Contemporary Data Processing Technology (CCOD)
Lab 5 (October 7, 2016)
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Controll two metro cars using Speed(X), Distance(Y), and Brake(Z). In this work we assume a virtual loop with 1000 conventional units on which two metro cars. The speed of train is denoted as X. Speed ranges from 0 to 20 conventional units per unit of time. The distance between both train is denoted as Y. We assume that the train should not crash. So we have to calculate break of train, we denoted it as Z.

At first, I created 25 rules (shown below) of all possible combination of {speed = very slow, slow, medium, fast, very fast} and {distance = very short, short, medium, long, very long}, and set break according to a situation. Then I get de-fuzzified break value for all combination of {speed = 0, 2.5, 5, 7.5, 10, 12.5, 15, 17.5, 20} and {distance = 0, 100, 200, 300, 400, 500, 600, 700, 800, 1000 }. I wrote a program, that get de-fuzzified value from chrisp value of speed and distance. The result is represented in a table below.

1. IF X=very slow   AND Y=very short   THEN   Z= weak
2. IF X= very slow   AND Y= short   THEN   Z= weak
3. IF X= very slow   AND Y= medium   THEN   Z= weak
4. IF X= very slow   AND Y= long   THEN   Z= very weak
5. IF X= very slow   AND Y= very long   THEN   Z= very weak

6. IF X=slow   AND Y= very short THEN   Z= medium
7. IF X= slow   AND Y= short   THEN   Z= weak
8. IF X= slow   AND Y= medium   THEN   Z= very weak
9. IF X= slow   AND Y= long   THEN   Z= very weak
10. IF X= slow   AND Y= very long   THEN   Z= very weak

11. IF X= medium AND Y= very short   THEN   Z= strong
12. IF X= medium AND Y= short   THEN   Z= weak
13. IF X= medium AND Y= medium   THEN   Z= very weak
14. IF X= medium AND Y= long   THEN   Z= very weak
15. IF X= medium AND Y= very long   THEN   Z= very weak

16. IF X= fast   AND Y= very short THEN   Z= very strong
17. IF X= fast   AND Y= short   THEN   Z= weak
18. IF X= fast   AND Y= medium   THEN   Z= very weak
19. IF X= fast   AND Y= long   THEN   Z= very weak
20. IF X= fast   AND Y= very long   THEN   Z= very weak

21. IF X= very fast AND Y= very short THEN   Z= very strong
22. IF X= very fast AND Y= short   THEN   Z= medium
23. IF X= very fast AND Y= medium   THEN   Z= very weak
24. IF X= very fast AND Y= long   THEN   Z= very weak
25. IF X= very fast AND Y= very long   THEN   Z= very weak

Table of values

#	X(Speed)	Y(Distance)	Z(Break)
1	0	0	3
2	0	100	3
3	0	200	3
4	0	300	1,667
5	0	400	0,875
6	0	500	0,875
7	0	600	0,875
8	0	700	0,875
9	0	800	0,875
10	0	1000	0,875
11	2,5	0	3,108
12	2,5	100	3,108
13	2,5	200	3
14	2,5	300	1,667
15	2,5	400	0,875
16	2,5	500	0,875
17	2,5	600	0,875
18	2,5	700	0,875
19	2,5	800	0,875
20	2,5	1000	0,875
21	5	0	4,063
22	5	100	4,063
23	5	200	2,29
24	5	300	1,667
25	5	400	0,875
26	5	500	0,875
27	5	600	0,875
28	5	700	0,875
29	5	800	0,875
30	5	1000	0,875

#	X(Speed)	Y(Distance)	Z(Break)
31	7,5	0	6,299
32	7,5	100	6,299
33	7,5	200	6,299
34	7,5	300	1,667
35	7,5	400	0,875
36	7,5	500	0,875
37	7,5	600	0,875
38	7,5	700	0,875
39	7,5	800	0,875
40	7,5	1000	0,875
41	10	0	6
42	10	100	6
43	10	200	3
44	10	300	2,366
45	10	400	0,875
46	10	500	0,875
47	10	600	0,875
48	10	700	0,875
49	10	800	0,875
50	10	1000	0,875
51	12,5	0	8,119
52	12,5	100	8,119
53	12,5	200	1,667
54	12,5	300	1,667
55	12,5	400	0,875
56	12,5	500	0,875
57	12,5	600	0,875
58	12,5	700	0,875
59	12,5	800	0,875
60	12,5	1000	0,875

