ABR LV contractility gain

estimat.c

779 ref -> compliance[0] = theta->vec[46];

781 ref -> compliance[1] = theta->vec[52];

527 // Contractility feedback. Limit contractility feedback so end-systolic

// ventricular elastances do not become too large during severe stress.

(\*r).compliance[0] = (\*theta).vec[46] + (\*theta).vec[12]\*beta\_resp;

(\*r).compliance[0] = ((\*r).compliance[0] > 0.01 ? (\*r).compliance[0] : 0.01);

(\*r).compliance[1] = (\*theta).vec[52] + (\*theta).vec[13]\*beta\_resp;

(\*r).compliance[1] = ((\*r).compliance[1] > 0.3 ? (\*r).compliance[1] : 0.3);

reflex.c

94// Update the contractility feedback.

95 p -> c[4] = (\*r).compliance[0];

96 p -> c[5] = (\*r).compliance[1];

equation.c

32 double sigCr = p->c[4];

37 double sigCl = p->c[5];

Some things here don’t check out.

The sympathetic gains are set to zero in line 24 and 25 in file initialization.c . While the thesis says:



But:

initial.h @ initial\_ptr

421 (\*reflex)[0].c[0][0] = 0.021; (\*reflex)[0].c[0][1] = 0.003;

422 (\*reflex)[0].c[0][2] = 0.007; (\*reflex)[0].c[0][3] = 0.030;

How does the program run?:

Turns out only initial\_ptr get’s called. Initialization.c is an old file that is no longer used.

Conclusion:

initial.h @ initial\_ptr

421 (\*reflex)[0].c[0][0] = 0.021; (\*reflex)[0].c[0][1] = 0.003;

422 (\*reflex)[0].c[0][2] = 0.007; (\*reflex)[0].c[0][3] = 0.030;

Initial.c @ mapping\_ptr

512 tmp -> vec[12] = (\*reflex)[0].c[0][0]; // ABR RV contractility gain

512 tmp -> vec[13] = (\*reflex)[0].c[1][0]; // ABR LV contractility gain

estimat.c

779 ref -> compliance[0] = theta->vec[46];

781 ref -> compliance[1] = theta->vec[52];

527 // Contractility feedback. Limit contractility feedback so end-systolic

// ventricular elastances do not become too large during severe stress.

(\*r).compliance[0] = (\*theta).vec[46] + (\*theta).vec[12]\*beta\_resp;

(\*r).compliance[0] = ((\*r).compliance[0] > 0.01 ? (\*r).compliance[0] : 0.01);

(\*r).compliance[1] = (\*theta).vec[52] + (\*theta).vec[13]\*beta\_resp;

(\*r).compliance[1] = ((\*r).compliance[1] > 0.3 ? (\*r).compliance[1] : 0.3);

reflex.c

94// Update the contractility feedback.

95 p -> c[4] = (\*r).compliance[0];

96 p -> c[5] = (\*r).compliance[1];

equation.c

32 double sigCr = p->c[4];

37 double sigCl = p->c[5];

My own calculation for d(Plv)/dt

Text, letter

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