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Modularity and Robustness in Organizations

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Introduction

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- Organization as **information processing system** is a central question in economic, organizational and computational theory.

“ We can think of a decision as produced by executing a large computer program, each subroutine having its special tasks and relying on local sources of information. No single person or group need to be expert on all aspects of the decion ”

Herbert A. Simon, 1969.



Model Requirements

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- Possibility to explore the coevolution's process of different organizational forms.

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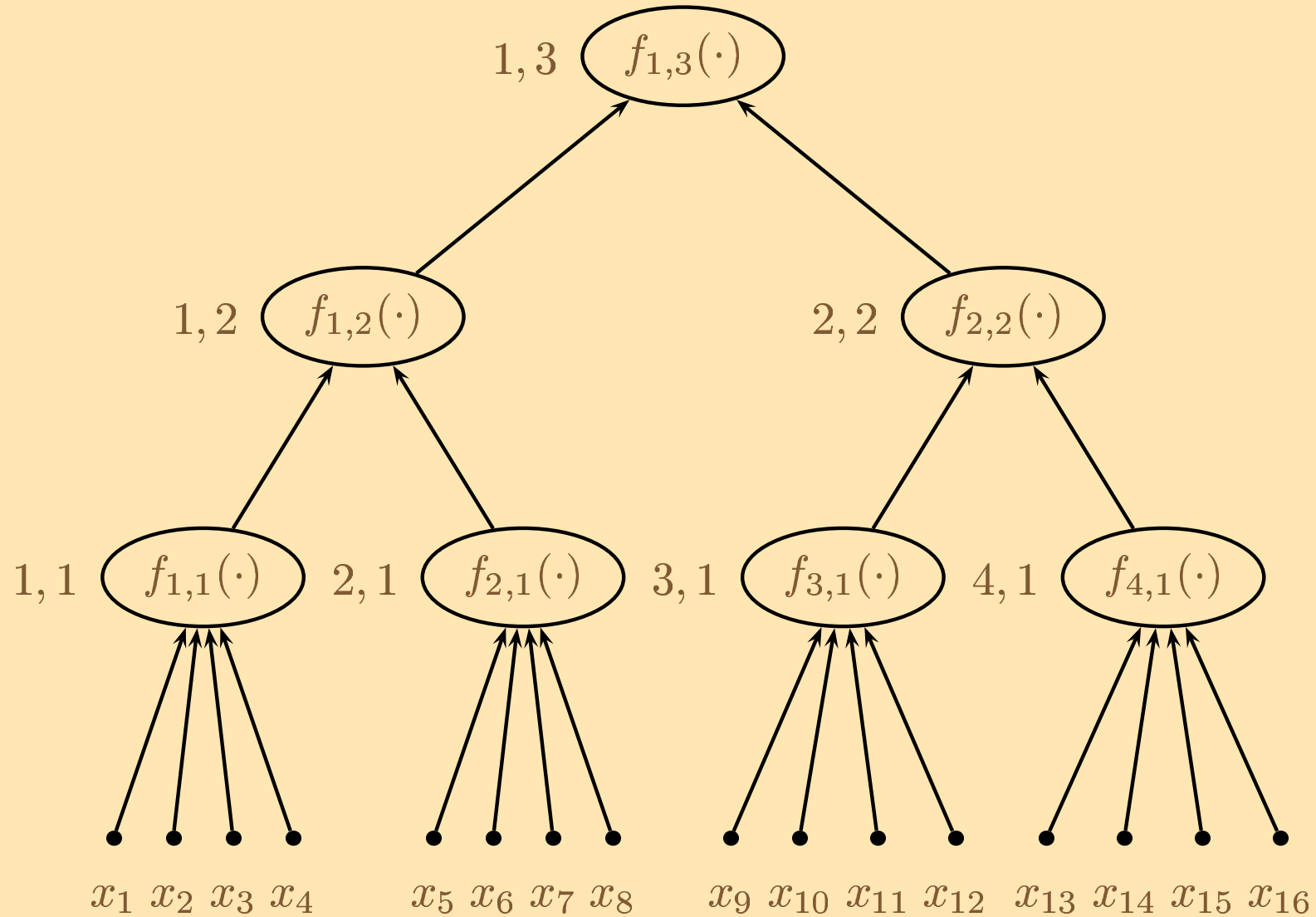
$$f : S^n \longrightarrow S^m \text{ with } n > m$$