#	X(Speed)	Y(Distance)	Z(Break)
61	15	0	8,636
62	15	100	8,636
63	15	200	4,063
64	15	300	2,185
65	15	400	0,875
66	15	500	0,875
67	15	600	0,875
68	15	700	0,875
69	15	800	0,875
70	15	1000	0,875
71	17,5	0	8,636
72	17,5	100	8,636
73	17,5	200	3,108
74	17,5	300	1,8
75	17,5	400	0,875
76	17,5	500	0,875
77	17,5	600	0,875
78	17,5	700	0,875
79	17,5	800	0,875
80	17,5	1000	0,875
81	20	0	8,636
82	20	100	8,636
83	20	200	3
84	20	300	1,667
85	20	400	0,875
86	20	500	0,875
87	20	600	0,875
88	20	700	0,875
89	20	800	0,875
90	20	1000	0,875

Next step, again metro. I simulate metro with two metro car. They are moving with random speed. Step by step speed changes by +5 or -5 , then we calculate distance and have to take break(Z) from table(shown above), then we do this: speed = speed - break.

The results of simulation are shown below.

5 snapshots

Xa = 5.61
Ya = 510
Za = 0.88

Xb = 16.89
Yb = 490
Zb = 0.88

750

B

500

0

A

250

Xa = 7.76
Ya = 750
Za = 0.88

Xb = 4.11
Yb = 250
Zb = 2.29

750

B

500

0

A

250
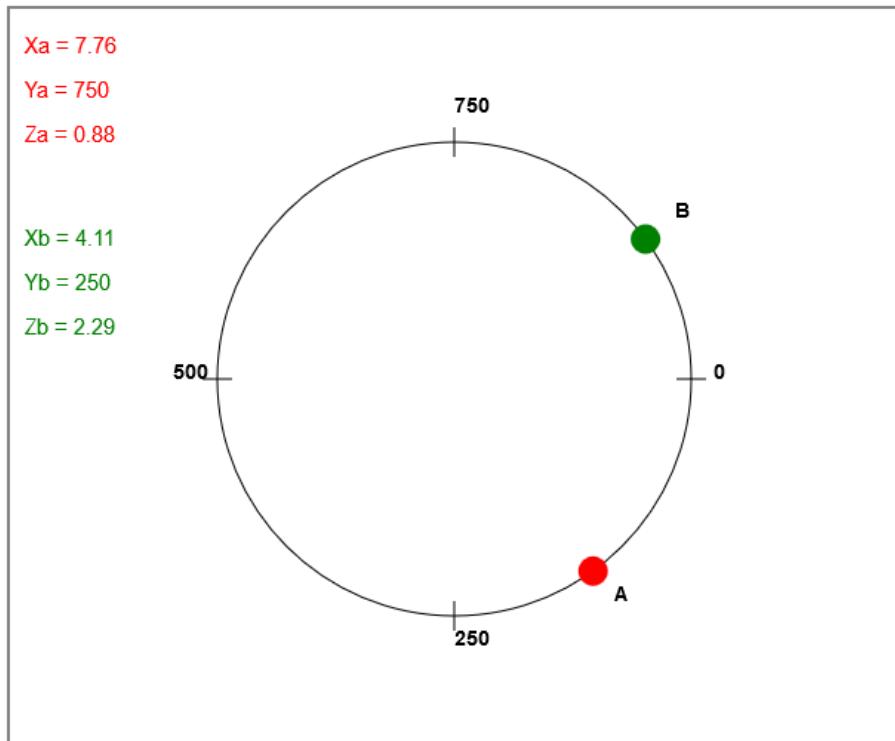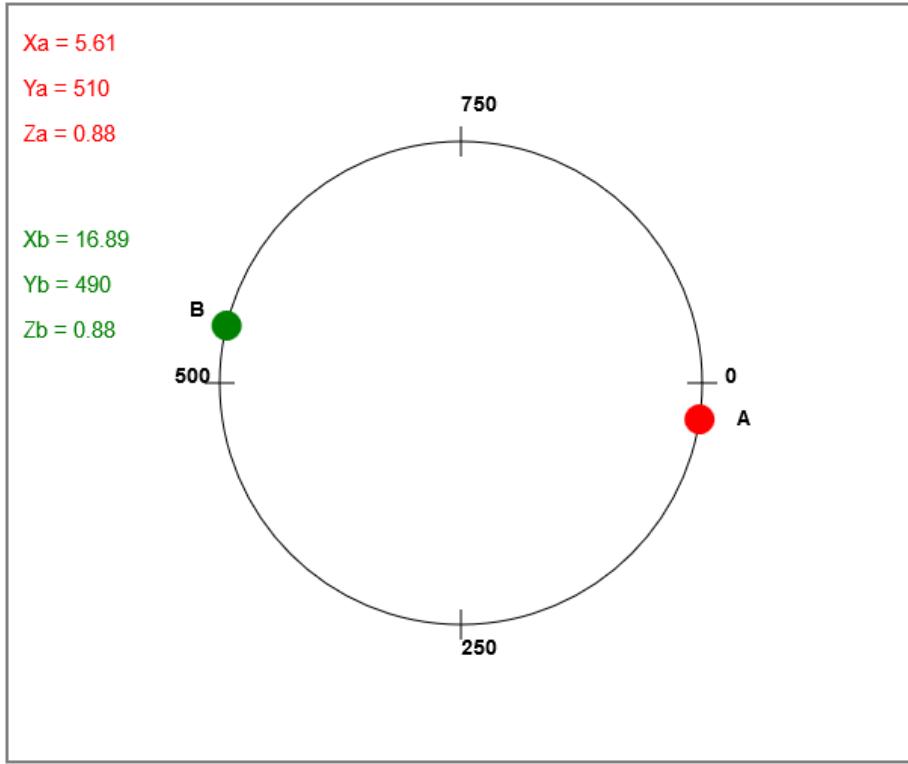
Xa = 11.55
Ya = 584
Za = 0.88

