



Advanced Technology Laboratories

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Technology: Semantic Interoperability

When is a Truck Not a Truck?

Introduction

For many Americans, a request to “transport cargo by lorry” would result in an incredulous stare. In the UK, the term “lorry” means precisely the same thing as “truck” in the US.

It is just a matter of semantics, but this minor misunderstanding between English-speaking countries is just one example of the challenges for computer systems trying to compare and correlate data from different information sources that use different semantics.

Today

Information sources, like databases, may be described using ontologies. An ontology is simply a description for a set of concepts—objects, actions, ideas, etc. An ontology organizes concepts in a way that represents their real-world relationships in a manner that is understood by computers. Typically, an ontology is created by a community that shares a common interest—or domain—and needs to describe concepts so that all members of the community understand each concept.

The problem occurs when

different ontologies are created for the same domain by different communities due to regional, cultural, educational, or language differences.

Consider, for example the domain for trucks—motorized wheeled vehicles with a driver’s cab and a rear freight compartment.

Creating a world-wide truck database from existing sources would require transforming many different ontologies with different structures and languages.

Through continuing research, ATL is developing semantic interoperability tools that can examine different ontologies and match ontological descriptions of *concepts* (e.g., motorized, cab for the driver and a separate rear compartment for

Military Truck Database (World)		
Multi-Purpose Trucks		
Make	Model	Inventory
Am General	M813	
Am General	M9321a1	
Am General	HUMMWV	
Oshkosh	M-997 HEMTT	

(A)



Ontrapro

Военная База Данных Грузовиков Многоцелевые Грузовики		
Модель	Производитель	Запас
68	ГАЗ	
131	ЗИЛ	
135	ЗИЛ	
157	ЗИЛ	

(B)



Military Truck Database (World)		
Multi-Purpose Trucks		
Make	Model	Inventory
Am General	M813	
Am General	M9321a1	
Am General	HUMMWV	
Gaz	68	
Oshkosh	M-997 HEMTT	
URAL	375D	
ZIL	131	
ZIL	135	
ZIL	157	

(C)



Ontrapro Use Case: To assemble a database of worldwide multi-purpose military truck inventories, it is necessary to merge databases from many sources. (A) shows a portion of the entries from a U.S. database. Another database (B) using a different structure (ontology), can use Ontrapro to discover those concepts that the databases have in common. The result is a virtual system composed of interoperable databases (C).

transporting freight) rather than specific terms such as “truck.”

ATL’s ontology alignment tool, Ontrapro, quickly and automatically discovers semantic alignments between concepts in widely diverse heterogeneous information sources (each described by a unique ontology). It intelligently takes advantage of the many types of descriptive features useful in aligning different descriptions of common concepts including syntactical, lexical, phonetic, and structural similarities.

The goal of ATL’s research is to develop “semantic adapters” that act in much the same way as a human translator: listening to messages from a system with one ontology and transforming them correctly into messages understandable with another ontology.

ATL is a leader in semantic alignment research. In concert with its research, ATL has played an active role in the research community in an effort to accelerate mutual progress on this critical challenge. ATL is committed to overcoming the language barriers in a world of different ontologies, data models, and information sources.

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