Analysing Breakdowns in Performance in ZCS *

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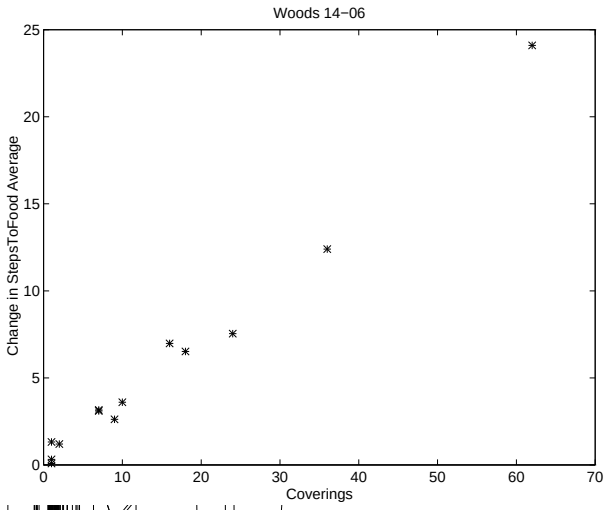
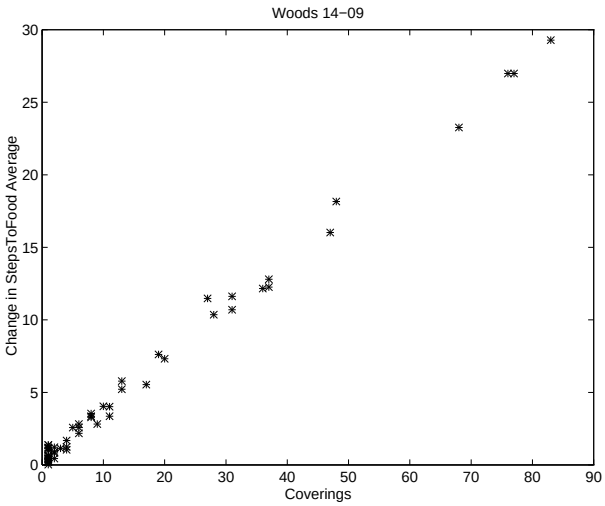
Abstract

Wilson's "zeroth-level" classifier system, suggested as a minimalist system that would allow a better understanding of the inner workings of classifier systems, has been shown to suffer performance breakdowns in simple Markovian environments due to its inability to support long chains of actions. Cliff and Ross [1] suggested some possible explanations as to why this may

wild cards, and


Woods 14−06
Change in StepsToFood Average
Coverings
0
5
10
15
20
25
0
10
20
30
40
50
60
70


Woods 14−09
Change in StepsToFood Average
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0
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30
0
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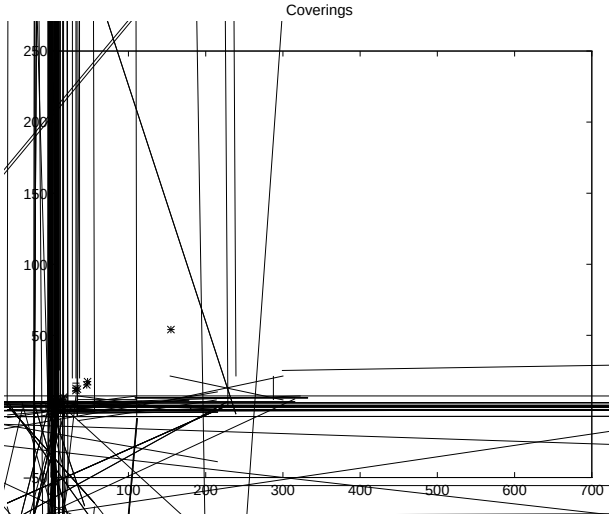
20
30
40
50
60
70
80
90


100
200
300
400
500
600
700

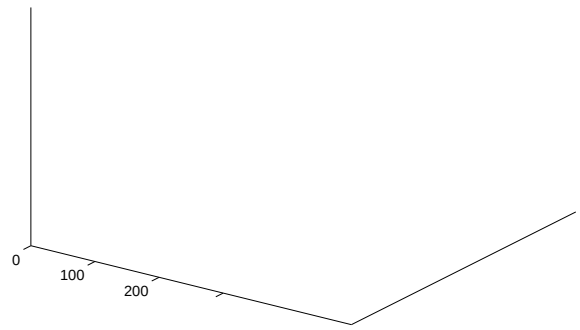
rule clearly dominates the set. The action set will therefore only include it and the strength of all the rules in the matching set will decrease until, seven steps later, by chance the appropriate action is selected. Although, in this case, the system is able to continue, the match set for the cell is still inappropriate and will cause some disruption next time the animat lands on it.

```
>Environment: (1,9) ->[1010101010100010]<

MatchSet:
 35:< [10#01#1#1010##10]->[ N]  1.41 >
 87:< [##1###10##100010]->[NW]  2.32 >
119:< [10#0##1#1##00###]->[ E] 16.99 >
181:< [10###0#01#1000#0]->[ W]  1.19 >
214:<
```

```
>Environment: (3,7) ->[1000001000101010]<

MatchSet:
158:< [100#0##0#0#0#010]->[ N]  (3,7)
```


0
100
200

takes to find the food on average are not very far from the limit we are setting and thus, it seems, we find again a trade off between the amount of disruption that we allow covering to cause and the speed of convergence in the learning process.

It seems that the strategy of limiting the amount of covering to a 2% of the population is too simplistic. We are allowing covering to randomly select some classifiers and delete

Limit	Traditional ZCS		Combined		t-test
	Mean	Std.Dev.	Mean	Std.Dev.	
10	60.79	62.38	77.46	133.64	-2.65
11	60.79	62.38	77.46	133.64	-2.65
12	60.79	62.38	77.46	133.64	-2.65
13	60.79	62.38	77.46	133.64	-2.65
14	43.37	53.49	45.89	83.20	-0.58
15	44.26	49.39	33.42	68.04	2.95
16	47.52	39.81	43.24	74.09	1.19
17	40.73	38.62	37.85	62.23	0.82
18	41.22	37.69	40.13	55.05	0.29
19	39.60	34.23	37.10	54.45	0.73
20	38.96	31.18	34.19	42.05	1.50
21	38.44	29.29	40.01	42.25	-0.46
22	34.63	29.04	32.39	38.22	0.69
23	35.54	28.77	27.40	35.64	2.58
24	34.36	29.39	30.10	30.42	1.20
25	36.34	29.64	27.75	29.71	2.35

This are the results of the T-student .960 [illegible] results