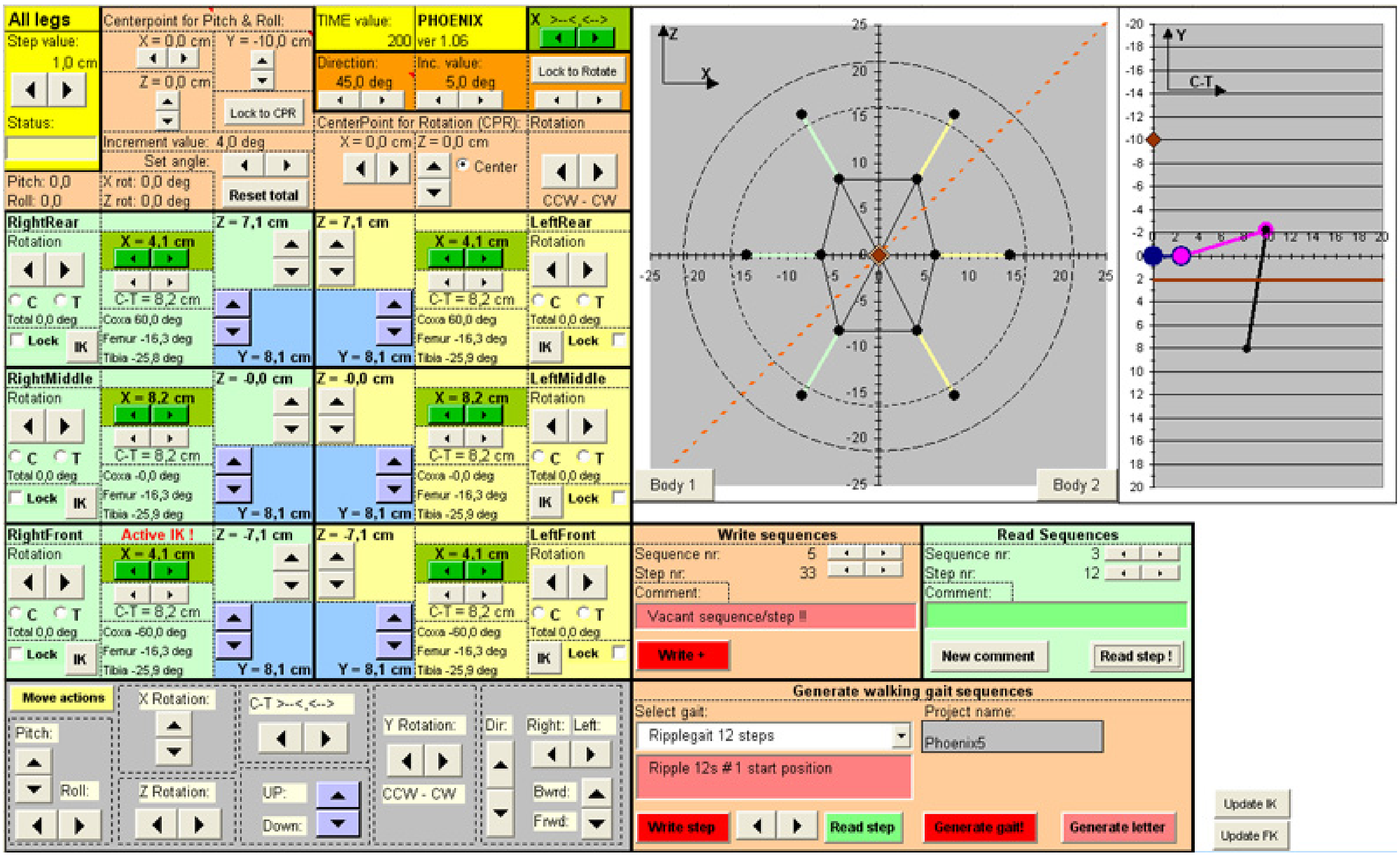
P.E.P

Phoenix Excel Program

MANUAL

V1.06



Author and programmer: Kåre Halvorsen alias Zenta.

Table of Contents

Introduction……………………………………... 3

Warning…………………………………………. 3

Configuration…………………………………… 3

SSC-32 pin configuration……………………….. 4

The Body & Coxa sheet………………………… 4

Status and CPR…………………………… 4

Individual leg…………………………….. 5

Graph……………………………………... 5

Move actions……………………………... 6

Read & Write…………………………….. 6

Individual sequences…………………………… 7

Create simple moves…………………………… 9

Adding sequences……………………………….. 11

Walking gait…………………………………….. 12

Define reference positions……………….. 13

Exporting projects………………………………. 14

How to export a project from SEQ………. 14

Importing projects………………………………. 15

Introduction:

This is a MS Excel spreadsheet made for generating moving and walking sequences for hexapod robots. The program take care of inverse kinematics calculations for every individual leg and all legs together relative to the body, meaning body moving in any direction along all axis and body rotation along all axis. It's also possible to define center of rotation, a useful effect if you want the robot to walk along an arc… The sequences are intended to be imported into the Lynxmotion Visual Sequencer program.

The Phoenix Excel Program (PEP) is freeware.
1280*1024 or higher screen resolution are recommended.

First I must say that somehow I managed to mix the Z and Y-axis! LOL, but that shouldn't matter. I have not translated everything in the VB code.

Warning!

While generating steps and sequences for your hexapod there is a great chance of damaging your servo, robot parts or your fingers ;) when you are trying to run the sequence for the first time. I have pinched my fingers sometimes…. **NB! Remember, you have to activate macros to make PEP work!**

Configuration:

It is very important that your hexapod is 100% correctly calibrated. Every joint (servo) must be calibrated with a protractor. Refer to the Visual Sequencer SSC32 configuration part. All legs are parallel to the X-axis when the coxa (HipH) servo is set to 0 deg, same as for an inline body.

Before you start doing anything with the Phoenix Excel program you have to open the worksheet called **Setup**. Enter all dimension and angle limit values in the bright yellow fields. The body dimensions are relative to center of the body to the centerpoint of each coxaservo axis (horisontal hip servo), meaning center of the body equals X=0 and Z=0. It's also possible to define a round/circular body, then you only have to enter the radius.

Setup worksheet:

	A	B	C	D	E	F	G
1	Dimensions of leg:			Dimensions of body :			
2	Coxa length:	2,5 cm		Body 1 (inline or ovale):		Body 2 (circular):	
3	Femur length	7,7 cm		FCX:	4,3 cm	FCX:	5,4 cm
4	Tibia length	10,4 cm		FCZ:	8,2 cm	FCZ:	9,4 cm
5				SCX:	6,3 cm	SCX:	10,8 cm
6				BCX	4,3 cm	BCX	5,4 cm
7				BCZ:	8,2 cm	BCZ:	9,4 cm
8				Lowest part of body:		1,9 cm	
9				Radius for circular body:		10,8 cm	
10							
11	Limit angle values:						
12	Leg:	Coxa min	Coxa max	Femur min	Femur max	Tibia min	Tibia max
13	Left Front	-141,0 deg	39,0 deg	-90,1 deg	90,0 deg	-77,0 deg	90,0 deg
14	Left Middle	-73,0 deg	66,0 deg	-90,1 deg	90,0 deg	-77,0 deg	90,0 deg
15	Left Rear	-52,0 deg	142,0 deg	-90,1 deg	90,0 deg	-77,0 deg	90,0 deg
16	Right Front	-140,0 deg	41,0 deg	-90,1 deg	90,0 deg	-77,0 deg	90,0 deg
17	Right Middle	-74,0 deg	63,0 deg	-90,1 deg	90,0 deg	-77,0 deg	90,0 deg
18	Right Rear	-39,0 deg	140,0 deg	-90,1 deg	90,0 deg	-77,0 deg	90,0 deg

