

This Hypercard stack was prepared by: Dennis L. Bricker, Dept. of Industrial Engineering, University of Iowa, Iowa City, Iowa 52242

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Problem Description

(Exercise 41, page 785, of Principles of O.R., by Harvey Wagner):

At the start of each day, an expensive piece of machinery is examined in order to determine whether it is in good working order, in need of minor maintenance, or requiring a major repair.

If the machinery is not in good working order, the company can utilize either of two maintenance-&-repair services:

- the We-Fix-It Service Company (charging \$14 &
- \$21 for minor & major repairs, respectively)
 the We-Try-To-Fix-It Service Company (charging
 \$12 & \$19 for minor & major repairs, respectively. The We-Fix-It company does better quality work, reflected in the probabilities that at the beginning of the next day, the equipment is in good working order.

We seek a policy which minimizes expected cost per day.

States

i	name
123	Good condition Minor faults Major faults

Actions

k	name
123	Do nothing Fix-it Try-to-fix-it

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Cost Matrix

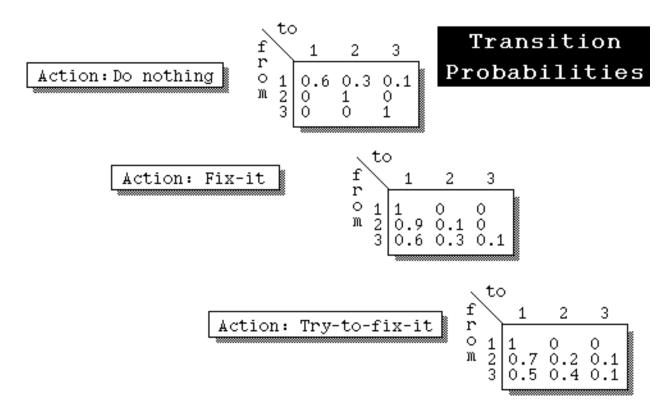
k	name	1	2	3
1	Do nothing	0	999	999
2	Fix-it	999	14	21
3	Try-to-fix-it	999	12	19

(Rows ~ actions, Columns ~ states)

A value of 999 above signals an infeasible action in a state.

States

i	name
123	Good condition Minor faults Major faults



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LP Tableau

Machinery Maintenance

k:	1	2	3	2	3	R H
i:	1	2	2	3	3	អ ន
Min	0	14	12	21	19	
	0.4 -0.3	-0.9 0.9	-0.7 0.8	-0.6 -0.3	-0.5 -0.4	0
	1	1	1	1	1	1

i~state, k~action

Machinery Maintenance

Iteration 0

Policy: (Cost= 5.37273)

Stat	:e		Action	P{i}
1 Good co 2 Minor f 3 Major f		3	Do nothing Try-to-fix-it Fix-it	0.627273 0.272727 0.1

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Iteration 0

k:	1	2	3	2	3	
i:	1	2	2	3	3	rhs
Min	0 1 0	-1.19091 -0.190909 1.09091 0.1	0	0	-0.909091 0.0909091 -0.0909091 1	-5.37273 0.627273 0.272727 0.1

i~state, k~action

Iteration 1

Policy: (Cost= 5.075)

State	Action	P{i}
1 Good condition	1 Do nothing	0.675
2 Minor faults	2 Fix-it	0.25
3 Major faults	2 Fix-it	0.075

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Iteration 1

k:	1	2	3	2	3	
i:	1	2	2	3	3	rhs
Min	0 1 0 0	0 0 1 0	1.09167 0.175 0.916667 -0.0916667	0	-1.00833 0.075 -0.0833333 1.00833	-5.075 0.675 0.25 0.075

i~state, k~action

Iteration 2

Policy: (Cost= 5)

	State	State Action		
1	Good condition	1 Do nothing	0.669421	
2	Minor faults	2 Fix-it	0.256198	
3	Major faults	3 Try-to-fix-it	0.0743802	

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Iteration 2

k:	1 2	3	2	3	
i:	1 2	2	3	3	rhs
Min	0 0 1 0 0 1 0 0	1 0.181818 0.909091 -0.0909091	1 -0.0743802 0.0826446 0.991736	0 0 0 1	-5 0.669421 0.256198 0.0743802

i~state, k~action

Optimal Policy

	State	Action
1	Good condition	1 Do nothing
2	Minor faults	2 Fix-it
3	Major faults	3 Try-to-fix-it

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