

Automatic Report Processing

Dr. Ulrich Schade

FGAN-FKIE

Neuenahrer Straße 20
53343 Wachtberg-Werthhoven
GERMANY

Preliminary Remarks

With respect to forces, NCW demands

- clear and consistent **understanding of command intent**,
- **shared situational awareness**,
- **competence** at all levels of the force,
- **trust** (in subordinates, superiors, peers, information, and equipment)

cf. Alberts & Hayes (2003): *Power to the Edge*

Preliminary Remarks

The same holds for the IT-systems. NCW demands:

- **adaptability** to command intent,
- **interoperability** (to achieve shared awareness),
- **competence**,
- **reliability**.

To show:

IT-systems need **ontological** components to answer these demands.

Structure of the Talk

- Preliminary Remarks
- SOKRATES: A Report Processing System
- Examples
- Benefits

The SOKRATES-System for Report Processing

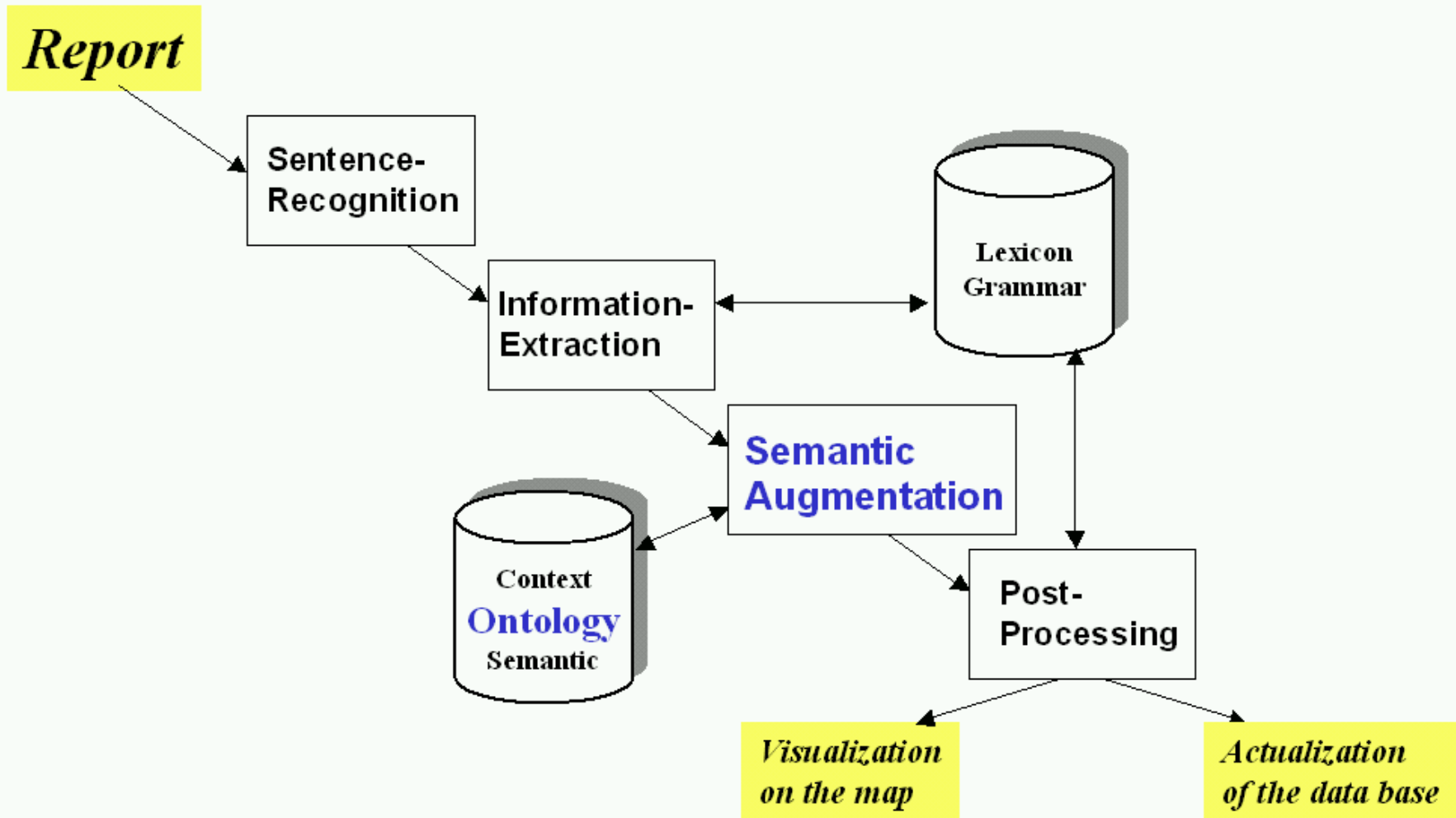
Input: reports written in natural language