SSC-32 pin configuration

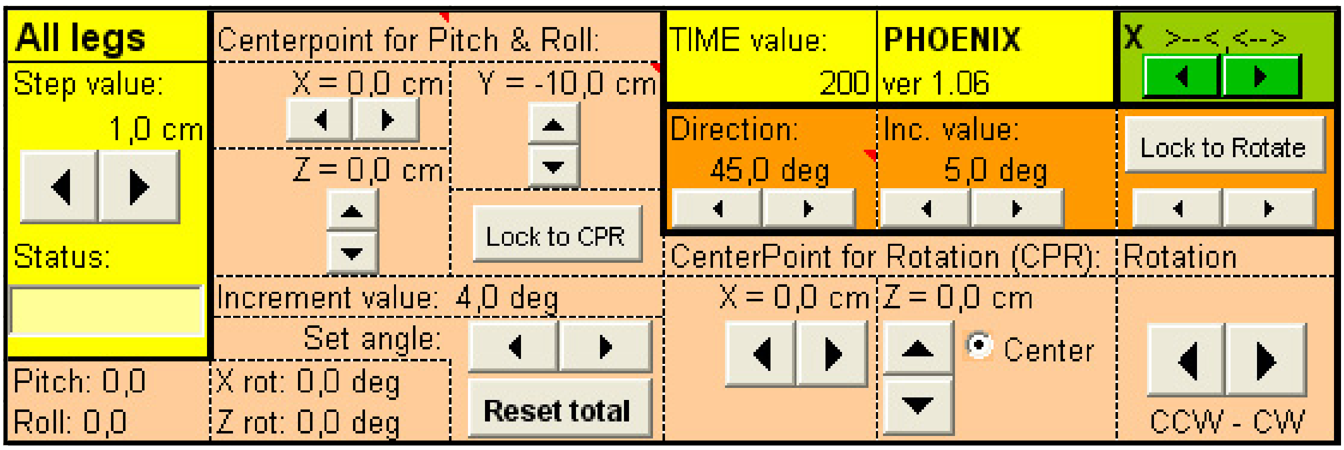
To make PEP work for your hexapod you also has to connect each servo to the same PIN's on the SSC-32 servo controller as for the PEP setup. See the table below:

SSC-32 configuration								
Leg name	**Left front leg**				**Left middle leg**			
Leg part	Coxa	Femur	Tibia		Coxa	Femur	Tibia	
Bank 1	PIN0	PIN1	PIN2	PIN3	PIN4	PIN5	PIN6	PIN7
Status	Normal	Normal	Normal	Disabled	Normal	Normal	Normal	Disabled
Leg name	**Left rear leg**							
Leg part	Coxa	Femur	Tibia					
Bank 2	PIN8	PIN9	PIN10	PIN11	PIN12	PIN13	PIN14	PIN15
Status	Normal	Normal	Normal	Disabled	Disabled	Disabled	Disabled	Disabled
Leg name	**Right front leg**				**Right middle leg**			
Leg part	Coxa	Femur	Tibia		Coxa	Femur	Tibia	
Bank 3	PIN16	PIN17	PIN18	PIN19	PIN20	PIN21	PIN22	PIN23
Status	Reverse	Reverse	Reverse	Disabled	Reverse	Reverse	Reverse	Disabled
Leg name	**Right rear leg**							
Leg part	Coxa	Femur	Tibia					
Bank 4	PIN24	PIN25	PIN26	PIN27	PIN28	PIN29	PIN30	PIN31
Status	Reverse	Reverse	Reverse	Disabled	Disabled	Disabled	Disabled	Disabled

The Body & Coxa sheet:

Open the sheet called "Body & Coxa", this is the main sheet in PEP.
Feel free to click on all the spinbuttons and observe what happens!
This sheet has 5 sections:

1. Status and CPR
In this section you define the centerpoint of Y rotation (CPR) and for pitch & roll. In the latest version 1.06 I've also added real X and Z rotation where you also can define the Y coordinate (height of centerpoint of X and Z rotation). Try clicking on the spinbuttons and you can see a square dot moving in the graph section. At startup this dot is always in the center of body. "Step value" set the increment value used by most of the moving functions.

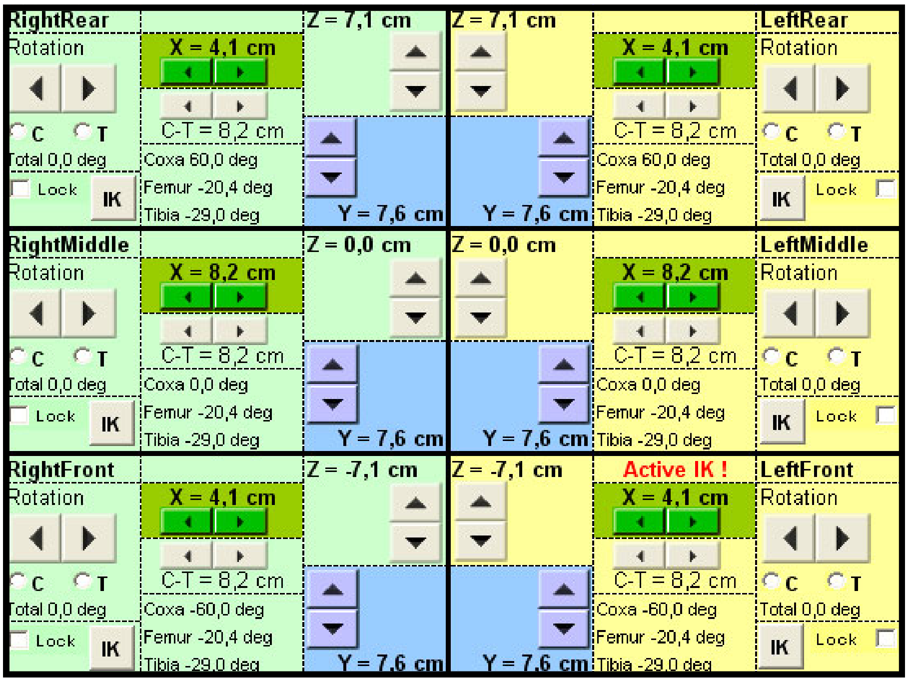


2. Individual leg

Use this section to create starting postures for gaits and other poses of the legs. Every move is IK (inverse kinematics) calculated. Click the "**IK**" button to see one of the legs in profile on the graph (Active IK).

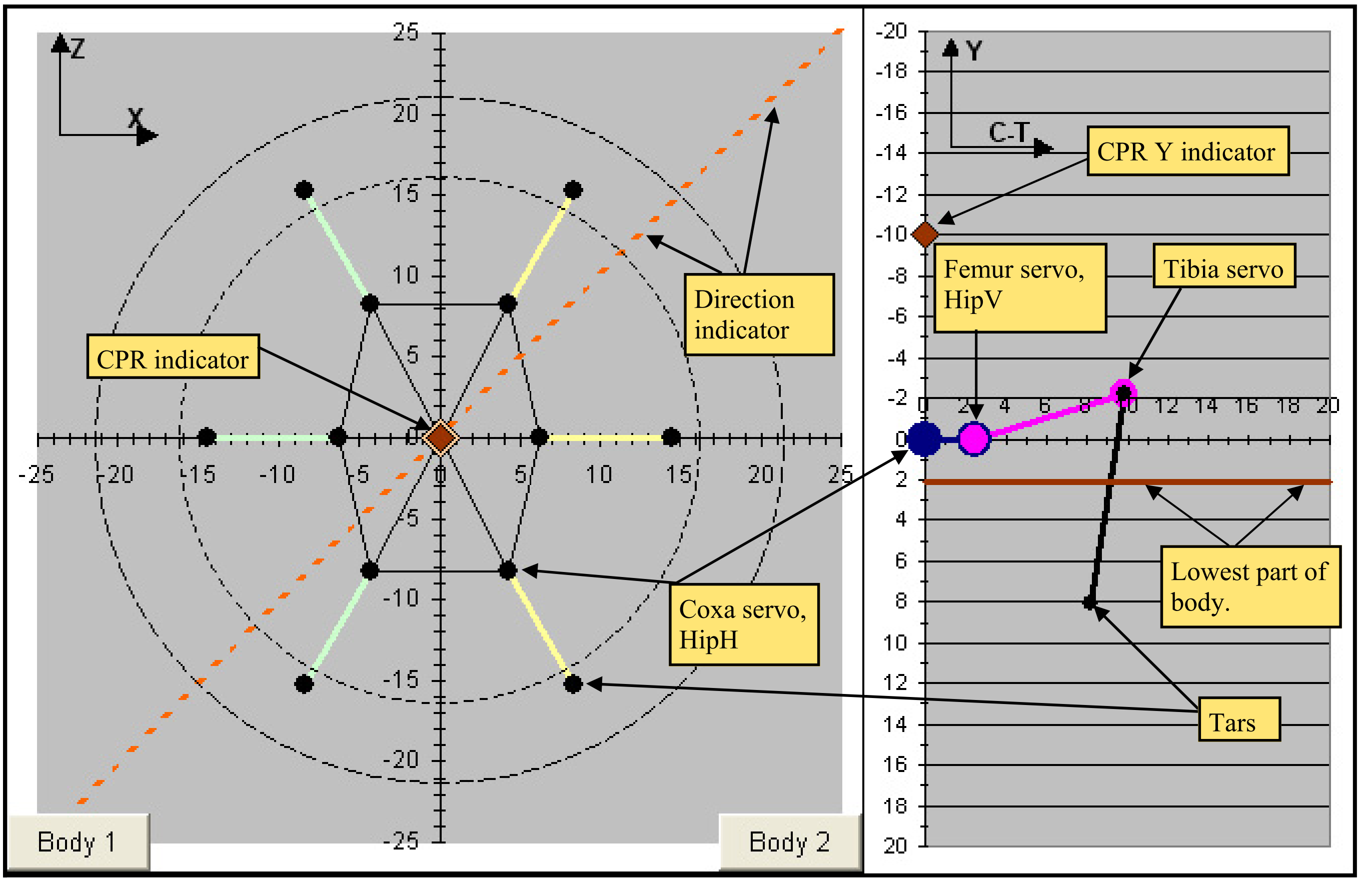
It's also possible to define CPR in this section by clicking one of the optionbuttons "**C**" (coxa) and "**T**" (tars, foot/end of tibia)! This is a cool effect if you want the hexapod to rotate or walk in a arc around one of it's own tars ;) If you just want to rotate a leg around it's coxa axis, then click the "**C**" optionbutton for the actual leg and then rotate it with the "**Rotation**" spinbutton.

