Tether Conclusions

The following MATLAB Live Script details the conclusions of the tether experiments, including the resulting plots for a total of 30 experiments perfomed on the orange 4-limbed robot on the black mat.

Extract and define parameters for GaitTest() objects.

From 20220707 Experiments:

Gait B-120 [heavy - not following (restting) - left/up]

Gait E-120 [heavy - not following - left/up]

Gait E-60 [heavy - not following - left/up]

Gait E-60* [heavy - not following - right/up] Caution! Not real E gait! Limb A not actuating

From 20220819 Experiments:

Gait B-120 [light sheath - not following (restting) - right/up]

From 20220829 Experiments:

Gait B Follow (Left)* [light sheath - following - left] Caution! Not real B gait! Limb A not actuating

Gait B Follow (Right)* [light sheath - following - right] Caution! Not real B gait! Limb A not actuating

Gait E Left (sheath on) [light sheath - not following - left]

Gait E Right (sheath on) [no sheath - not following - right]

Gait E Left (sheath off) [no sheath - not following - left]

Gait E Right (sheath off)* [no sheath - not following - right] Caution! Not real E gait! Limb B not actuating

From 20220901 Experiments:

Gait E Left (sheath off) [no sheath - not following - left (flipped)]

Gait B Follow (Left) Trial 1 [light sheath - following - left]

Gait B Follow (Left) Trial 2 [light sheath - following - left (flipped)]

Gait B Left (Sheath on) Trial 1 [light sheath - following - left (flipped)]

Gait B Left (Sheath on) Trial 2 [light sheath - following - left (flipped)]

From 20220908 Experiments:

Gait B Right (sheath on) [sheath - not following - right] (not consistent / semi-following)

Gait B Right Follow (sheath off) Trial 1 [no sheath - following - right]

Gait B Right Follow (sheath off) Trial 2 [no sheath - following - right]

Gait B Left Follow (sheath off) Trial 1 [no sheath - following - left]

Gait B Left Follow (sheath off) Trial 2 [no sheath - not following - left]

Gait B Right (sheath off) Trial 1 [no sheath - not following - right] (not consistent / semi-following)

Gait B Right (sheath off) Trial 2 [no sheath - not following - right] (not consistent / semi-following)

Gait B Left (sheath off) Trial 1 [no sheath - not following - left] (not consistent / semi-following)

Gait B Left (sheath off) Trial 2 [no sheath - not following - left] (not consistent / semi-following)

Gait B Right Follow (sheath on) [sheath - following - right]

Gait E Right (sheath off) Trial 1 [no sheath - not following - right] (not consistent / semi-following)

Gait E Right (sheath off) Trial 2 [no sheath - not following - right] (not consistent / semi-following)

Gait E Left (sheath off) Trial 1 [no sheath - not following - left] (not consistent / semi-following)

Gait E Left (sheath off) Trial 2 [no sheath - not following - left] (not consistent / semi-following)

Build Experiment Matrix

`sorted_exps = 30×7 table`

	Experiment	Gait	#Cycles	Tether	Protocol	Placement	Trial
1	1	'B'	'120'	'H'	'NF'	'L'	
2	20	'B'	'60'	'NS'	'F'	'L'	
3	21	'B'	'60'	'NS'	'F'	'L'	2
4	18	'B'	'60'	'NS'	'F'	'R'	
5	19	'B'	'60'	'NS'	'F'	'R'	2
6	24	'B'	'60'	'NS'	'NF'	'L'	
7	25	'B'	'60'	'NS'	'NF'	'L'	2
8	22	'B'	'60'	'NS'	'NF'	'R'	
9	23	'B'	'60'	'NS'	'NF'	'R'	2
10	13	'B'	'60'	'S'	'F'	'L'	
11	14	'B'	'60'	'S'	'F'	'Lf'	
12	26	'B'	'60'	'S'	'F'	'R'	
13	15	'B'	'60'	'S'	'NF'	'L'	
14	16	'B'	'60'	'S'	'NF'	'Lf'	
15	5	'B'	'120'	'S'	'NF'	'R'	

	Experiment	Gait	#Cycles	Tether	Protocol	Placement	Trial
16	17	'B'	'60'	'S'	'NF'	'R'	
17	6	'Bs'	'60'	'S'	'F'	'L'	
18	7	'Bs'	'60'	'S'	'F'	'R'	
19	2	'E'	'120'	'H'	'NF'	'L'	
20	3	'E'	'60'	'H'	'NF'	'L'	
21	10	'E'	'60'	'NS'	'NF'	'L'	
22	29	'E'	'60'	'NS'	'NF'	'L'	2
23	30	'E'	'60'	'NS'	'NF'	'L'	3
24	12	'E'	'60'	'NS'	'NF'	'Lf'	
25	27	'E'	'60'	'NS'	'NF'	'R'	
26	28	'E'	'60'	'NS'	'NF'	'R'	2
27	8	'E'	'60'	'S'	'NF'	'L'	
28	9	'E'	'60'	'S'	'NF'	'R'	
29	4	'Es'	'60'	'H'	'NF'	'R'	
30	11	'Es'	'60'	'NS'	'NF'	'R'	

Rotate the data w.r.t. the initial global orientation.

Instantiate GaitTest() objects for each experimental trial.

This analyzes the data from each trial to find motion primitive twist information.

Plot the full motion data for each experiment.

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Experiment 1 : 120 cycles of Gait B with heavy sheath tether ( left , not following ), trial 1
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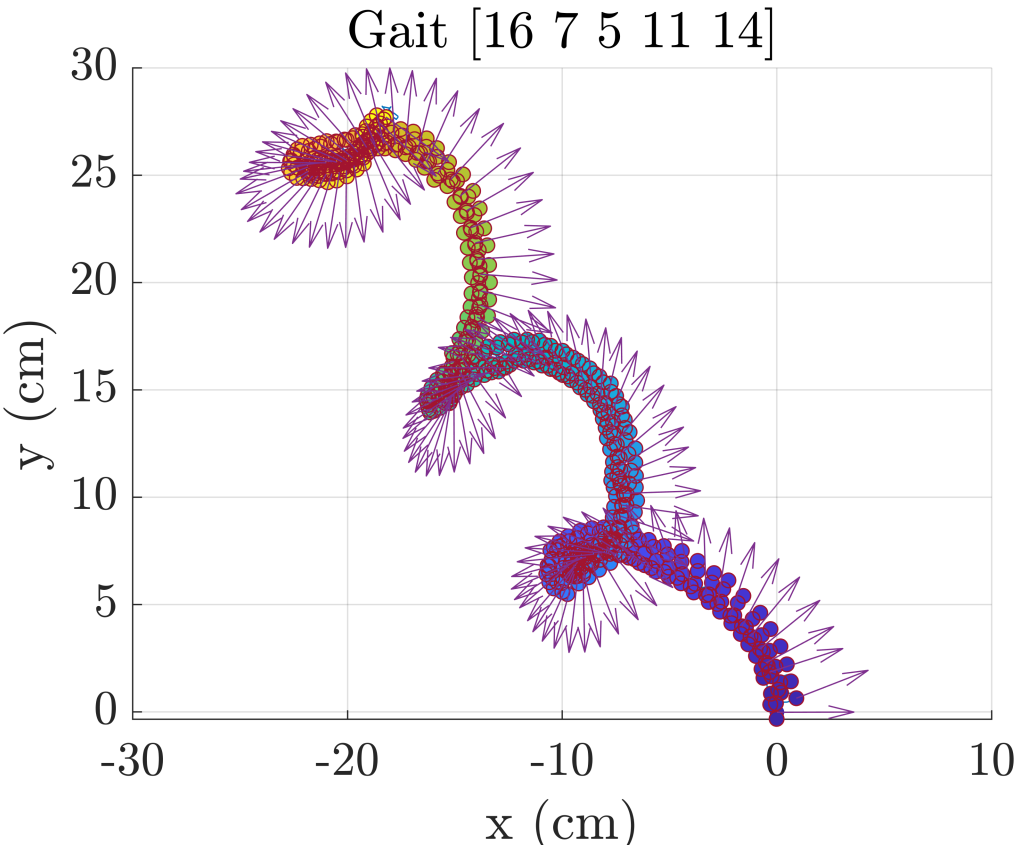
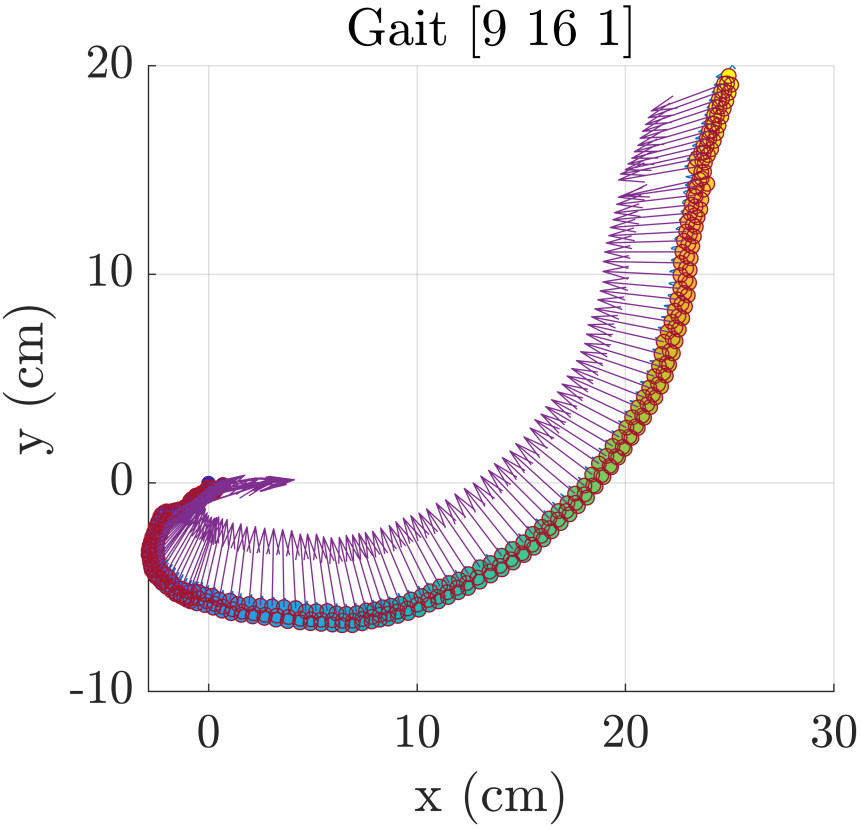
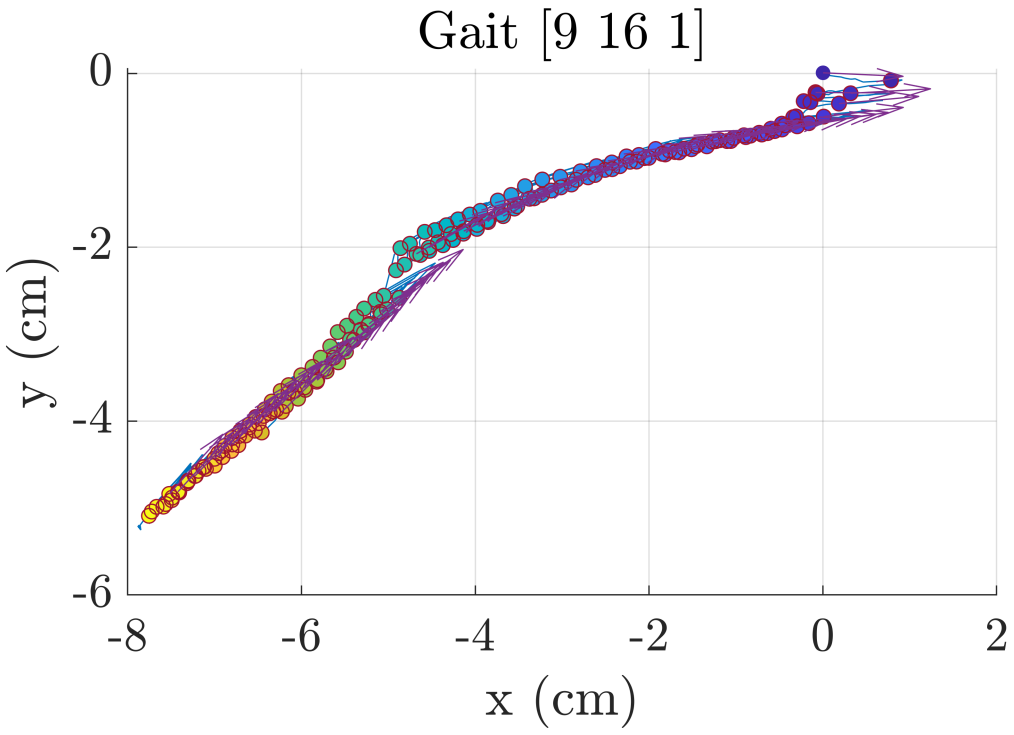