→ An organization is then a recursive composition of functions:

$$f_o : S^I \longrightarrow S^o \text{ i.e.}$$

$$f_o(i) = f_{1,l}(f_{1,l-1}(f_{1,l-2}(\cdot), \dots, f_{n_{1,l-1},l-2}(\cdot)), \dots, f_{n_{1,l},l-1}(\cdot))$$

where l is the number of layers, $n_{p,q}$ the number of arguments of the node of index p in the layer q, \dots



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- The action part of the rule belong to the set $\{0, 1\}^m$ with $m < n$.

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- Exploitation using mutation operator

before	010##11
after	010#111

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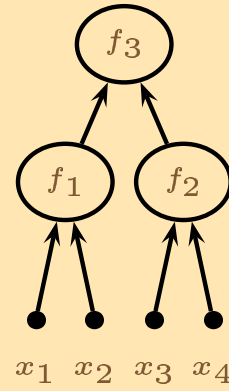
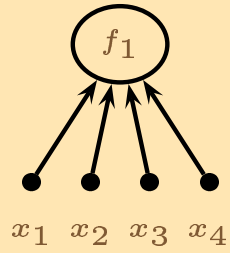
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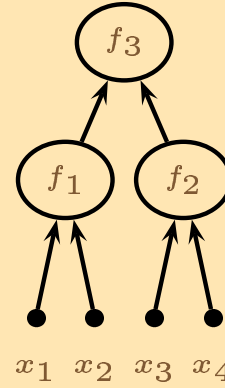
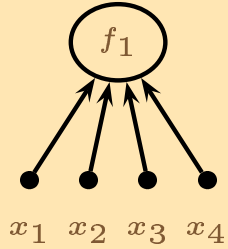
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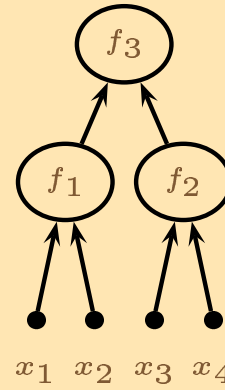
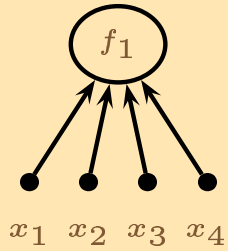
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- Using the *NK* model one can control and measure the level of decomposability of the problem facing the organization.