If you don't want one or more of the legs to be affected of the group (body) moves click the "**Lock**" checkbox.

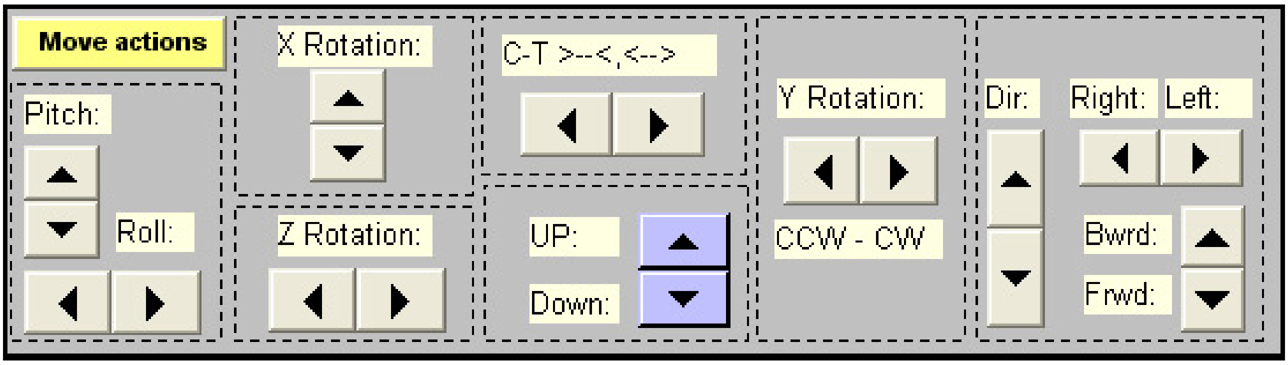


3. Graph

Gives you a simple graphical view of the body and legs seen from above (X and Z-axis) and a profile view of one leg (Y axis and C-T). C-T = Coxa to Tars. Switch between the two body configurations via **Body 1** and **Body 2** buttons.

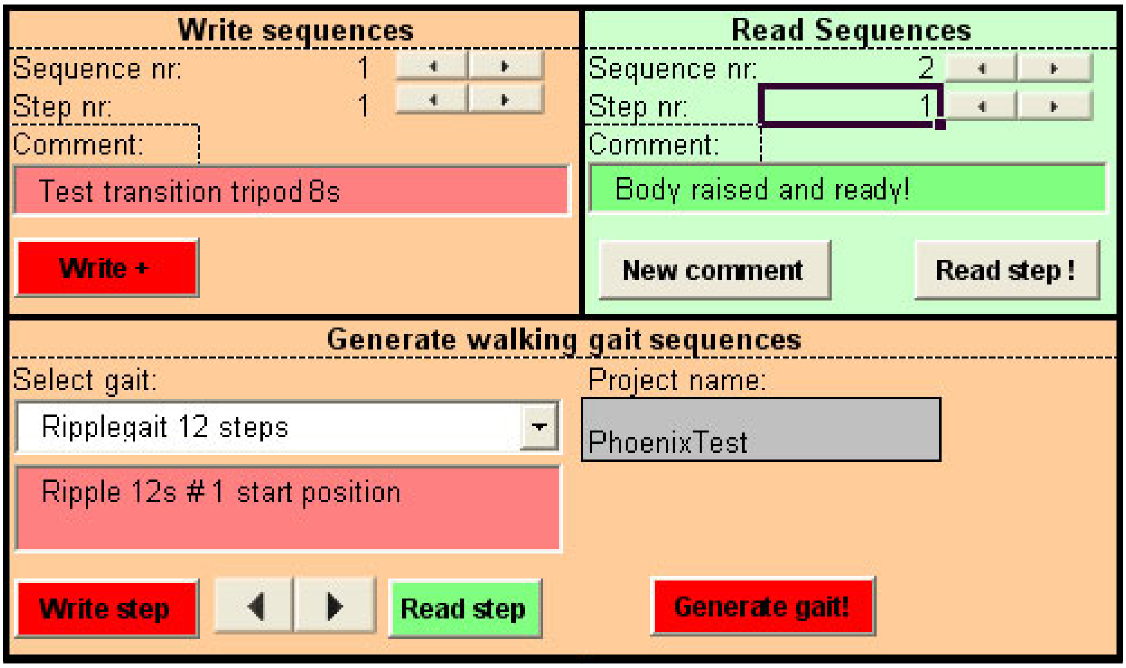


4. Move actions
You will be able to control all legs (move the body) simultaneously in this section. Click the spinbuttons and watch the graphs and the values in the individual legs sections.



5. Read & Write

In this section you can write steps to a sequence, create a new sequence, read steps in sequences you have created and make walking gaits. All steps and sequences are stored in the "Ind.Sekvenser" worksheet.