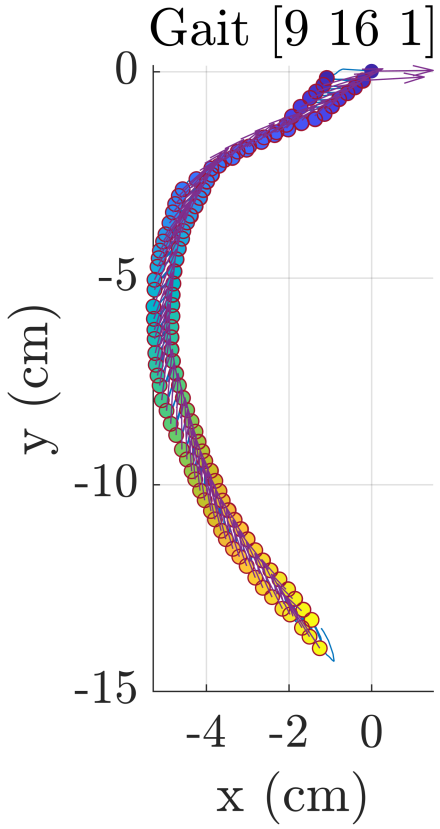
Experiment 2 : 120 cycles of Gait E with heavy sheath tether (left , not following), trial 1



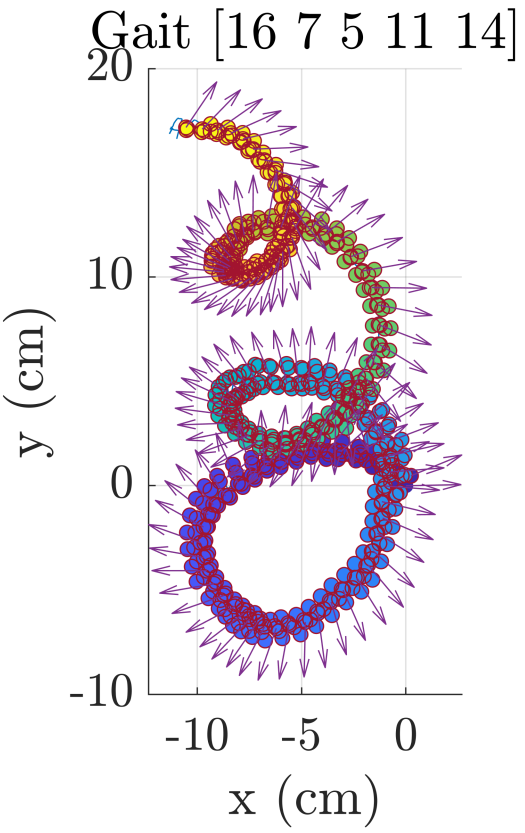
Experiment 3 : 60 cycles of Gait E with heavy sheath tether (left , not following), trial 1



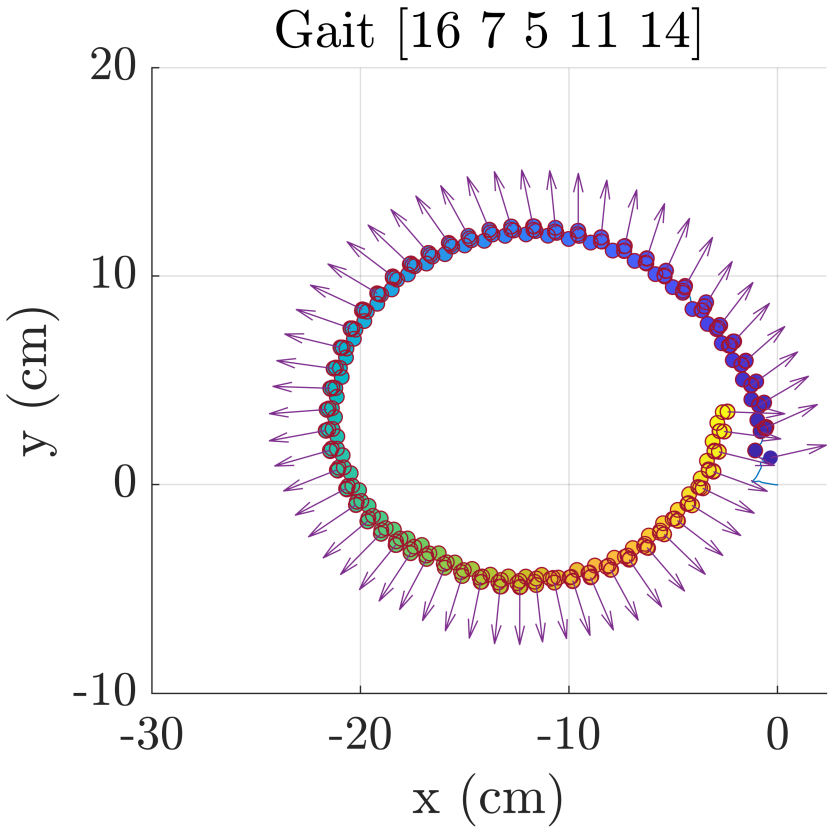
Experiment 4 : 60 cycles of Gait Es with heavy sheath tether (right , not following), trial 1