Xb = 15.72
Yb = 416
Zb = 0.88

B

750

500

0

A

250
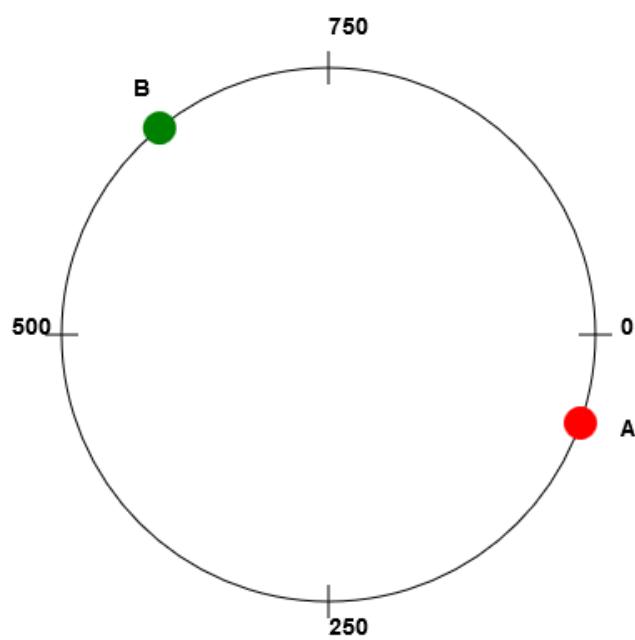
Xa = 5.66
Ya = 831
Za = 0.88

Xb = 6.90
Yb = 169
Zb = 6.29

B 750

A

500

0

250
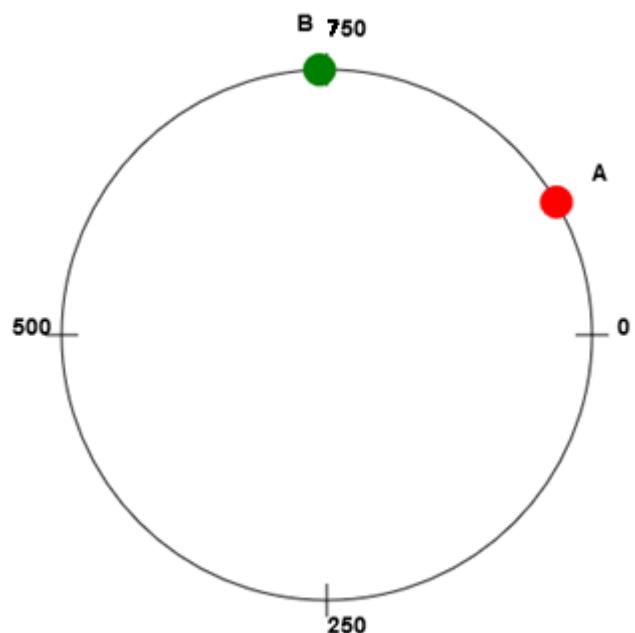
Xa = 9.55
Ya = 286
Za = 2.36

Xb = 19.13
Yb = 714
Zb = 0.87