Electronic Supplementary Material (ESI) for Lab on a Chip.

Supplemental Information

Microfluidics Droplet Trapping, Splitting and Merging with Feedback Controls and State Space Modelling

David Wong and Carolyn Ren*

Department of Mechanical and Mechatronics Engineering, University of Waterloo, 200 University Ave W., Waterloo, ON, N2L 3G1,Canada

Fax: (519) 888-4567; Tel: (519) 888-4567 x33030;

E-mail: c3ren@uwaterloo.ca

Table 1 – Screen shot of state space full matrix

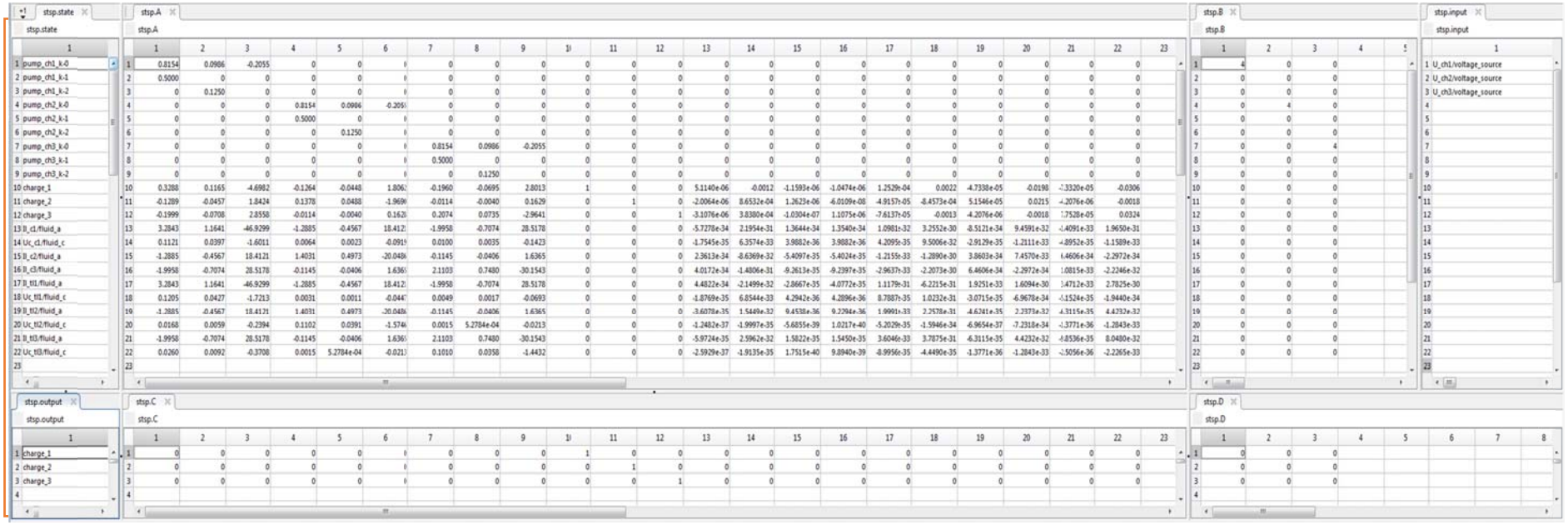
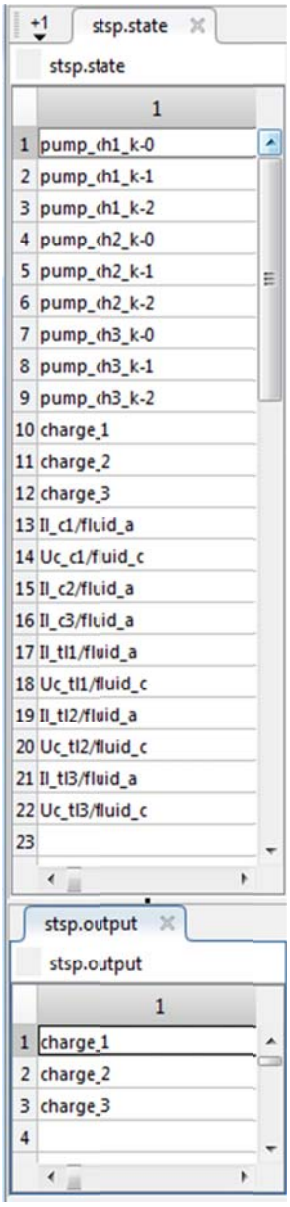
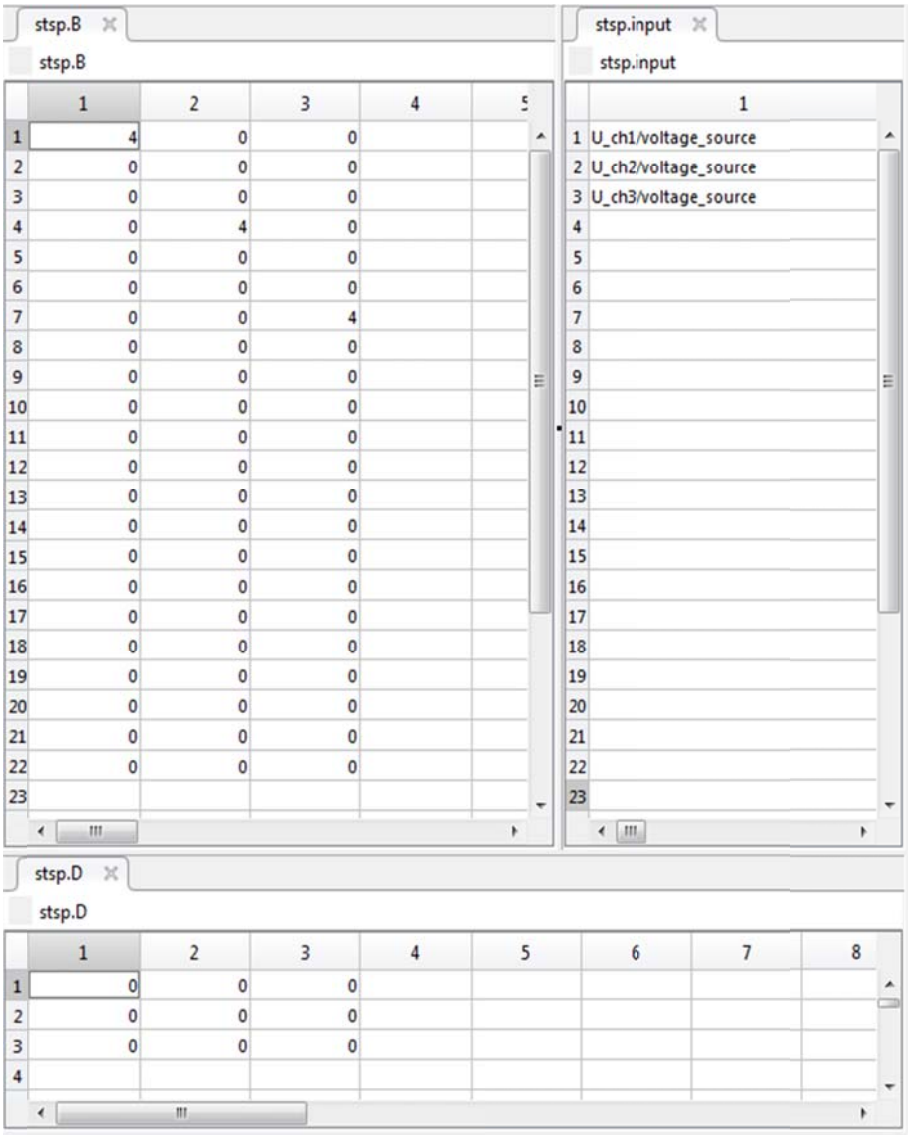