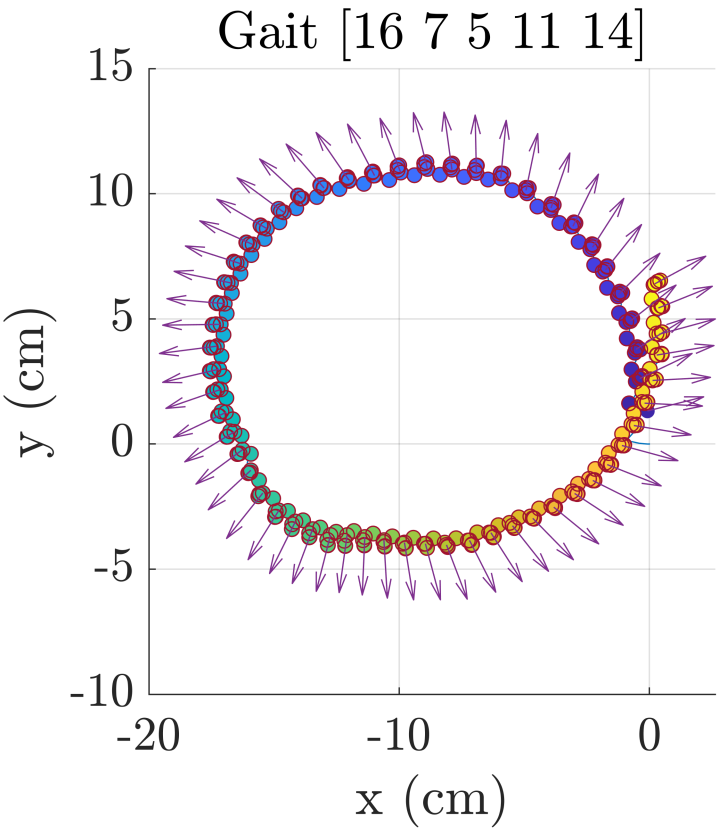
Experiment 5 : 120 cycles of Gait B with light sheath tether (right , not following), trial 1



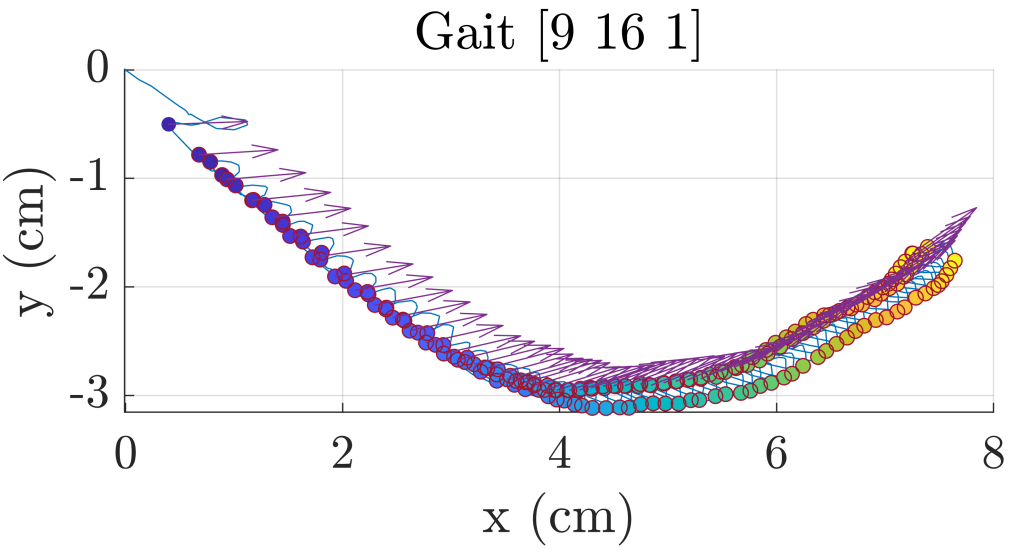
Experiment 6 : 60 cycles of Gait Bs with light sheath tether (left , following), trial 1



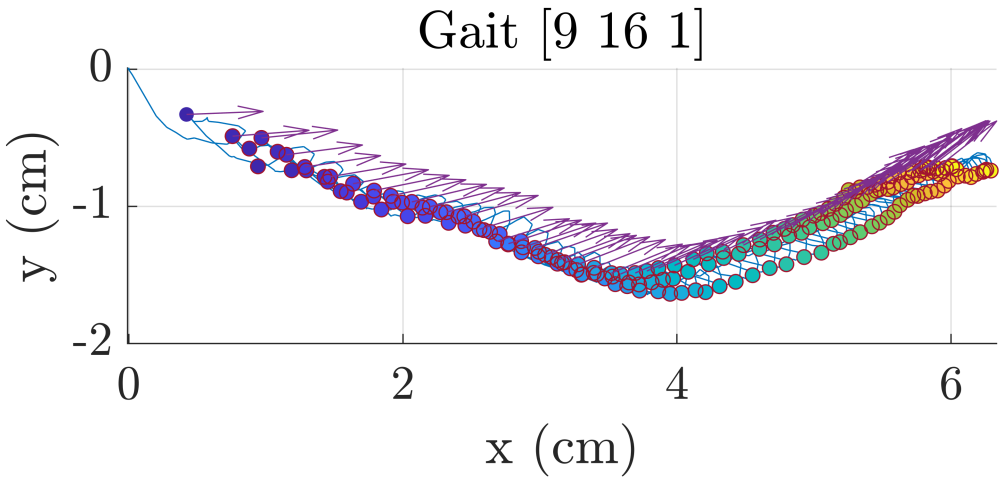
Experiment 7 : 60 cycles of Gait Bs with light sheath tether (right , following), trial 1



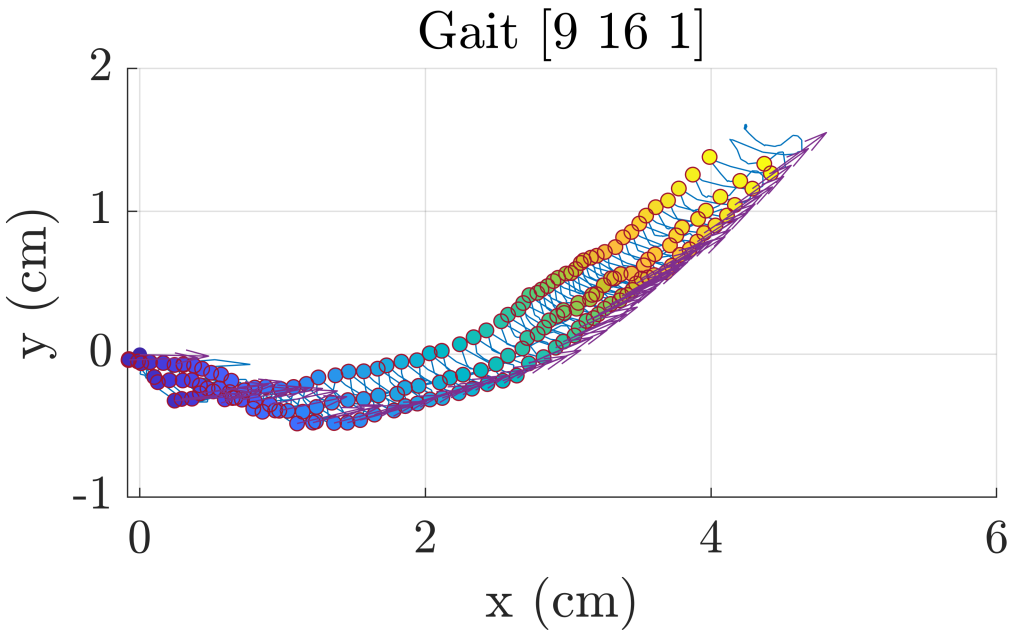
Experiment 8 : 60 cycles of Gait E with light sheath tether (left , not following), trial 1



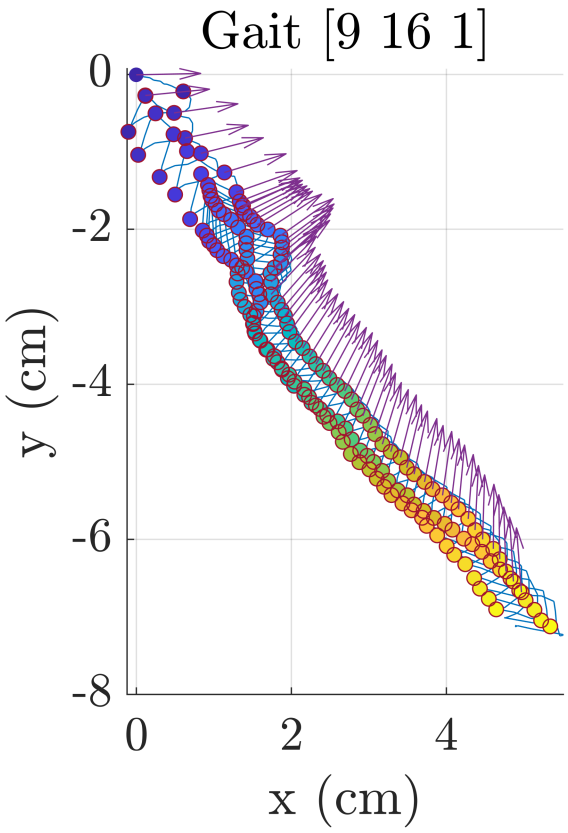
Experiment 9 : 60 cycles of Gait E with light sheath tether (right , not following), trial 1