Individual sequences

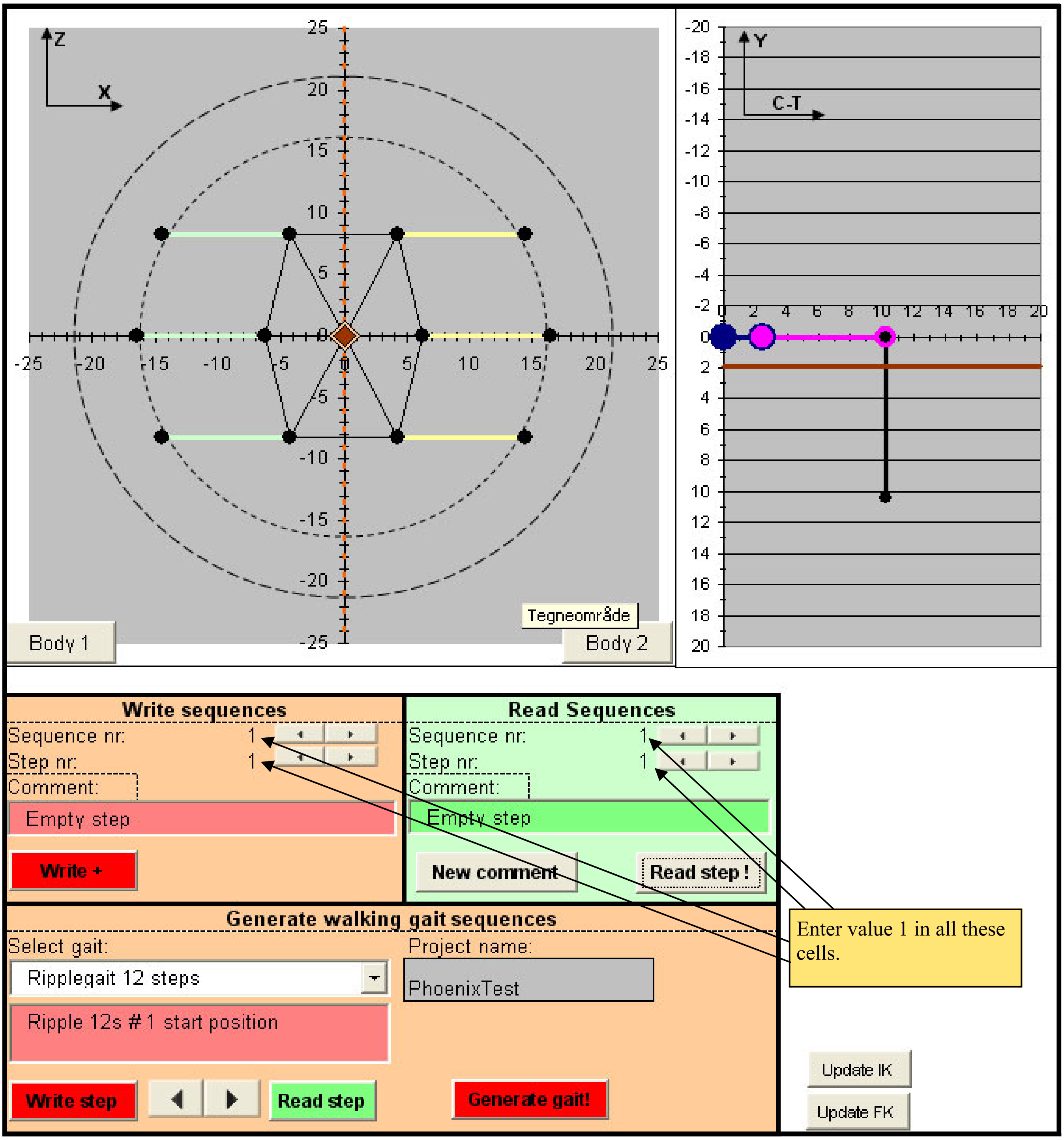
Open the “Ind.sekvenser” worksheet. If you already have worked with exported and imported .csv files from Lynxmotion Visual Sequencer (SEQ) you will probably recognize this worksheet… Ref. the Project module in the SEQ manual page 10 (ver 1.13). In column **A** I have made a sequence pointer. A short explanation about the seq.pointer: cell **A3** does always contain the value **6**, because sequence #1 always start in row 6. In this example sequence #2 starts in row 55 and seq #3 starts in row 90, and so on… The last value in the seq.pointer, here row 31, does always contain the row value for the next empty/vacant sequence/ step. The same value is also stored in cell A2. This means that the last used row in the last sequence in this sheet is in row 989 (990 - 1).

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	Seq.pointer	2	3	4	5	6	7	8	9	10	11	12	13	14	15
2	990	Update Seq.pointer	Export ->		Individual sequences										
3	6	Clear sheet	Import <-		Left front leg			Left middle leg			Left rear leg			Right front leg	
4	55				Coxa	Femur	Tibia	Coxa	Femur	Tibia	Coxa	Femur	Tibia	Coxa	Femur
5	90	Comment	SEQUENCE	STEP	PIN0	PIN1	PIN2	PIN4	PIN5	PIN6	PIN8	PIN9	PIN10	PIN16	PIN17
6	118	All legs up	1	1	-60,0	-90,0	-63,4	0,0	-90,0	-63,4	60,0	-90,0	-63,4	-60,0	-90,0
7	220	All legs a bit out	1	2	-60,0	-83,3	-56,1	0,0	-83,3	-56,0	60,0	-83,3	-56,1	-60,0	-83,3
8	272	All legs downwards	1	3	-60,0	-71,4	-53,5	0,0	-71,4	-53,4	60,0	-71,4	-53,5	-60,0	-71,4
9	284	0	1	4	-60,0	-59,7	-49,9	0,0	-59,7	-49,9	60,0	-59,7	-49,9	-60,0	-59,7
10	353	0	1	5	-60,0	-48,7	-45,5	0,0	-48,7	-45,5	60,0	-48,7	-45,5	-60,0	-48,7
11	413	0	1	6	-60,0	-38,5	-40,5	0,0	-38,5	-40,5	60,0	-38,5	-40,5	-60,0	-38,5
12	418	0	1	7	-60,0	-29,1	-35,0	0,0	-29,1	-35,0	60,0	-29,1	-35,0	-60,0	-29,1
13	478	0	1	8	-60,0	-20,4	-29,0	0,0	-20,4	-29,0	60,0	-20,4	-29,0	-60,0	-20,4
14	538	Rotate CCW	1	9	-70,7	-20,5	-28,8	-8,8	-20,5	-28,8	49,4	-20,5	-28,5	-49,4	-20,6
15	550	0	1	10	-81,1	-20,7	-27,9	-17,5	-20,6	-28,2	39,2	-20,8	-27,3	-39,2	-20,8
16	605	0	1	11	-91,0	-21,0	-26,3	-26,0	-20,8	-27,2	29,5	-21,1	-25,4	-29,5	-21,1
17	617	0	1	12	-100,4	-21,2	-24,1	-34,2	-21,1	-25,9	20,4	-21,3	-22,9	-20,5	-21,3
18	625	0	1	13	-109,0	-21,3	-21,2	-41,9	-21,3	-24,2	12,1	-21,3	-19,7	-12,1	-21,3
19	637	0	1	14	-116,9	-21,2	-17,6	-49,3	-21,4	-22,1	4,5	-21,0	-15,9	-4,5	-21,0
20	649	Rotate body CW	1	15	-116,9	-21,2	-17,6	-49,3	-21,4	-22,1	4,5	-21,0	-15,9	-4,5	-21,0
21	661	0	1	16	-109,0	-21,3	-21,2	-41,9	-21,3	-24,2	12,1	-21,3	-19,7	-12,1	-21,3
22	667	0	1	17	-100,4	-21,2	-24,1	-34,2	-21,1	-25,9	20,4	-21,3	-22,9	-20,5	-21,3
23	679	0	1	18	-91,0	-21,0	-26,3	-26,0	-20,8	-27,2	29,5	-21,1	-25,4	-29,5	-21,1
24	732	0	1	19	-81,1	-20,7	-27,9	-17,5	-20,6	-28,2	39,2	-20,8	-27,3	-39,2	-20,8
25	818	0	1	20	-70,7	-20,5	-28,8	-8,8	-20,5	-28,8	49,4	-20,5	-28,5	-49,4	-20,6
26	857	0	1	21	-60,0	-20,4	-29,0	0,0	-20,4	-29,0	60,0	-20,4	-29,0	-60,0	-20,4
27	900	0	1	22	-49,4	-20,5	-28,5	8,8	-20,5	-28,8	70,7	-20,5	-28,8	-70,7	-20,5
28	937	0	1	23	-39,2	-20,8	-27,3	17,5	-20,6	-28,2	81,1	-20,7	-27,9	-81,1	-20,7
29	974	0	1	24	-29,5	-21,1	-25,4	26,0	-20,8	-27,2	91,0	-21,0	-26,3	-91,0	-21,0
30	981	0	1	25	-20,4	-21,3	-22,9	34,2	-21,1	-25,9	100,4	-21,2	-24,1	-100,3	-21,3
31	990	0	1	26	-12,1	-21,3	-19,7	41,9	-21,3	-24,2	109,0	-21,3	-21,2	-109,0	-21,4
32		0	1	27	-4,5	-21,0	-15,9	49,3	-21,4	-22,1	116,9	-21,2	-17,6	-116,9	-21,2
33		0	1	28	2,5	-20,3	-11,4	56,2	-21,3	-19,6	124,2	-20,7	-13,4	-124,2	-20,7
34		0	1	29	-4,5	-21,0	-15,9	49,3	-21,4	-22,1	116,9	-21,2	-17,6	-116,9	-21,2
35		0	1	30	-12,1	-21,3	-19,7	41,9	-21,3	-24,2	109,0	-21,3	-21,2	-109,0	-21,4
36		Pitch and roll	1	31	-12,1	-14,3	-14,3	41,9	-25,7	-27,3	109,0	-33,9	-29,4	-109,0	-9,5
37		0	1	32	-12,1	-7,4	-8,3	41,9	-30,3	-30,3	109,0	-47,4	-36,4	-109,0	2,0
38		0	1	33	-12,1	11,2	10,7	41,9	-11,5	-16,4	109,0	-45,6	-35,5	-109,0	0,5
39		0	1	34	-12,1	1,8	0,6	41,9	-20,7	-23,7	109,0	-46,5	-36,0	-109,0	1,3
40		0	1	35	-20,4	-5,6	-9,9	34,2	-28,4	-31,0	100,4	-48,0	-39,7	-100,3	2,1
41		0	1	36	-29,5	-11,8	-18,1	26,0	-37,5	-37,9	91,0	-51,7	-43,7	-91,0	4,8
42		0	1	37	-39,2	-16,9	-24,4	17,5	-48,1	-44,3	81,1	-58,1	-48,0	-81,1	9,2
43		0	1	38	-49,4	-6,9	-17,3	8,8	-33,6	-37,5	70,7	-53,2	-47,2	-70,7	6,0
44		0	1	39	-60,0	0,7	-10,6	0,0	-20,4	-29,0	60,0	-45,5	-44,0	-60,0	0,7
45		Move body forward	1	40	-56,1	-8,7	-24,4	7,0	-21,2	-29,3	63,2	-33,3	-32,7	-56,1	-8,8
46		0	1	41	-51,2	-16,9	-35,8	13,8	-20,7	-27,9	65,8	-21,3	-19,8	-51,2	-17,0