- *Five hostile battle tanks approaching.*
- *Five Bradyland howitzers moving
from Nederveert to Helmond via Someren.*
- *Arrived at 31UFT785235 .*

Output:

- visualization of the report's content on a map
- insertion of the content into a C2IEDM data base

The SOKRATES-System for Report Processing



The SOKRATES-System for Report Processing

Information Extraction

transforms the report into a formal representation.

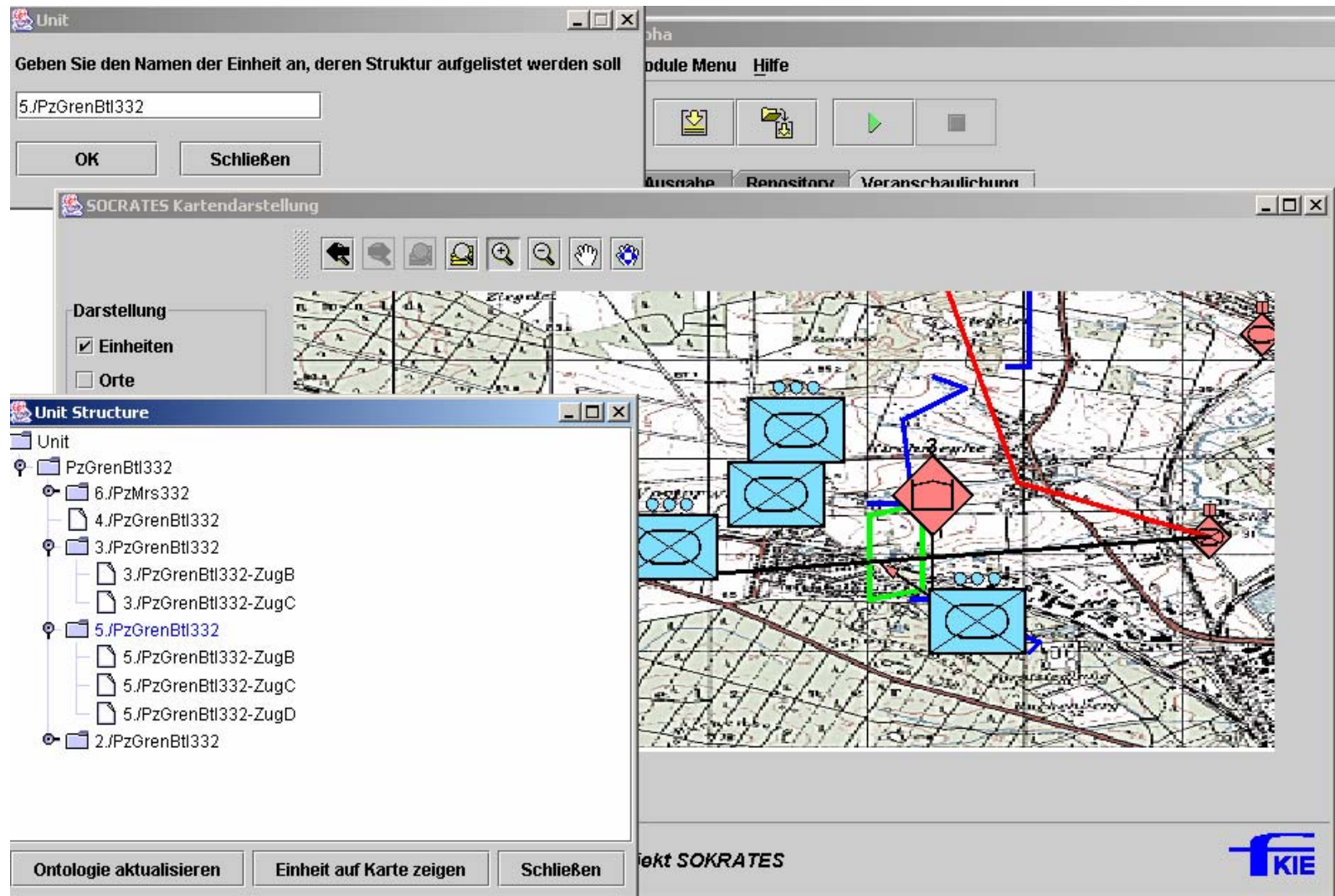
Semantic Augmentation

adds to the representation
by ontological exploitation of knowledge.

Post-Processing

visualizes the resulting content on a map and
stores the resulting content in a C2IEDM data base.

The SOKRATES-System for Report Processing



The SOKRATES-System for Report Processing

Information Extraction

transforms the **report** into a **formal representation**.

*051218ZSEP04
by 4./PzGrenBtl332-Zug C:
Standing at Nederveert*

```
...
rep_d:  type:  in_position
        agent: type: unit
        name: 4./PzGren...
        ...
        loc:  type: town
        name: Nederveert
```

The SOKRATES-System for Report Processing

type:	report		
sender:	type:	unit	
	name:	4./PzGrenBtl332-Zug C	
	size:	PLT	
reporting_datetime:	type:	datetime	