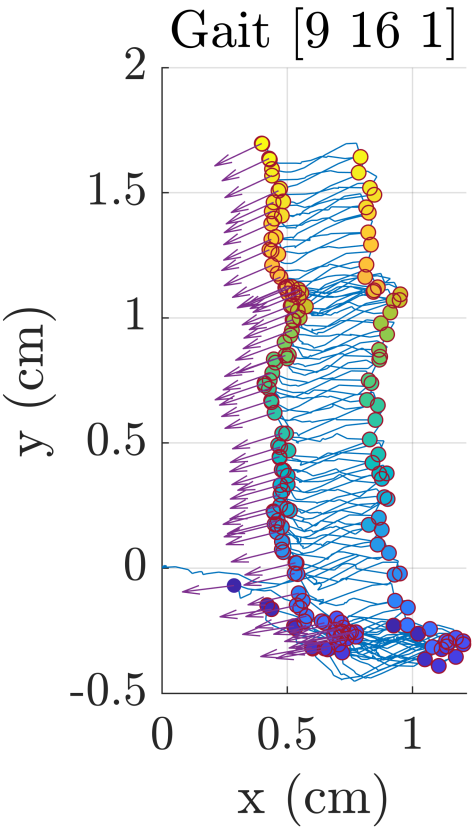
Experiment 10 : 60 cycles of Gait E with no sheath tether (left , not following), trial 1



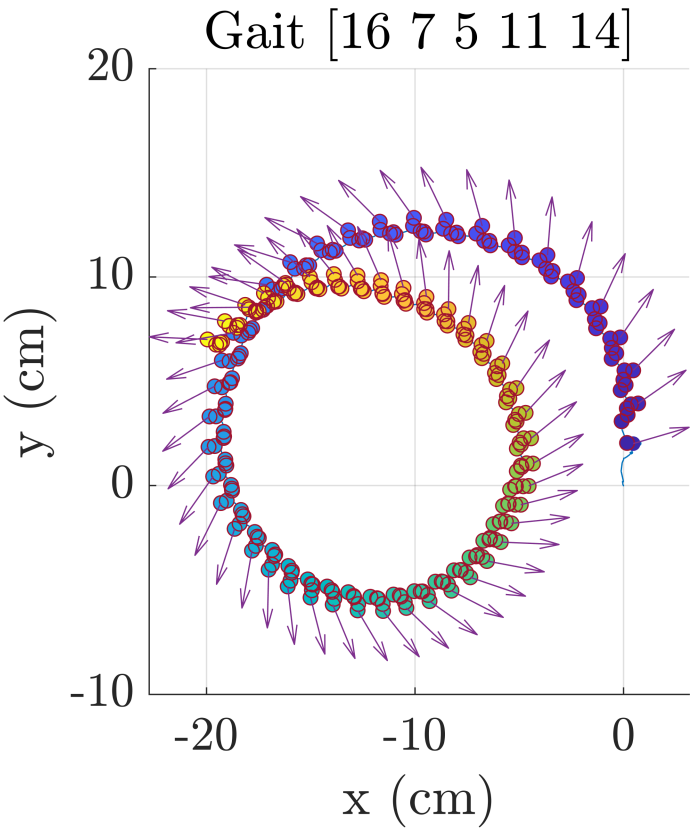
Experiment 11 : 60 cycles of Gait Es with no sheath tether (right , not following), trial 1



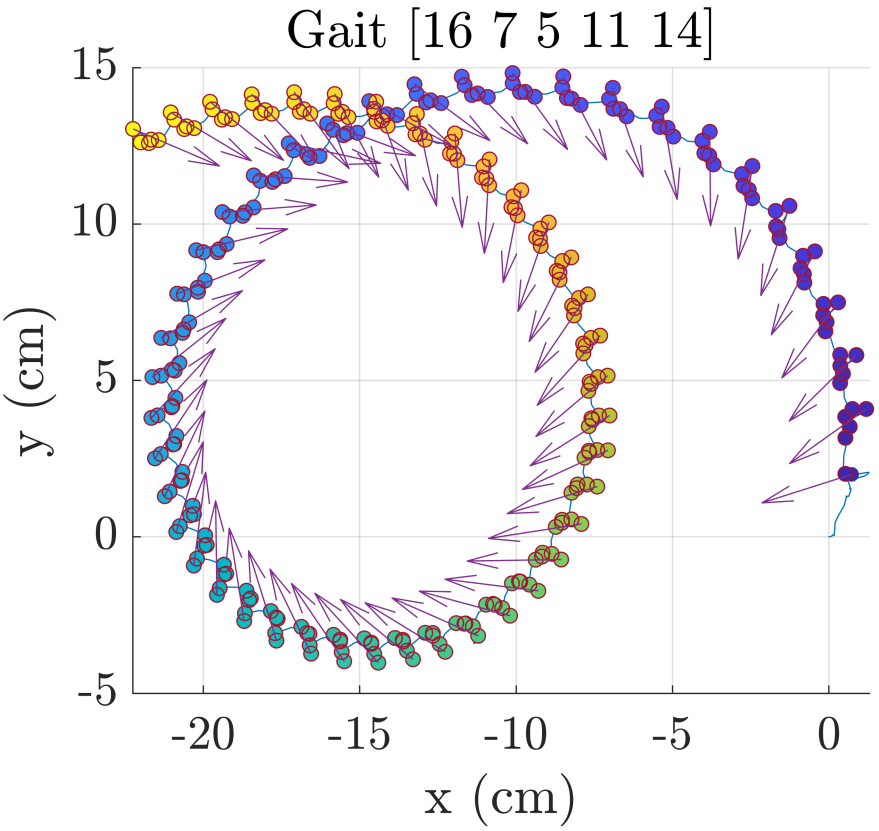
Experiment 12 : 60 cycles of Gait E with no sheath tether (Lf , not following), trial 1



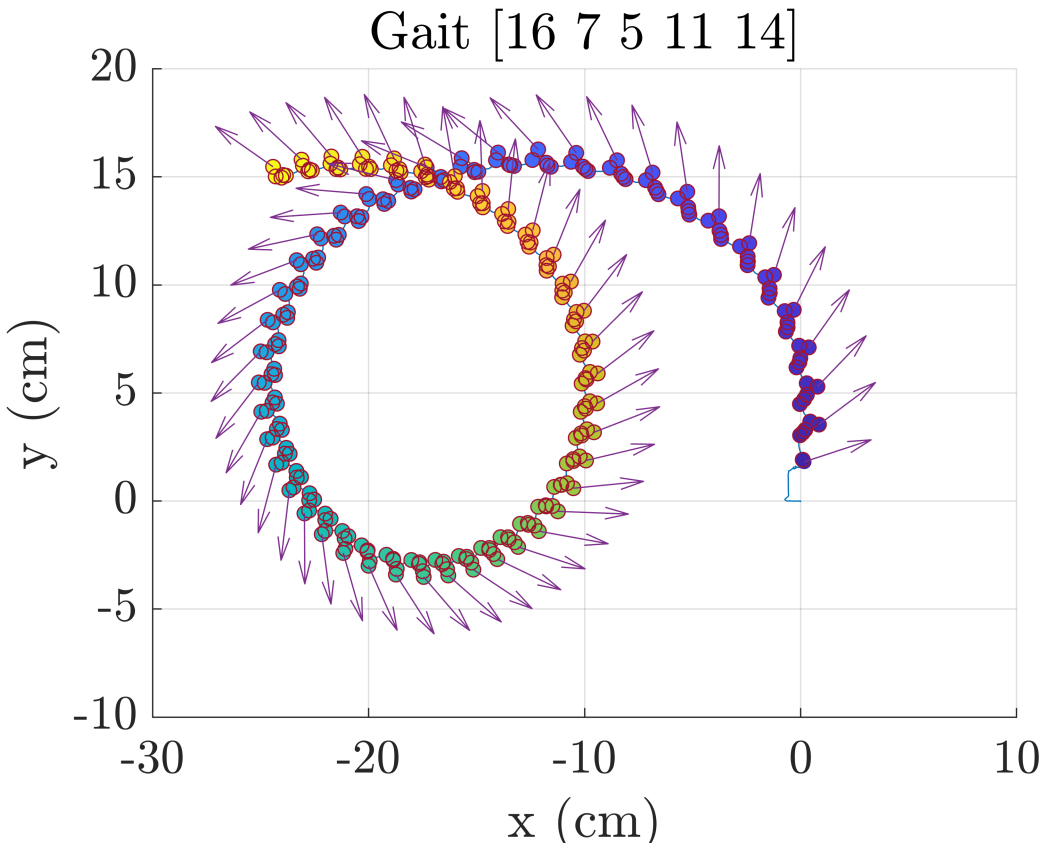
Experiment 13 : 60 cycles of Gait B with light sheath tether (left , following), trial 1