x_1	x_2	x_3	x_4	y
0	0	0	0	0
		⋮		
0	1	0	0	0
0	1	0	1	1
		⋮		
1	0	0	1	0
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1	0	1	1	0	0
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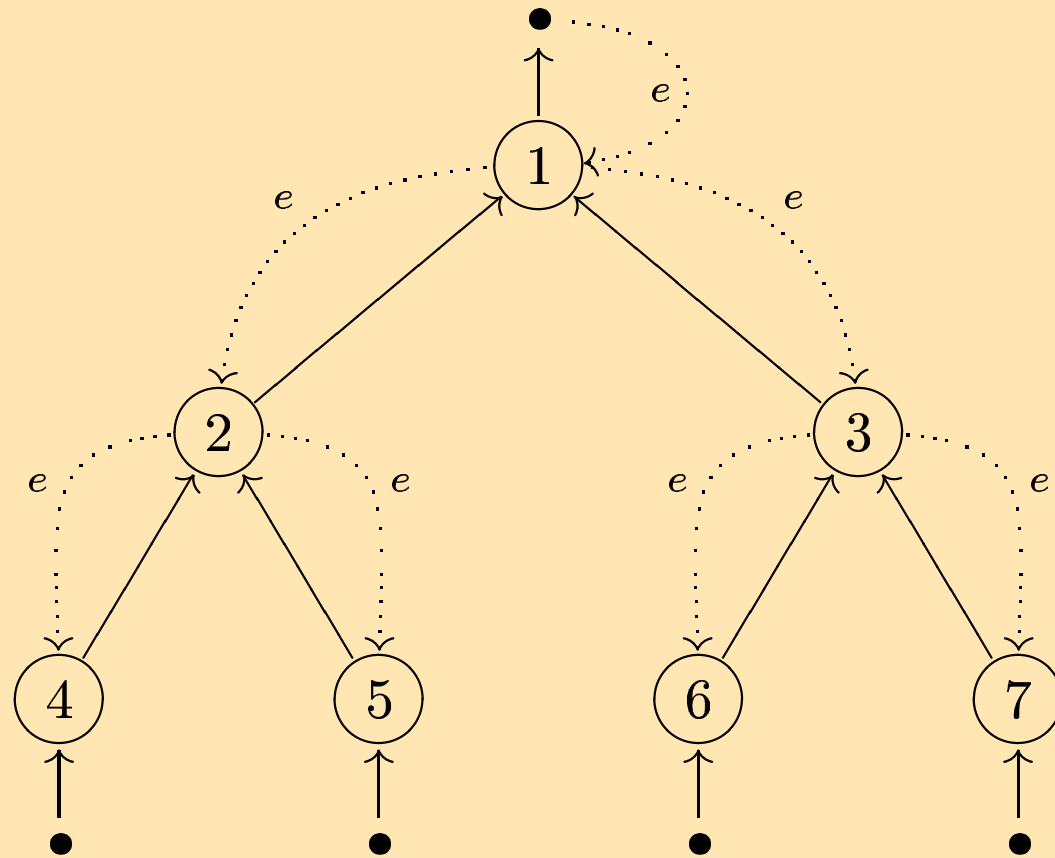
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- Node use the premium as learning stimulus.
- Two flows of information: bottom-up information processing, top-down premium feedback.