Table 2 – Enlarged images for each section

Section I



Section III



Section II

stsp.A

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	08154	0.0986	-0.2055	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
2	05000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
3	0	0.1250	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
4	0	0	0	0.8154	0.0986	-0.2055	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
5	0	0	0	0.5000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6	0	0	0	0	0.1250	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7	0	0	0	0	0	0	0.8154	0.0986	-0.2055	0	0	0	0	0	0	0	0	0	0	0	0	0	
8	0	0	0	0	0	0	0.5000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
9	0	0	0	0	0	0	0	0.1250	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
10	03288	0.1165	-4.6982	-0.1264	-0.0448	1.8062	-0.1960	-0.0695	2.8013	1	0	0	5.1140e-06	-0.0012	-1.1593e-06	-1.0474e-06	1.2529e-04	0.0022	-4.7338e-05	-0.0198	-7.3320e-05	-0.0306	
11	-01289	-0.0457	1.8424	0.1378	0.0488	-1.9690	-0.0114	-0.0040	0.1629	0	1	0	-2.0064e-06	8.6532e-04	1.2623e-06	-6.0109e-08	-4.9157e-05	-8.4573e-04	5.1546e-05	0.0215	-4.2076e-06	-0.0018	
12	-01999	-0.0708	2.8558	-0.0114	-0.0040	0.1628	0.2074	0.0735	-2.9641	0	0	1	-3.1076e-06	3.8380e-04	-1.0304e-07	1.1075e-06	-7.6137e-05	-0.0013	-4.2076e-06	-0.0018	7.7528e-05	0.0324	
13	3.2843	1.1641	-46.9299	-1.2885	-0.4567	18.4121	-1.9958	-0.7074	28.5178	0	0	0	-5.7278e-34	2.1954e-31	1.3644e-34	1.3540e-34	1.0981e-32	3.2552e-30	-8.5121e-34	9.4591e-32	-1.4091e-33	1.9650e-31	
14	01121	0.0397	-1.6011	0.0064	0.0023	-0.0919	0.0100	0.0035	-0.1423	0	0	0	-1.7545e-35	6.3574e-33	3.9882e-36	3.9882e-36	4.2095e-35	9.5006e-32	-2.9129e-35	-1.2111e-33	-4.8952e-35	-1.1589e-33	
15	-1.2885	-0.4567	18.4121	1.4031	0.4973	-20.0486	-0.1145	-0.0406	1.6365	0	0	0	2.3613e-34	-8.6369e-32	-5.4097e-35	-5.4024e-35	-1.2155e-33	-1.2890e-30	3.8603e-34	7.4570e-33	6.4606e-34	-2.2972e-34	
16	-19958	-0.7074	28.5178	-0.1145	-0.0406	1.6365	2.1103	0.7480	-30.1543	0	0	0	4.0172e-34	-1.4806e-31	-9.2613e-35	-9.2397e-35	-2.9637e-33	-2.2073e-30	6.4606e-34	-2.2972e-34	1.0815e-33	-2.2246e-32	
17	3.2843	1.1641	-46.9299	-1.2885	-0.4567	18.4121	-1.9958	-0.7074	28.5178	0	0	0	4.4822e-34	-2.1499e-32	-2.8667e-35	-4.0772e-35	1.1179e-31	-6.2215e-31	1.9251e-33	1.6094e-30	3.4712e-33	2.7825e-30	
18	01205	0.0427	-1.7213	0.0031	0.0011	-0.0447	0.0049	0.0017	-0.0693	0	0	0	-1.8769e-35	6.8544e-33	4.2942e-36	4.2896e-36	8.7887e-35	1.0232e-31	-3.0715e-35	-6.9678e-34	-5.1524e-35	-1.9440e-34	
19	-1.2885	-0.4567	18.4121	1.4031	0.4973	-20.0486	-0.1145	-0.0406	1.6365	0	0	0	-3.6078e-35	1.5449e-32	9.4538e-36	9.2294e-36	1.9991e-33	2.2578e-31	-4.6241e-35	2.2373e-32	-6.3115e-35	4.4232e-32	
20	00168	0.0059	-0.2394	0.1102	0.0391	-1.5746	0.0015	5.2784e-04	-0.0213	0	0	0	-1.2482e-37	-1.9997e-35	-5.6855e-39	1.0217e-40	-5.2029e-35	-1.5946e-34	-6.9654e-37	-7.2318e-34	-1.3771e-36	-1.2843e-33	
21	-19958	-0.7074	28.5178	-0.1145	-0.0406	1.6365	2.1103	0.7480	-30.1543	0	0	0	-5.9724e-35	2.5962e-32	1.5822e-35	1.5450e-35	3.6046e-33	3.7875e-31	-6.3115e-35	4.4232e-32	-9.8536e-35	8.0480e-32	
22	00260	0.0092	-0.3708	0.0015	5.2784e-04	-0.0213	0.1010	0.0358	-1.4432	0	0	0	-2.5929e-37	-1.9135e-35	1.7515e-40	9.8940e-39	-8.9956e-35	-4.4490e-35	-1.3771e-36	-1.2843e-33	-2.5056e-36	-2.2265e-33	
23																							

stsp.C

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	
2	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	
3	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	
4																							