Body & Coxa | **Ind.Sekvenser** | Setup | Export_Import | Gait Seq | FK Phoenix | IK Phoenix

If your hexapod doesn't has the exact same measures (or calibrated the same way) as my Phoenix these sequences won’t work properly on your hexapod. The best thing to do then is to clear/delete all sequences in the “Ind.sekvenser” worksheet. Delete all sequences/steps in this sheet by clicking the “Clear sheet” button. You’ll get a warning to confirm deleting, click OK.

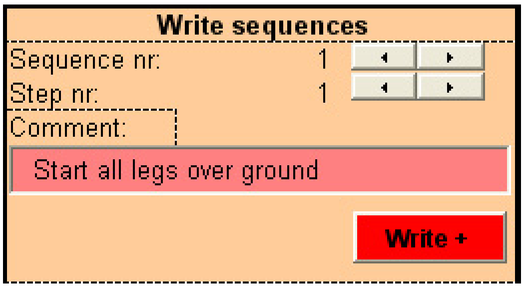
After deleting all sequences open the main sheet called “**Body & Coxa**”. Navigate to the read & write section and enter value 1 in all sequence and step # cells:



Of course, you can also use the scroll buttons to enter these values. If you don’t use the scroll buttons in the **Read Sequences** section you have to press the **Read step!** Button to update the graph section. Also pay attention to the **Individual leg** section and observe that all coxa, femur and tibia angle are 0 deg. They are 0 deg because you have read an empty/vacant step, here seq# 1 step# 1 (row 6 in the “Ind.sekvenser” sheet). An empty cell in Excel returns value 0.

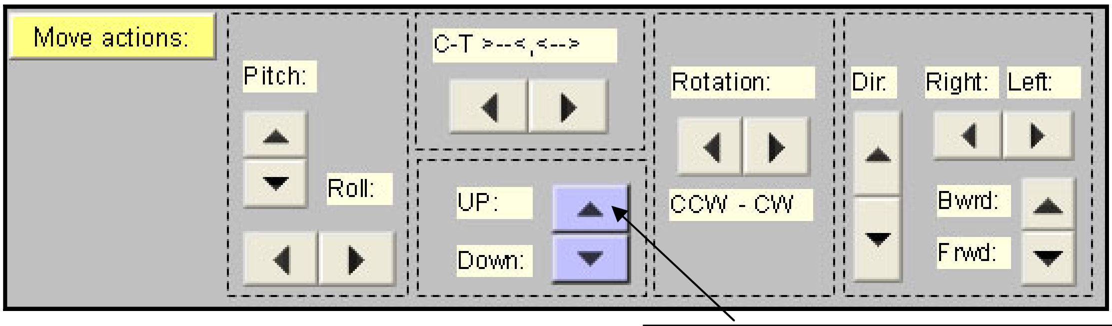
OK. Your PEP sheet is now ready for making some cool sequences! LOL

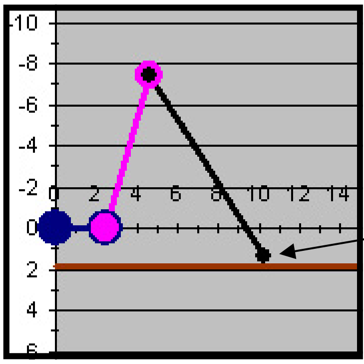
Create simple moves



Let's start with an empty sheet. Our first step start at address Seq# 1 and Step# 1. Notice that the comment textbox by default show "**Vacant sequence/step !!**" when you are at an empty address. You can alter this text by simply overwriting it, let's call our first step for "Start all legs over ground".

Ok, it's now time for making some simple moves. Navigate to the **Move actions** section.

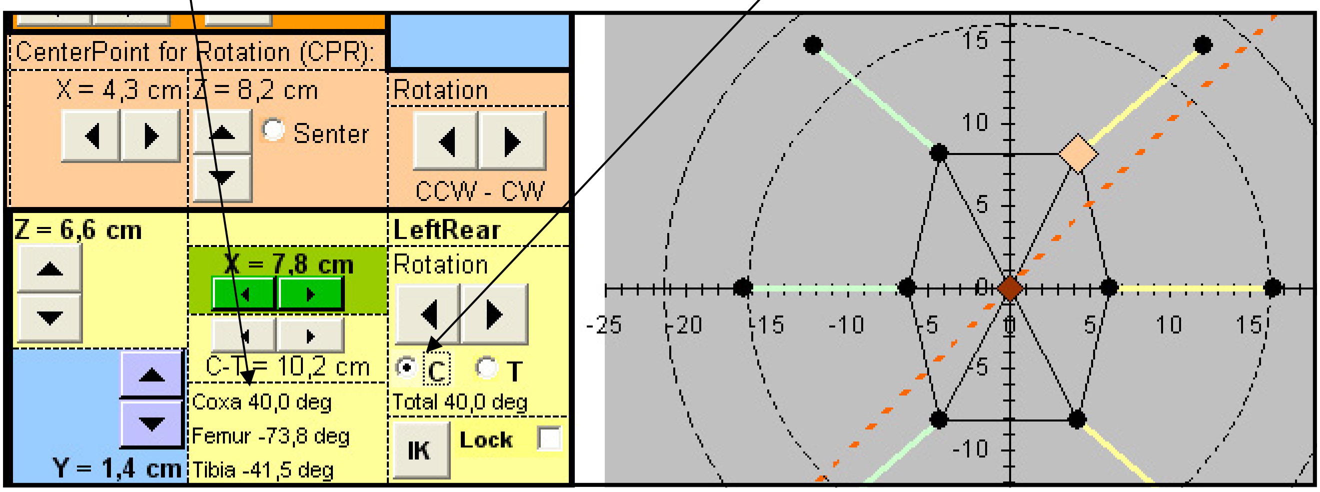




Press the All leg UP spin button. And watch the IK graph section. Observe that the leg is moving upwards. Click this button until the tars is above the ground level.

Ok, we want to store this position as our first step. Press the red **Write +** button in the "Write sequences" section. Note that after pressing this button the Step nr: value changes to 2 and the comment field again shows "**Vacant sequence/step !!**" , also note that the Status field shows **Write OK!**

To add another step to our first sequence we need to do some more moving. This time we want to alter the coxa angle for the rear and front legs. Press the OptionButton marked **C** and click the Rotation SpinButton until each legs coxa angle is 40 deg.



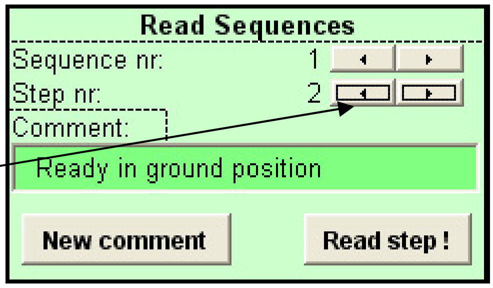
Let's call this new pose for "Ready in ground position". Save this step by clicking **Write +** . Of course you don't have to give every step a comment but they can be very helpful later. Especially when exporting sequences into Lynxmotion Visual Sequencer.

