

## The Evolutionary Computation Approach for the Supply Chain Integration of the Customized Product Configuration through Internet

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### Abstract:

In this paper, a supply chain decision has been made by using an optimal customized production configuration approach through Internet. Based on the demand of customers, the optimal customized production configuration with the related suppliers for each component can be decided by the proposed intelligent agent. In other words, the supply chain of a mass-customized product can be integrated optimally and automatically so as to response the customers' needs quickly. The algorithm of the intelligent agent in this work is mainly using a penalty guided evolutionary computation. The proposed system has been built and tested on the Internet. Based on our limited experience, it suggests that the intelligent agent provides customers the customized configurations that are of a quality.

### 1. Introduction

To thrive in the e-commerce world, companies need to structurally transform their internal foundations to be effective [Kalakota and Robinson, 2000]. While the e-commerce is built successfully of a company, an e-supply chain needs to be built as well for gaining more competitive ability. In this paper, an intelligent agent is proposed for integrating a supply chain that makes the most suitable customized product configuration and the corresponding suppliers can be decided at the same time through Internet so as to minimize the cost of the customized product automatically.

### 2. System Framework

According to customer's demands, both the components of the customized product configuration and the suppliers corresponding to each of the selected components are to be decided simultaneously so as to find the most desirable customized products through Internet. The configuration of personal computer (PC) is illustrated as an example of the customized product in this paper. The architecture of the proposed system has been illustrated in Figure 1. The problem belongs to the NP complete problem that makes the difficulty for solving it by using the mathematical programming approaches. The definition of the optimal customized configuration is to find the price of assembled PC that is most nearest to customer's budget while the other two constraints including delivery time and compatibility between any two components are not violated. In the problem, there are different component models to be selected and any identical component may be obtained from different suppliers with different cost and lead-time. Obviously, the difficulties encountered for solving the problem are the number of the component choices with the corresponding suppliers and the difficulty of satisfying constraints.

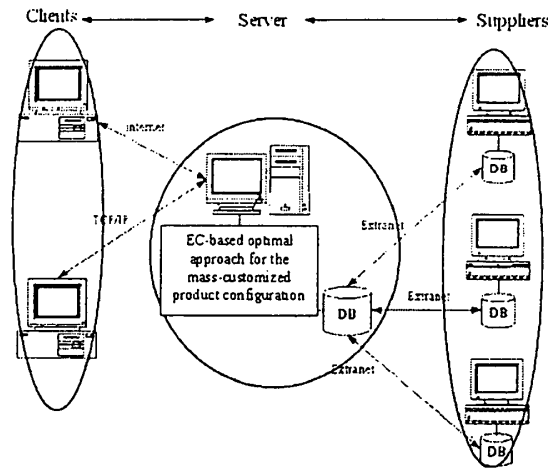


Figure 1, System architecture

A penalty-guided evolutionary computation (EC) approach [Bhandarkar and Zhang, 1999] [Chen and You, 2000] is presented for solving such customized computer configuration problem through Internet. While any of the constraints is violated, the penalty will be brought to the objective so that the infeasible solution space can be avoided and the optimal or near optimal solution can be obtained ultimately. The solution representation of a PC configuration is show as in Figure 2. When an order of the suggested computer configuration is accepted by customers through Internet, the corresponding suppliers of the selected components are decided at the same time. It gives the quick response to customers since the component-suppliers of each optimal customized product can be decided right away. On the other hand, the supply chain from the customers to suppliers is integrated optimally. Based on our limited experience, it suggests that the EC provides customers the product configurations which are of a quality. The proposed system has been built and tested on the Internet.

Component	1	2	3	4	5	6	...	...	11	12	13
No.	CPU	Hard Drive	Main Board	CD	Sound Card	VGA Card	.....	.....	Key Board	Mouse	Speaker
1	C001	H001	M007	D009	S002	V003	.....	.....	K007	U009	P012
2	C004	H006	M003	D007	S006	V005	.....	.....	K008	U004	P007
3	...	...	...	...	...	...	...	...	...	...	...

Figure 2. The solution representation of a PC configuration.

### 3. Acknowledgement

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### 4. References

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