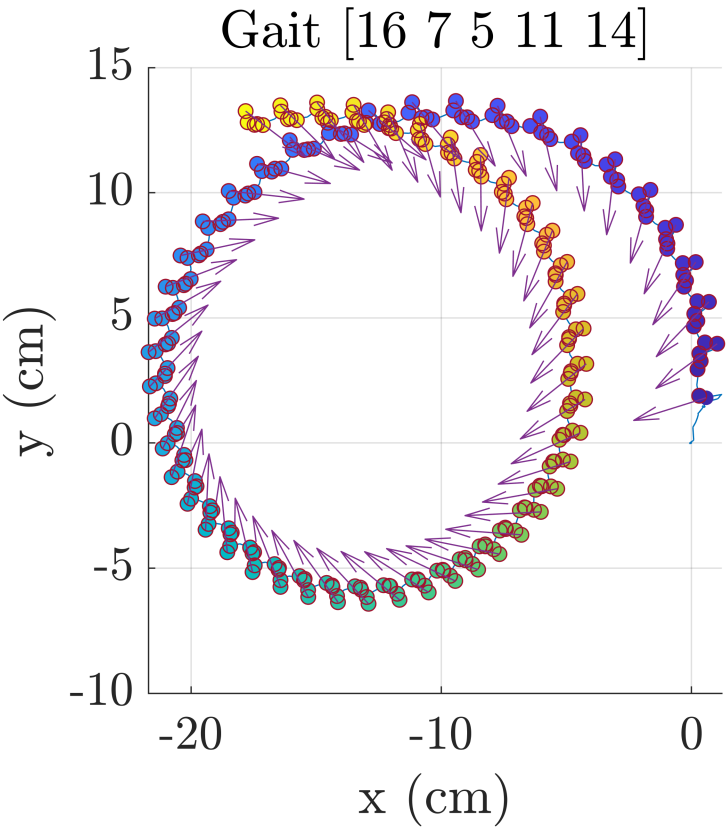
Experiment 14 : 60 cycles of Gait B with light sheath tether (Lf , following), trial 1



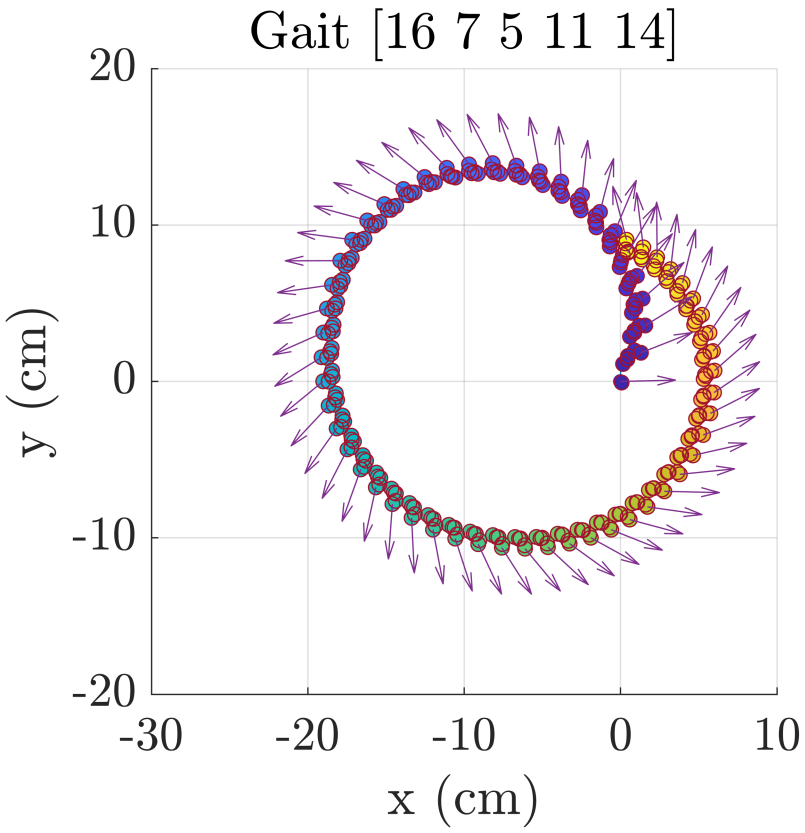
Experiment 15 : 60 cycles of Gait B with light sheath tether (left , not following), trial 1



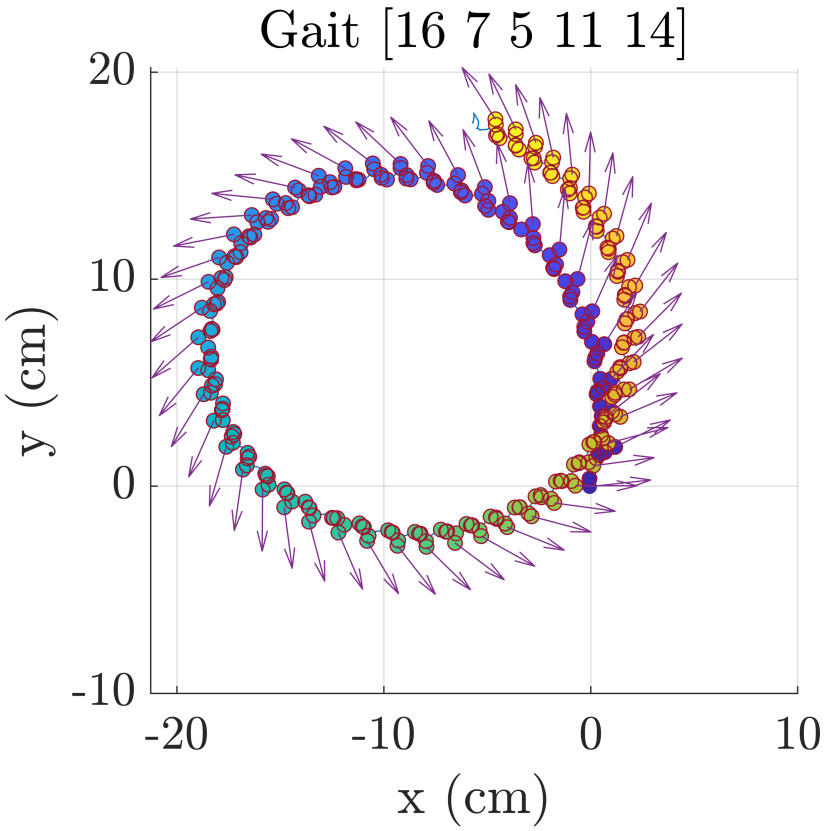
Experiment 16 : 60 cycles of Gait B with light sheath tether (Lf , not following), trial 1



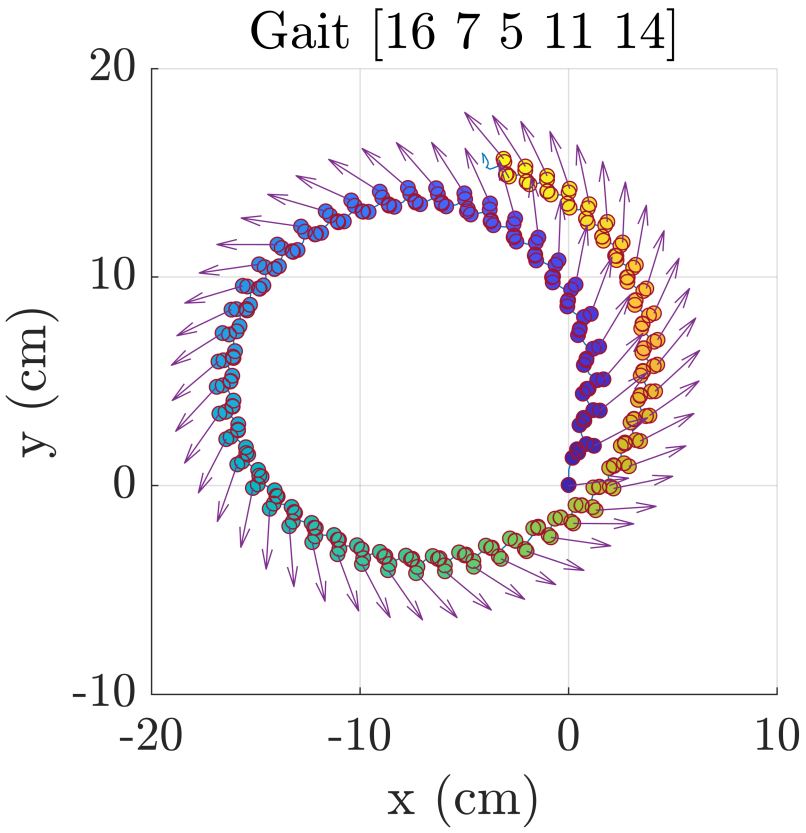
Experiment 17 : 60 cycles of Gait B with light sheath tether (right , not following), trial 1