Now, we have saved two steps in our first sequence. Open the "Ind.sekvenser" sheet and observe that our to steps has been added. Your sheet should look like this (an old screenshot from PEP ver 1.03):

	A	B	C	D	E	F	G	H	I	J	K	L
1	Seq.pointer	2	3	4	5	6	7	8	9	10	11	12
2	8	**Individual sequences**										
3	6				Left front leg			Left middle leg			Left rear leg	
4	8				Coxa	Femur	Tibia	Coxa	Femur	Tibia	Coxa	Femur
5		Kommentar	Seq #.	Step #.	PIN0	PIN1	PIN2	PIN4	PIN5	PIN6	PIN8	PIN9
6		Start all legs over ground	1	1	0,0	-73,8	-41,5	0,0	-73,8	-41,5	0,0	-73,8
7		Ready in ground position	1	2	-40,0	-73,8	-41,5	0,0	-73,8	-41,5	40,0	-73,8
8		Vacant sequence/step !!										
9		0										
10		0										
11		0										

Reading steps

Go back to the main sheet "Body & Coxa". Try to read our new steps by clicking the spin button.



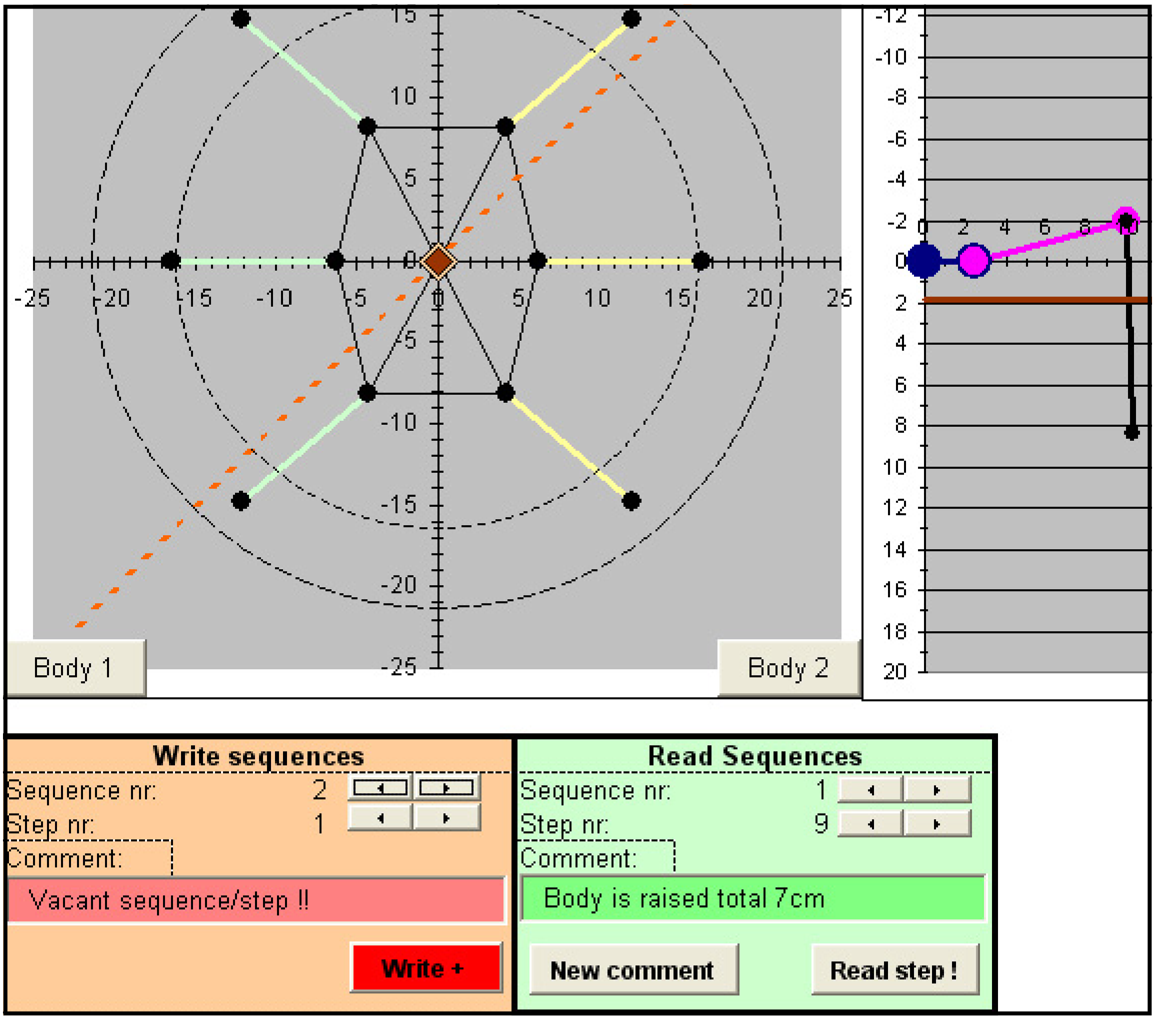
Ok, now you can try to make our hexapod to raise her body by moving all legs downwards. Check that the Step value is 1,0 cm and Time value is 200. Add 7 steps (from 3 to 9), meaning that you have lowered all legs by 7,0 cm. This process should not take more than few seconds, simply by clicking **"DOWN"** - **"Write +"** - **"DOWN"** - **"Write +"** … and so on.
Your Ind.sekvenser sheet should look like this now. Remember, if your hexapod has different leg dimension your femur and tibia angle values would not have the same values as mine.

	A	B	C	D	E	F	G	H	I	J	K	L	
1	Seq.pointer	2	3	4	5	6	7	8	9	10	11	12	
2	15	Update Seq.pointer	Export ->		**Individ**								
3	6				Left front leg			Left middle leg			Left rear leg		
4	15	Clear sheet	Import <-		Coxa	Femur	Tibia	Coxa	Femur	Tibia	Coxa	Femur	Tib
5		Comment	SEQUENCE	STEP	PIN0	PIN1	PIN2	PIN4	PIN5	PIN6	PIN8	PIN9	PI
6		Start all legs over ground	1	1	0,0	-73,8	-41,5	0,0	-73,8	-41,5	0,0	-73,8	
7		Ready in ground position	1	2	-40,0	-73,8	-41,5	0,0	-73,8	-41,5	40,0	-73,8	
8		Raise body, all leg down 1 cm	1	3	-40,0	-65,2	-39,7	0,0	-65,2	-39,7	40,0	-65,2	
9		0	1	4	-40,0	-56,4	-37,1	0,0	-56,4	-37,1	40,0	-56,4	
10		0	1	5	-40,0	-47,7	-33,7	0,0	-47,7	-33,7	40,0	-47,7	
11		0	1	6	-40,0	-39,1	-29,6	0,0	-39,1	-29,6	40,0	-39,1	
12		0	1	7	-40,0	-30,8	-24,8	0,0	-30,8	-24,8	40,0	-30,8	
13		0	1	8	-40,0	-22,8	-19,5	0,0	-22,8	-19,5	40,0	-22,8	
14		Body is raised total 7cm	1	9	-40,0	-15,0	-13,6	0,0	-15,0	-13,6	40,0	-15,0	
15		Vacant sequence/step !!											
16		0											
17		0											

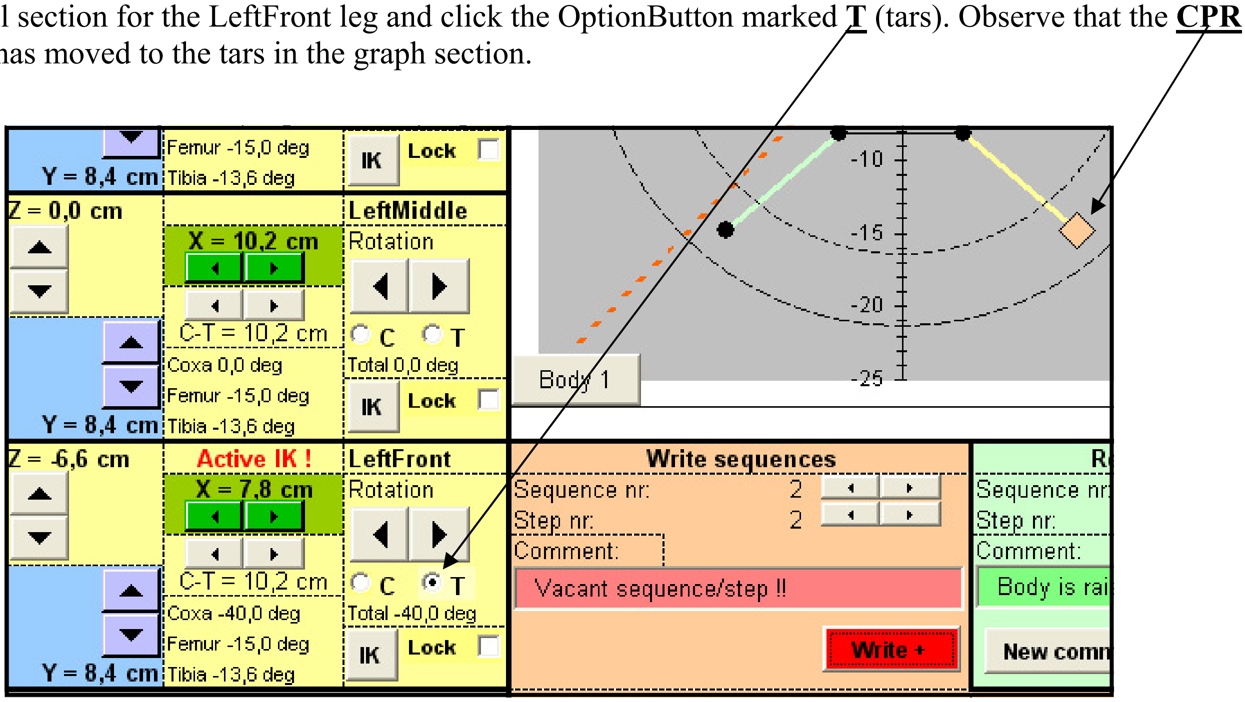
I gave step 3 and 9 some comment.