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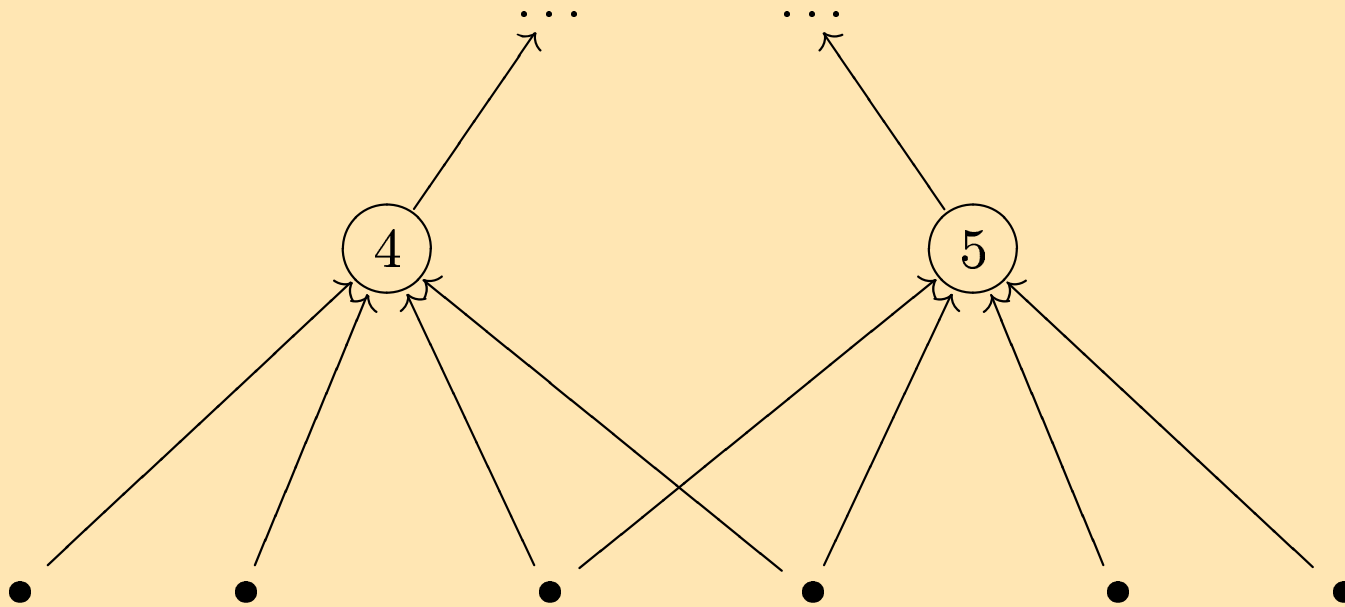
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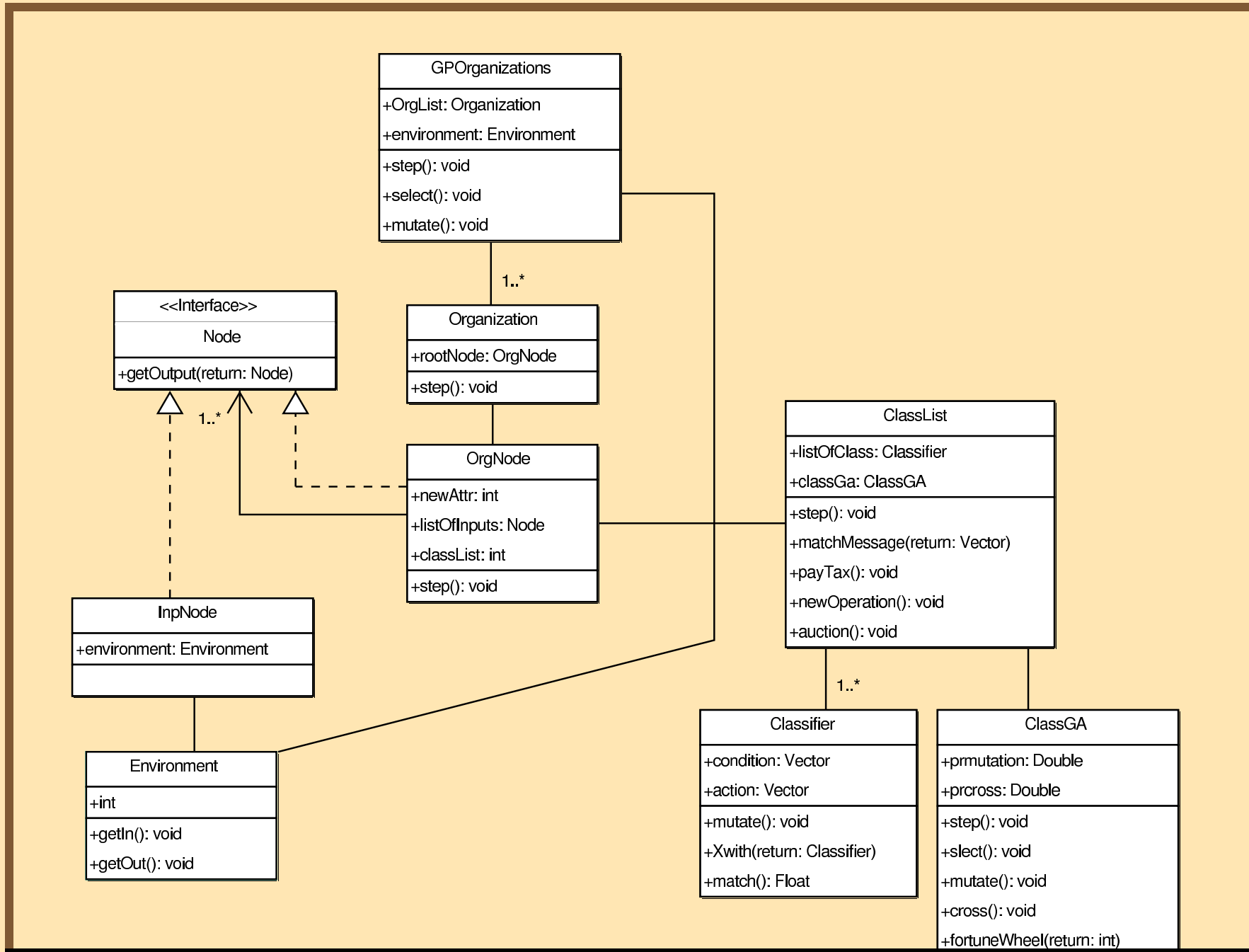
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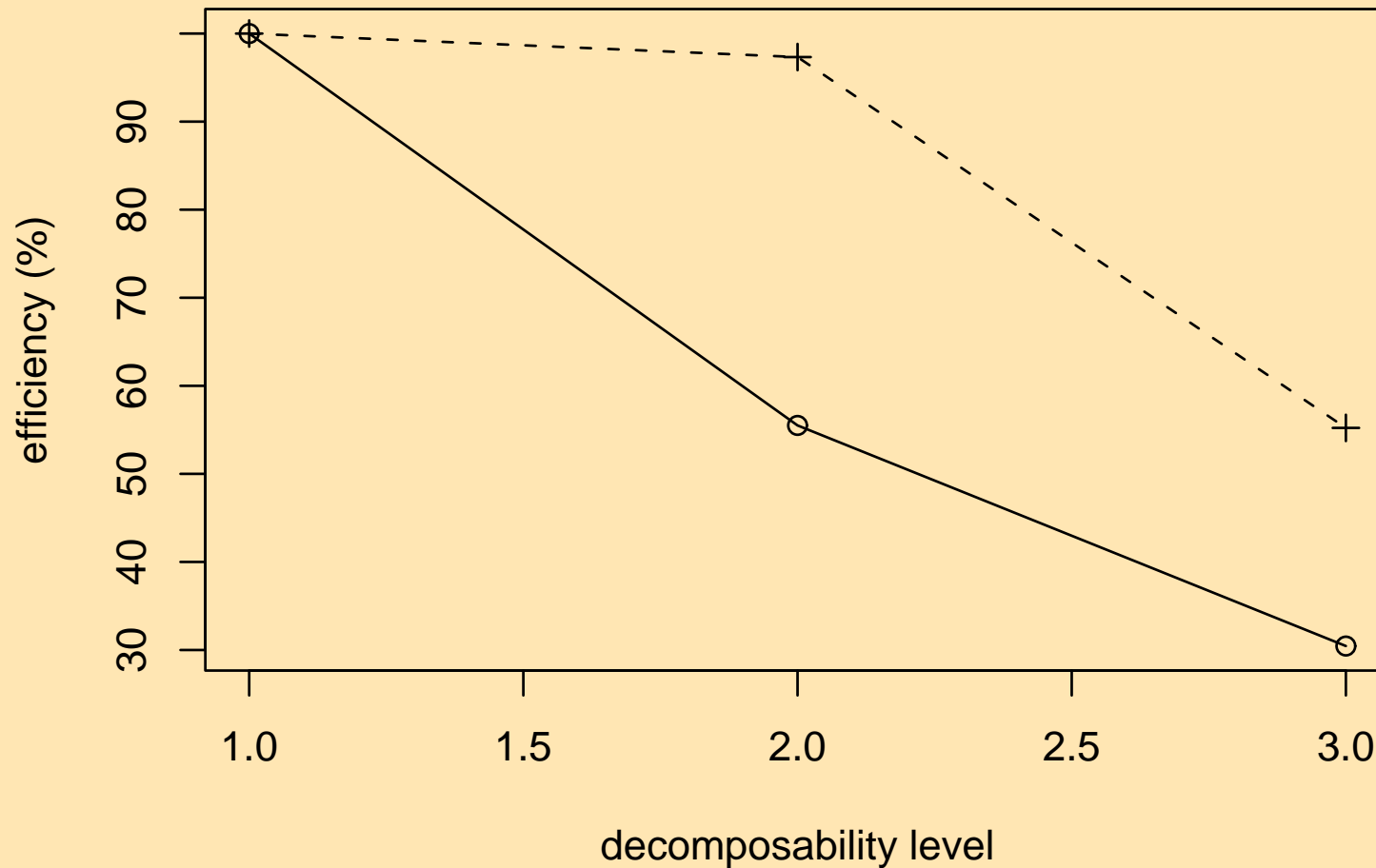
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 - the structural properties of the environment are changing i.e. the degree of interdependency of the fitness function (K) i.e. the level of decomposability of the problem



Preliminary results

Org. eff. Vs problem decomposability



To do

- analyze temporal dynamic (environmental change)
- analyze in detail the organization adaptation properties
- explore organizations with heterogeneous nodes
- explore population dynamic