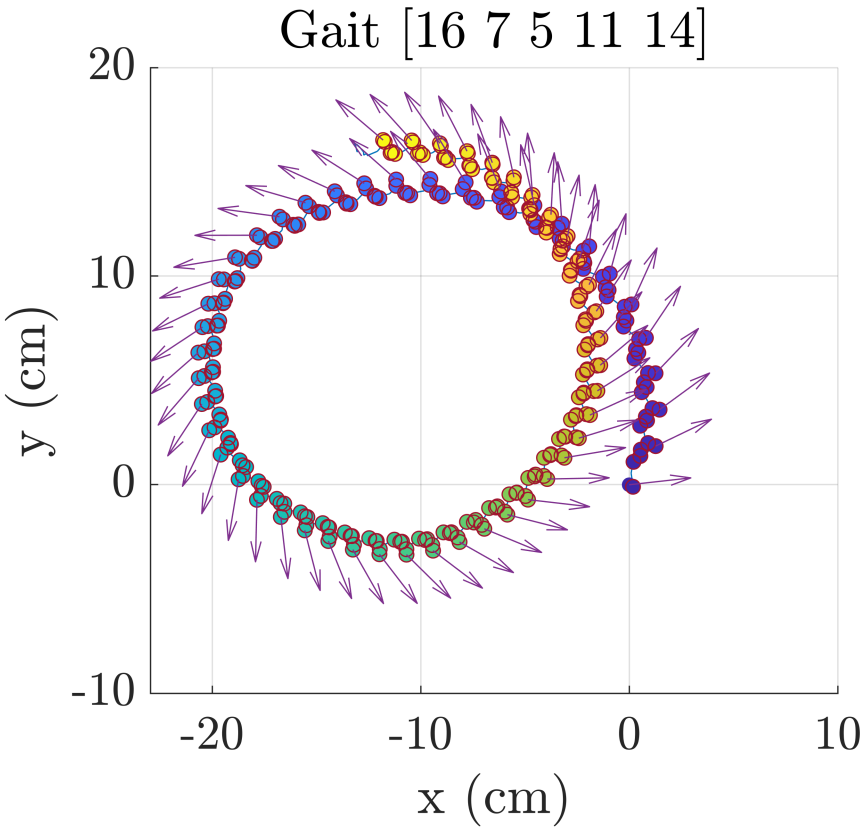
Experiment 18 : 60 cycles of Gait B with no sheath tether (right , following), trial 1



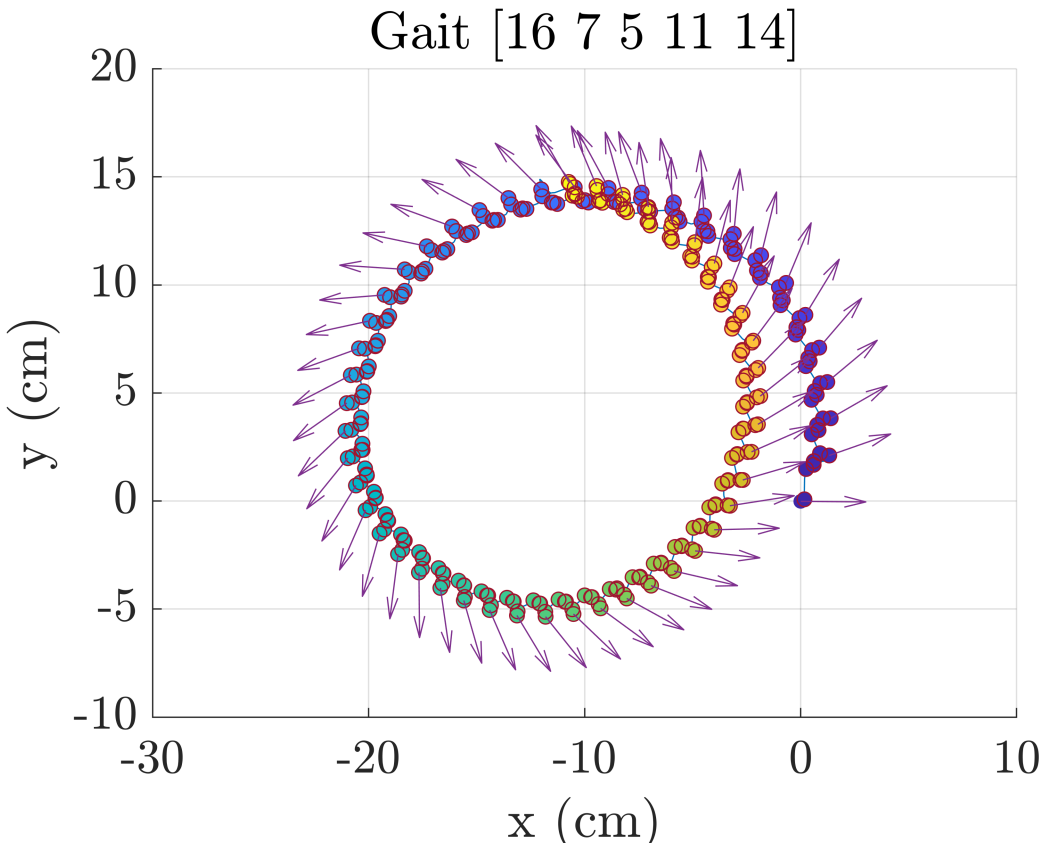
Experiment 19 : 60 cycles of Gait B with no sheath tether (right , following), trial 2



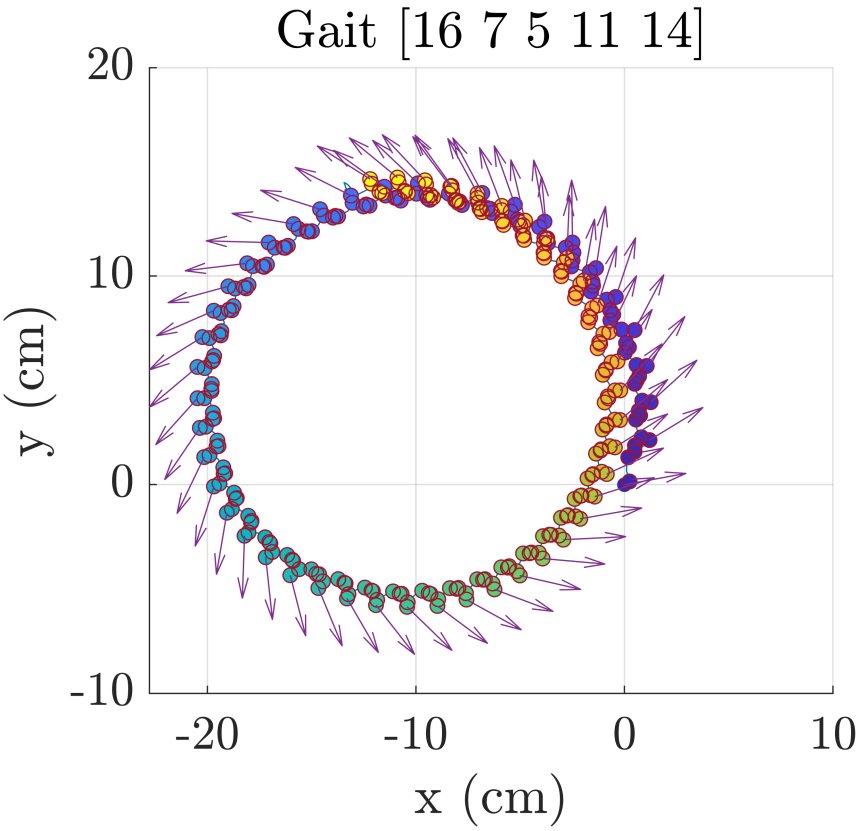
Experiment 20 : 60 cycles of Gait B with no sheath tether (left , following), trial 1



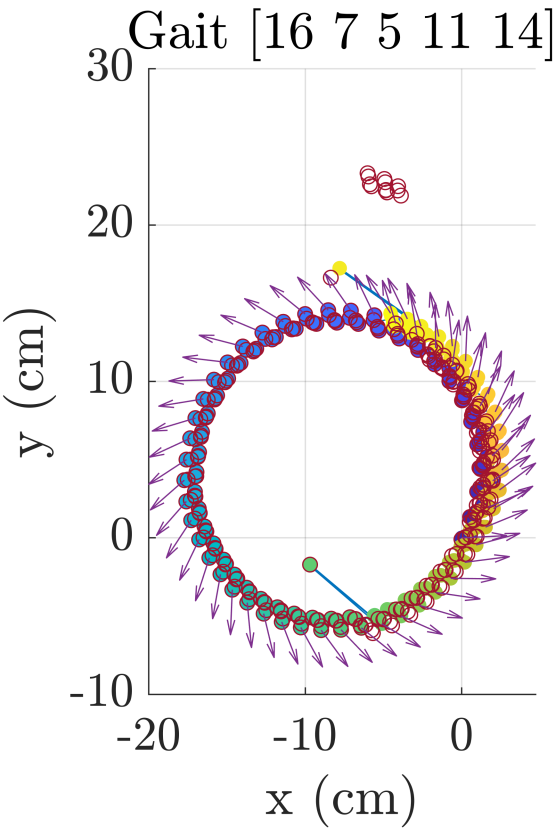
Experiment 21 : 60 cycles of Gait B with no sheath tether (left , following), trial 2