Adding sequences

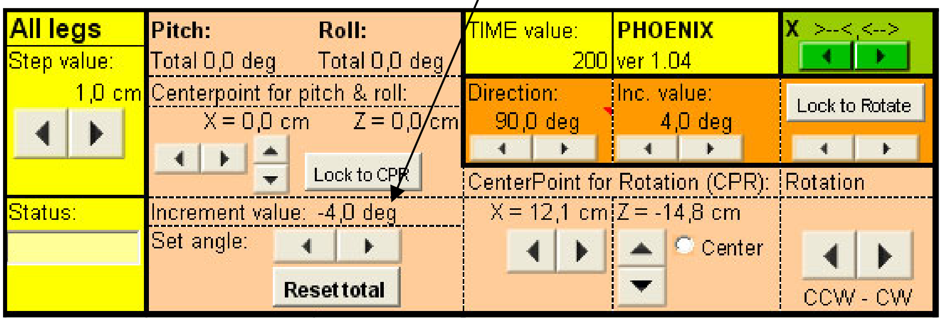
Ok, now we have made our first sequence of 9 steps. Let's play with some more advanced moves in a new sequence. Read step# 9 in seq# 1. Then set "Write sequences" to seq# 2 and step# 1. Your Body & Coxa sheet should look like this:



Write a new comment to our first step in seq# 2 in the **Write sequences** section. Let's call it "Body raised and ready!" Save this step (**Write +**). We want to start this sequence with some cool body rotation. Locate the control section for the LeftFront leg and click the OptionButton marked **T** (tars). Observe that the **CPR** indicator has moved to the tars in the graph section.



Locate the "**Status and CPR**" section. Set the increment value to 4 deg (ignore +/-, it doesn't matter). Also click the **Reset total** button. Reset total sets all Total x,x deg values to 0,0 deg.

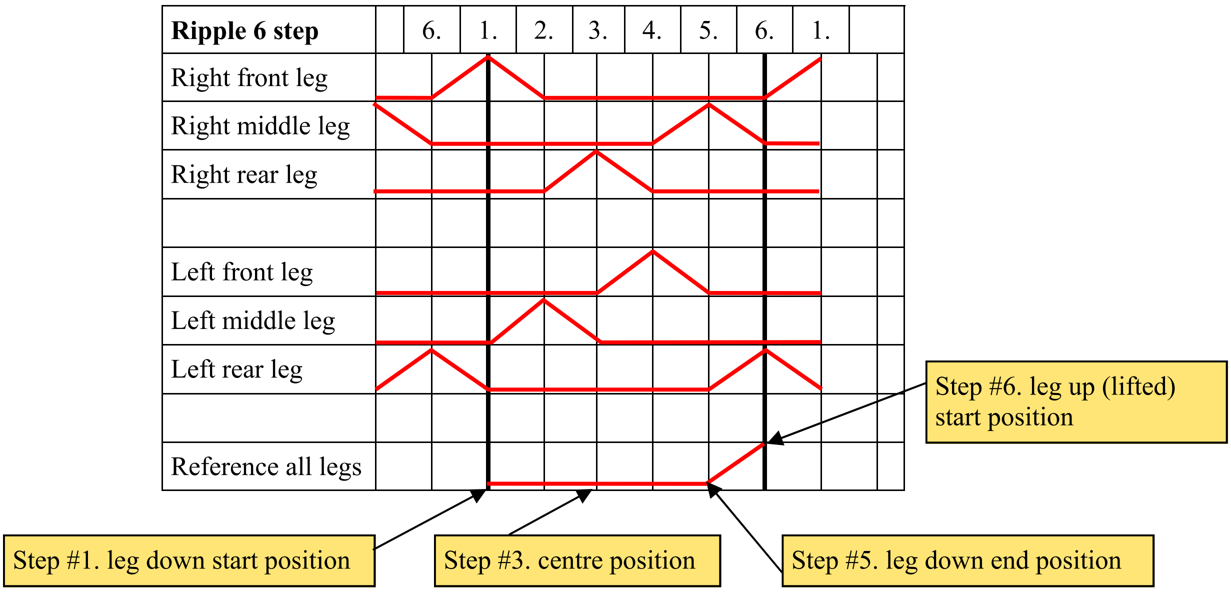


Locate the **Rotation** SpinButton in the **Move actions** section. Click this button and observe that all legs rotate with the tars of LeftFront leg as its Centre Point of Rotation (CPR)! Also use the the X and Z spin buttons to manually set the CPR wherever you want. If you want to manually enter a value, you have to locate the B72 or C72 cell. It's easier to use the spin buttons.

You have to decrease the increment value if you define the CPR further from the centre of body, maybe to 2 deg. Experiment with some body rotation, pitch and roll. Add some new steps in sequence #2.

Walking gaits

Before we start to make some walking sequences I'll try to explain how the PEP generate gait function work. The table below illustrates the ripple gait sequence. One sequence consists of 6 step.

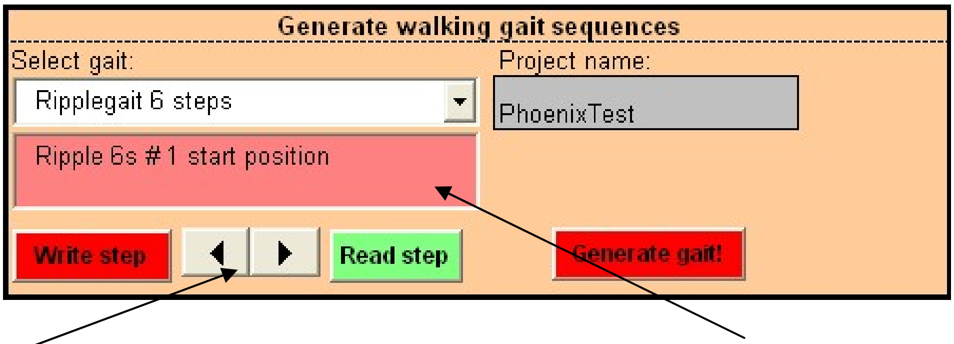


For continuous ripple walking run step #1. to #6. in a loop. Take a look at step #1. for each leg, this is the initiate start position for the ripple gait. In the VB-code I defined this table by the following code:

```
…..
 'Initiate start StepADR for each leg in gait sequence:
        HFTStep = 6   'Right front leg
        HSTStep = 2   'Right middle leg
        HBTStep = 4   'Right rear leg
        VFTStep = 3   'Left front leg
        VSTStep = 5   'Left middle leg
        VBTStep = 1   'Left rear leg
```

Compare the code with the table and you'll see that the initiate start StepADR are referred to the "Reference all legs" in the table. Ex. Right front leg start at reference step #6 (leg up/lifted) in the gait step #1.

Before we can generate a walking gait we'll have to define the reference position for each leg. Locate the "Generate walking gait sequences" (**GWG**) section and select the Ripplegait 6 steps:



Click the spinbutton several times and observe the information in the textbox. This section are referring to the steps stored in the "Gait Seq" sheet. Take a brief look at this sheet and you'll see that this sheet is very similar to the "Ind.Sekvenser" sheet. The "Gait Seq" sheet are used for temporary storage for reference positions for each leg.

