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Enterprise-level business component identification in business architecture integration

Key words: Business architecture integration; Business component; Component identification; CRUD matrix; Heuristic

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Motivation

- Identifying enterprise-level business components is an important issue in the component-based business architecture integration of military information systems.
- Currently used methodologies for business component identification tend to focus on software-level business components, and ignore such enterprise concerns in business architectures as organizations and resources.
- Moreover, approaches to enterprise-level business component identification have proven laborious.

Main idea

- Recognizing the relationships between activities and organizations within business architecture can be expressed by a Create, Read, Update, and Delete (CRUD) matrix, we try to identify business components from business architecture based on the CRUD matrix and its metrics by considering overall cohesion, coupling, granularity, maintainability, and reusability.

Method

1. Define and formulate enterprise-level business components based on the Component Business Model.
2. To quantify the indices of business components, we formulate a Create, Read, Update and Delete (CRUD) matrix and use six metrics as criteria.
3. Formulate business component identification as a multi-objective optimization problem and solve it by a novel meta-heuristic optimization algorithm called the Simulated Annealing Hybrid Genetic Algorithm (SHGA).
4. Carry out various experiments based on the proposed framework.

Major results

- The applicability of our method is tested by using it to identify business components of the Maritime Search and Rescue (SAR) case, we find the identified business components are reasonably good.

Table 3 CRUD matrix of SAR*

	Person in distress (o1)	Monitoring org (o2)	Tactical C2 org (o3)	SAR asset controller (o4)	Searcher (o5)	Boat driver (o6)	Swimmer (o7)	Helicopter pilot (o8)
Send distress signal (a1)	C							
Receive distress signal (a2)		R			R			
Send warning order (a3)		C	R		U			
Process warning order (a4)			C	R				
Send task (a5)				C	R		R	
Find victim (a6)					C	U		
Monitor health (a7)					U		R	
Provide medical assistance (a8)							C	R
Recover victim (a9)							U	R
Transit to SAR operation (a10)			R					C

* C: create; R: read; U: update

Table 6 Identified business components of maritime SAR

Business component	Activities	Organizations
C1	a1, a4, a5	o1, o3, o4
C2	a2, a3, a6, a7	o2, o5, o6
C3	a8, a9, a10	o7, o8

Major results (Cont'd)

- To verify the efficiency of the SHGA in our method, we compared our method with Simulated Annealing (SA) and Genetic Algorithm (GA), we find SHGA is more suitable and efficient for solving our problem.

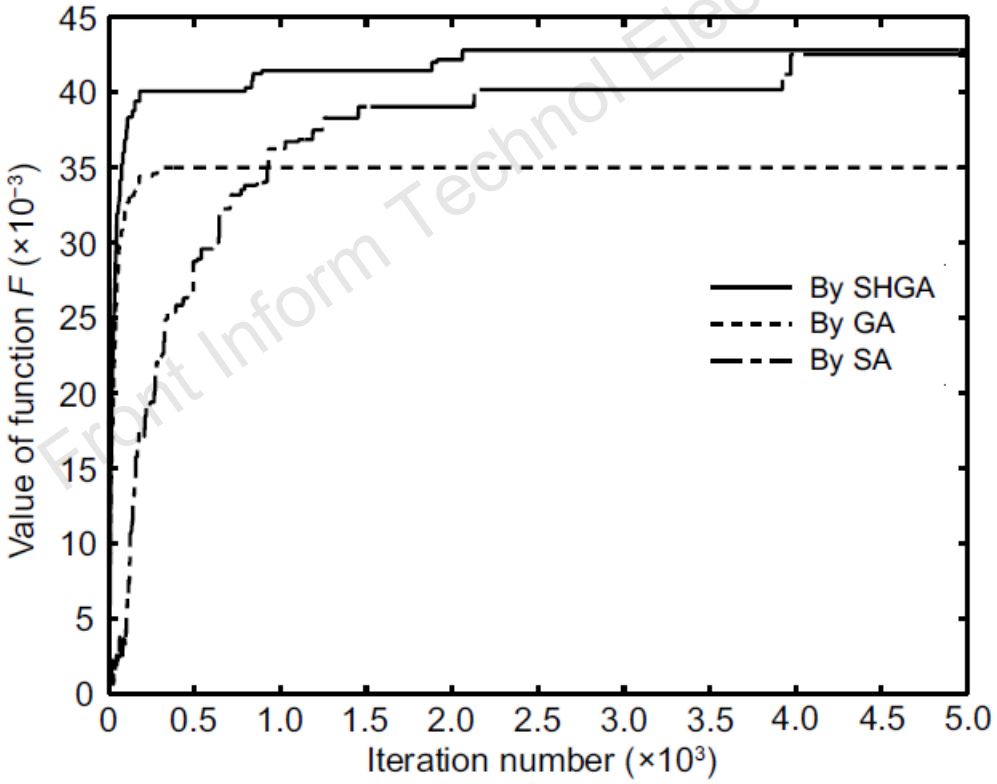

Fig. 13 Comparative results of SA, GA, and SHGA

Conclusions

- In our approach, we convert DoDAF models from business architecture to a CRUD matrix, and use six technical metrics as criteria during the identification process.
- We convert the business component identification problem into a multi-objective optimization problem and solve it using a meta-heuristic algorithm called Simulated Annealing Hybrid Genetic Algorithm (SHGA).
- The applicability and efficiency of our approach was evaluated through an enterprise-level case study and several experiments. The results show that our approach is more practical and efficient for enterprise-level business component identification.