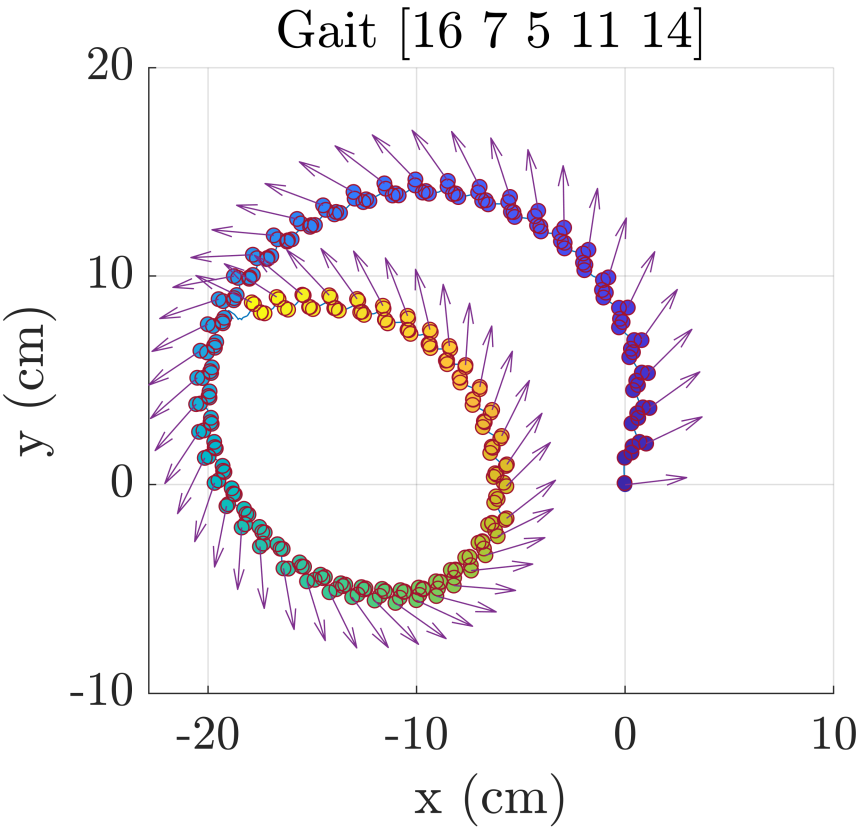
Experiment 22 : 60 cycles of Gait B with no sheath tether (right , not following), trial 1



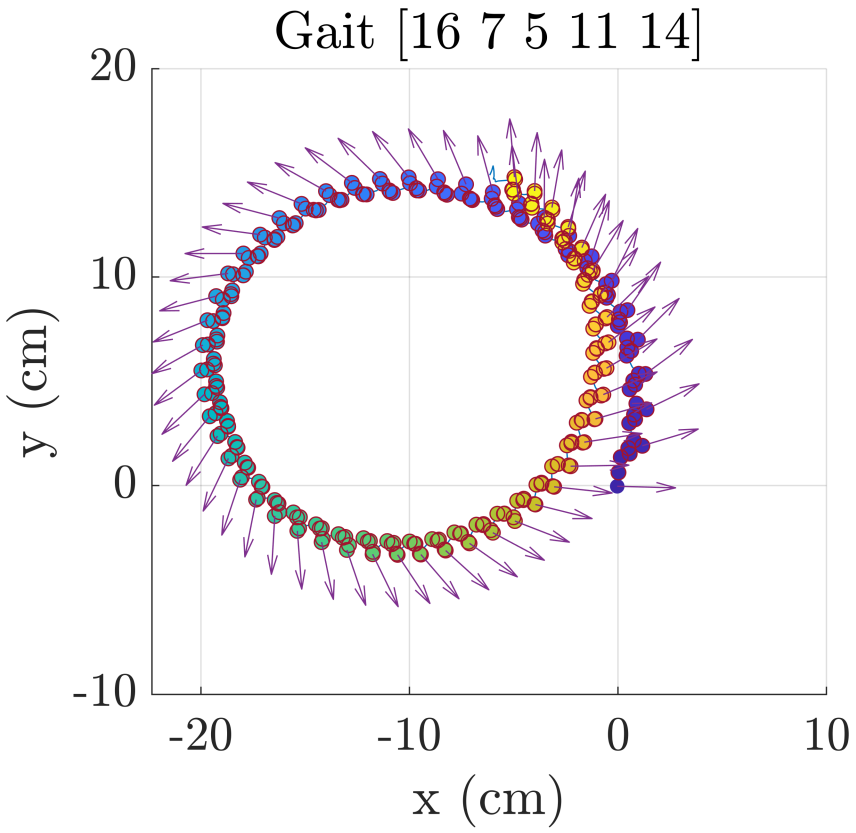
Experiment 23 : 60 cycles of Gait B with no sheath tether (right , not following), trial 2



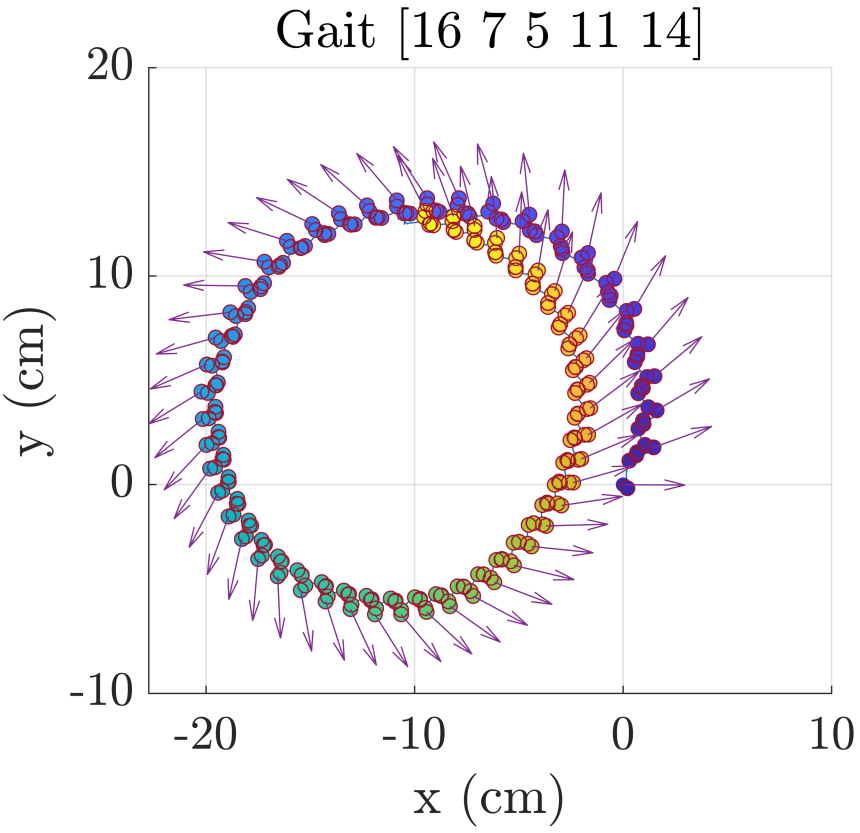
Experiment 24 : 60 cycles of Gait B with no sheath tether (left , not following), trial 1



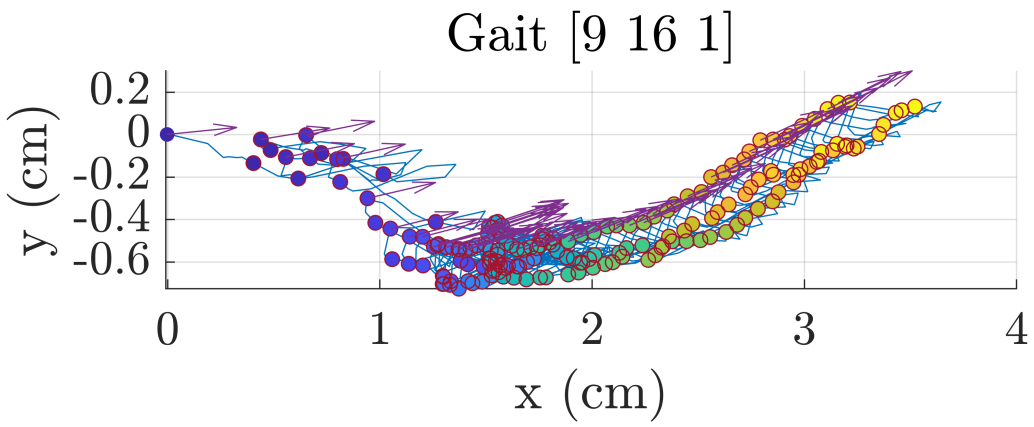
Experiment 25 : 60 cycles of Gait B with no sheath tether (left , not following), trial 2



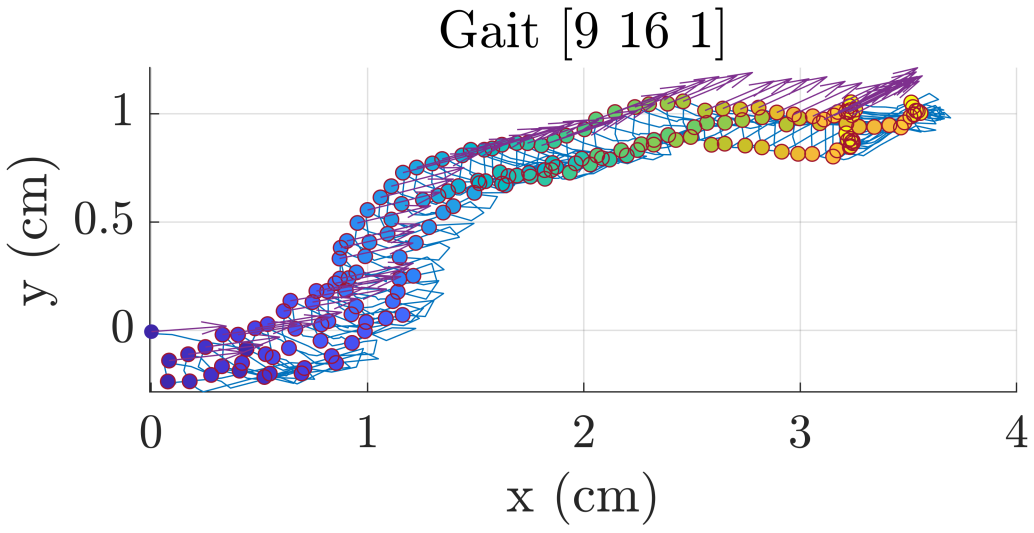
Experiment 26 : 60 cycles of Gait B with light sheath tether (right , following), trial 1