Define reference positions

The ripplegait 6 steps consists of 5 stance positions, this means that we have to define these positions. At first read the step at seq #2 step #1 (we called it "Body raised and ready!"), this is our base position for our first walking gait. At this position the legs are centred due to the reference position, that means at step #3 of the reference position.
For this example I just want to make a simple forward walking gait. Locate the **Bwrd** (Backward) / **Frwd** (Forward) spinbutton in the **Move actions** section and click the **Bwrd** button two times. Observe that all legs moved forward 2 cm relative to the body, this makes the body to move backward relative to the legs ;). The **Step value** (located in the Status and CPR section) has a default value of 1 cm, a **Step value** of 1 cm should give us a total of 5 cm stride length in one gait sequence.

1. Save this step by clicking the **Write step** button, observe that the textbox now says "Ripple 6s # 2"
2. Click the **Frwd** button one time and then click the **Write step** button again
3. Repeat this operation (2. point) until the textbox information says "Ripple 6s # 6 leg up start position". At this point we are done defining the 5 stance positions and the legs are at the end position (step #5).
4. Click the right spinbutton (located in GWG section) one time to enter the "Ripple 6s # 1 start position", then click the **Read step** button and observe that all legs moved to our first position (step #1).
5. At this point we have to define the "leg up" position. Move all legs upwards 5 cm by clicking the **UP** button (Move actions) 5 times.
6. Then click the left spinbutton (GWG section) and save this last position/step ("Ripple 6s # 6 leg up start position") by clicking the **Write step** button.

All these steps are now stored in the "Gait Seq" sheet.
We are now ready to generate a walking gait. Before we can generate a walking gait we have to define where to save it. Add a sequence in the **Write sequences** section, enter a text in the comment textbox: "Walk forward ripple 6s".
Hit the **Generate gait!** button. And observe PEP generating the gait.

Done.

Exporting projects

Open the ”Ind.Sekvenser” sheet.
To export this project simply click the “Export ->“ button.
This command generate a new worksheet with all your sequences in the same format as the Lynxmotion Visual Sequencer .csv project file.
I have tried PEP in two different versions of MS Excel, the 2000 and the 2003 version. I prefer the 2000 version because of the speed, the 2003 version are much slower… But the 2003 version is a bit easier when exporting .csv files.

In the File menu select SaveAs.

MS Excel 2000:

Select the file type .sdv (semicolon separated).
Enter a filename and location.
SAVE, click YES in the warning dialog box.
Before you can use this file you have to rename the file type to .csv

MS Excel 2003:

Select the file type .csv (semicolon separated).
Enter a filename and location.
SAVE, click YES in the warning dialog box.

NB! Before we can use this project .csv file we need a .shp file with the same filename.

To get a .shp file we need to export a project from the Lynxmotion Visual Sequencer program (SEQ).

How to export a project from SEQ:
First, read the SEQ manual!

In SEQ enter the project module and select a project to export. Click the Export button and (IMPORTANT!) select the fields, DO NOT use all fields (default). Select only the active fields (for the PINxx servo position and the Txx servo time) compatible with the .csv file we just saved from PEP. You should unselect the PIN3, 7,11,12,13,14,15,19,23,27,28,29,30,31 and T3,7,11,12,13,14,15,19,23,27,28,29,30,31. Save the project.

Take a backup copy of this .shp file, because this is the file we need together with our PEP .csv file, to make them work together you have to save them on the same location and they must have the same file-name.

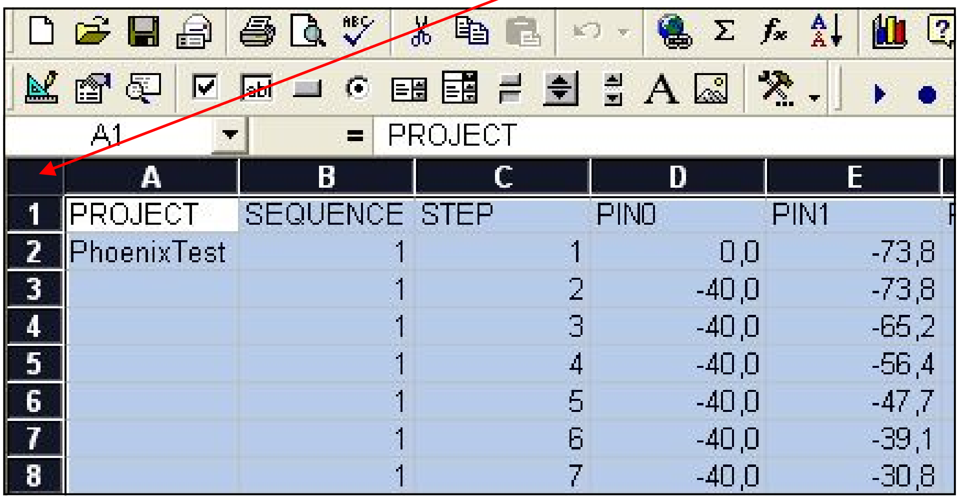
“Importing your home-made csv is a risk to crash the internal database!
To prevent this, close the SEQ software, go to installation directory and backup the two files 'MovesSeq.dbf' and 'MovesSeq.mdx' in a secure place. If you crash the database, you'll just have to close the software and restore these two files.” ref. SEQ manual.

Try to import our little PEP project into SEQ.

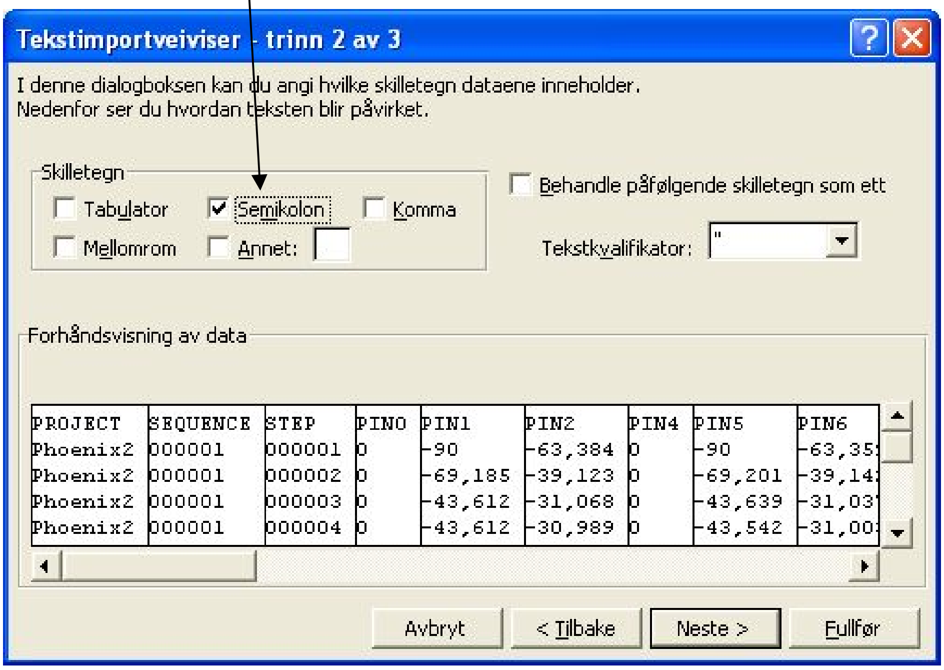
Importing projects

If you already have made some sequences for you hexapod in SEQ and want to import them into PEP, you have to export your project from SEQ. Export the project as explained on the previous page (**How to export a project from SEQ**). It's very important to only export the active fields (PINxx and Txx)!

Open the sheet called **Export_Import** and delete all contents by selecting all cells (click here) and then press delete on your keyboard.



Open your exported .csv project file in Excel (File menu—open file). In the File Open dialogbox select filetype .csv and enter the location where you saved the project files from SEQ. You'll probably get an importwisard dialogbox, select semicolon separated cells. Sorry, but I'm using a Norwegian version, but I think you'll recognise the picture ;)



After importing, your .csv file has been opened in a new worksheet. Select all contents in this sheet and copy and paste it into the empty **Export_Import** sheet in PEP. Remember to activate (click on it) cell A1 in the Export_Import sheet before pasting.
Open the **Ind.Sekvenser** sheet and click the **"Import <-"** button, select YES to confirm deleting your existing sequences.

Done!