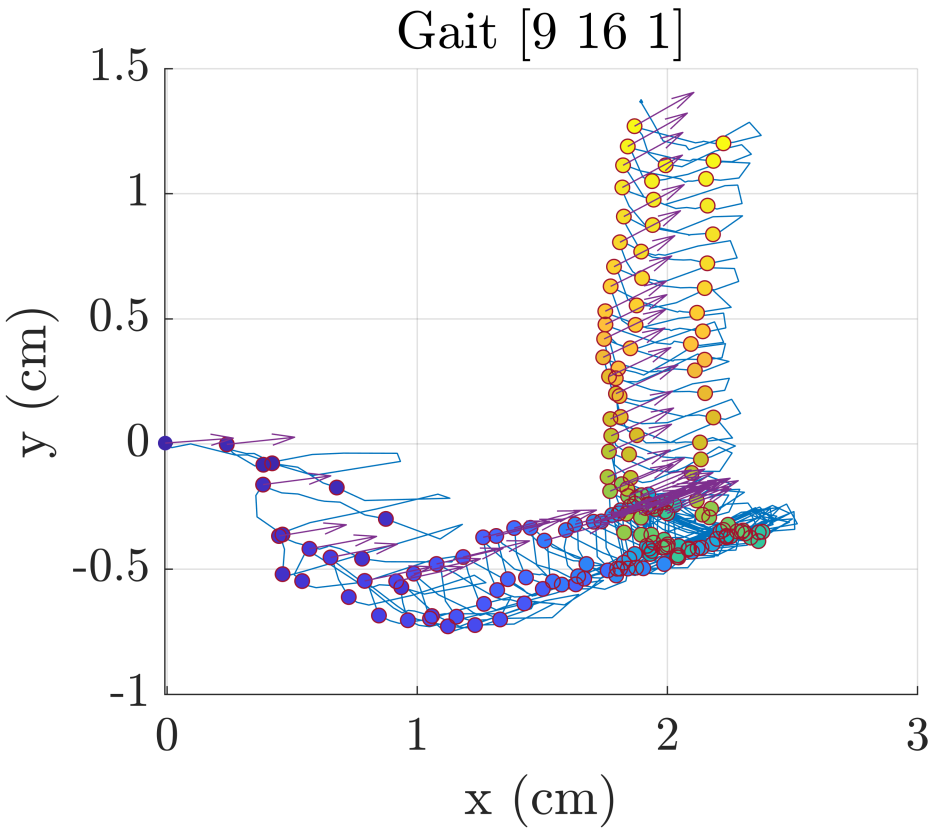
Experiment 27 : 60 cycles of Gait E with no sheath tether (right , not following), trial 1



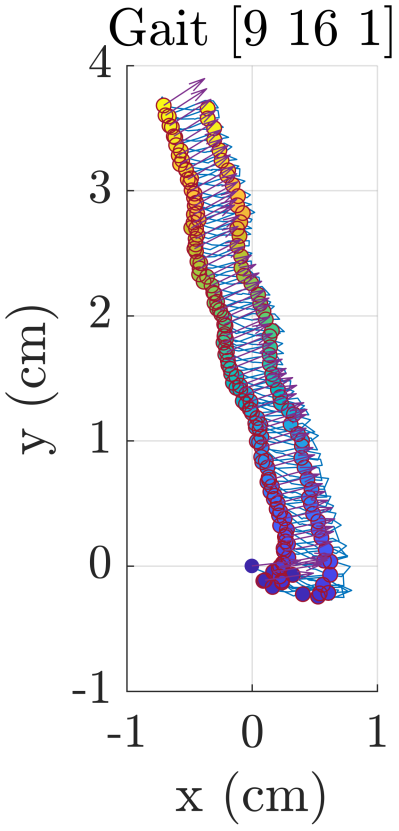
Experiment 28 : 60 cycles of Gait E with no sheath tether (right , not following), trial 2



Experiment 29 : 60 cycles of Gait E with no sheath tether (left , not following), trial 2

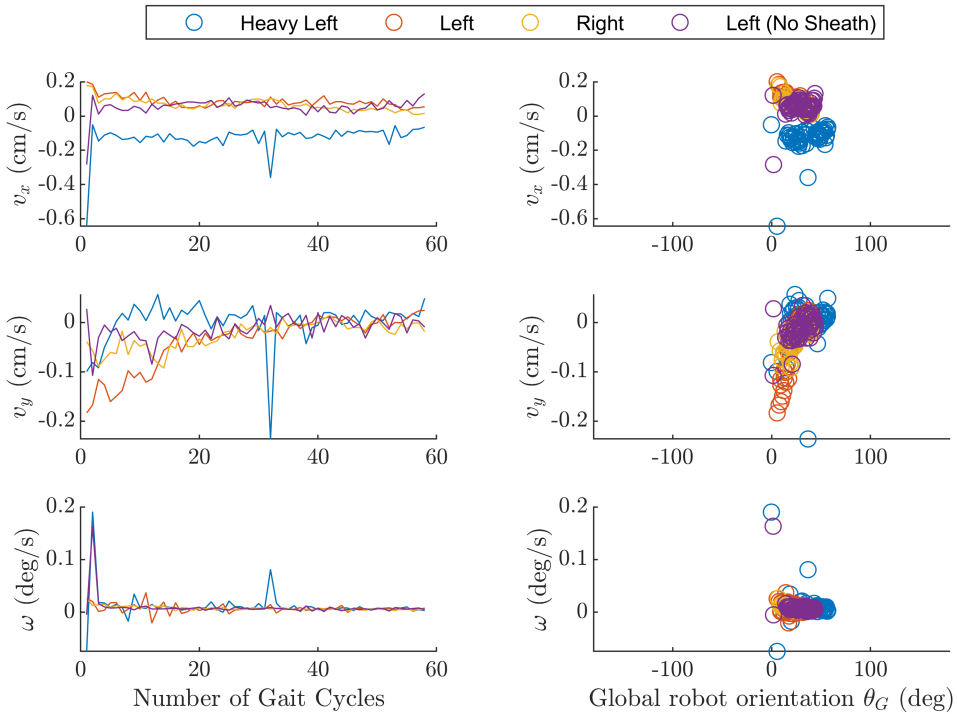


Experiment 30 : 60 cycles of Gait E with no sheath tether (left , not following), trial 3

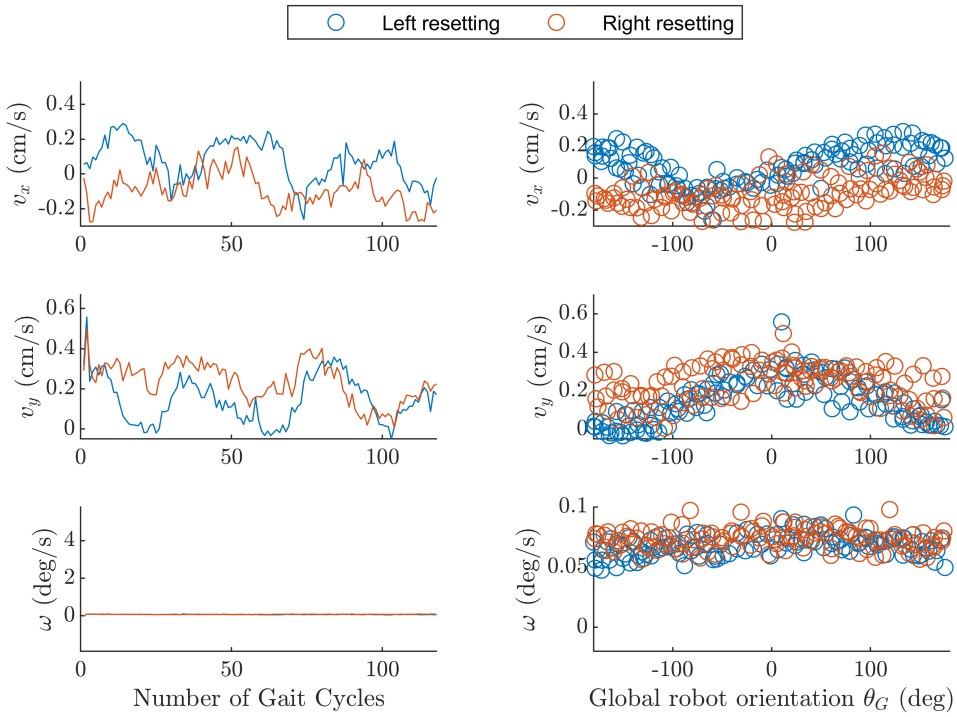


Plot the twist data for each experiment.

body velocity) for two experiments of Gait E



for two experiments of Gait B [16,7,5,11,14



omparison of averaged Gait B trials with no she