	year:	2004	
	month:	9	
	day:	5	
	hour:	12	
	minute:	18	
reporting_data:	type:	in_position	
	agent:	type:	unit
		name:	4./PzGrenBtl332-Zug C
		size:	PLT
	location:	type:	town
		name:	Nederveert
	qualifier:	exactly_at	

The SOKRATES-System for Report Processing

Semantic Augmentation

adds to the representation by ontological exploitation of knowledge to allow for post-processing.

*051218ZSEP04
by 4./PzGrenBtl332-Zug C:
Standing at Nederveert*

```
...
rep_d: | type:  in_position
       | agent:  type: unit
       |         name: 4./PzGren...
       |         ...
       |
       | loc:   type: town
       |         name: Nederveert
       |         latitude: 5.753
       |         longitude: 51.284
```

Ontology

Gruber (1993): “An ontology is an **explicit** specification of a **shared conceptualization**.”

explicit:

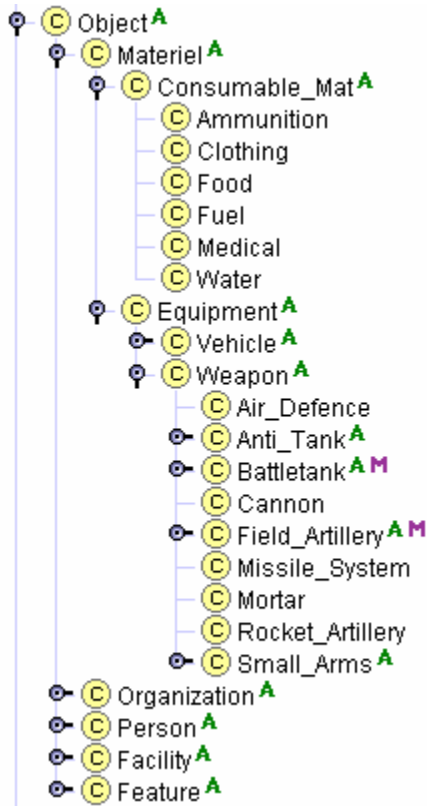
Everything the system has to know must be represented in the system.

shared conceptualization:

In particular, even the information human beings do **not** communicate (since it is self-evident for us) has to be represented.

Ontology

ontology = taxonomy + associated attribute-value pairs + rules



Example

Platoon B: 3 hostile T80 approaching.



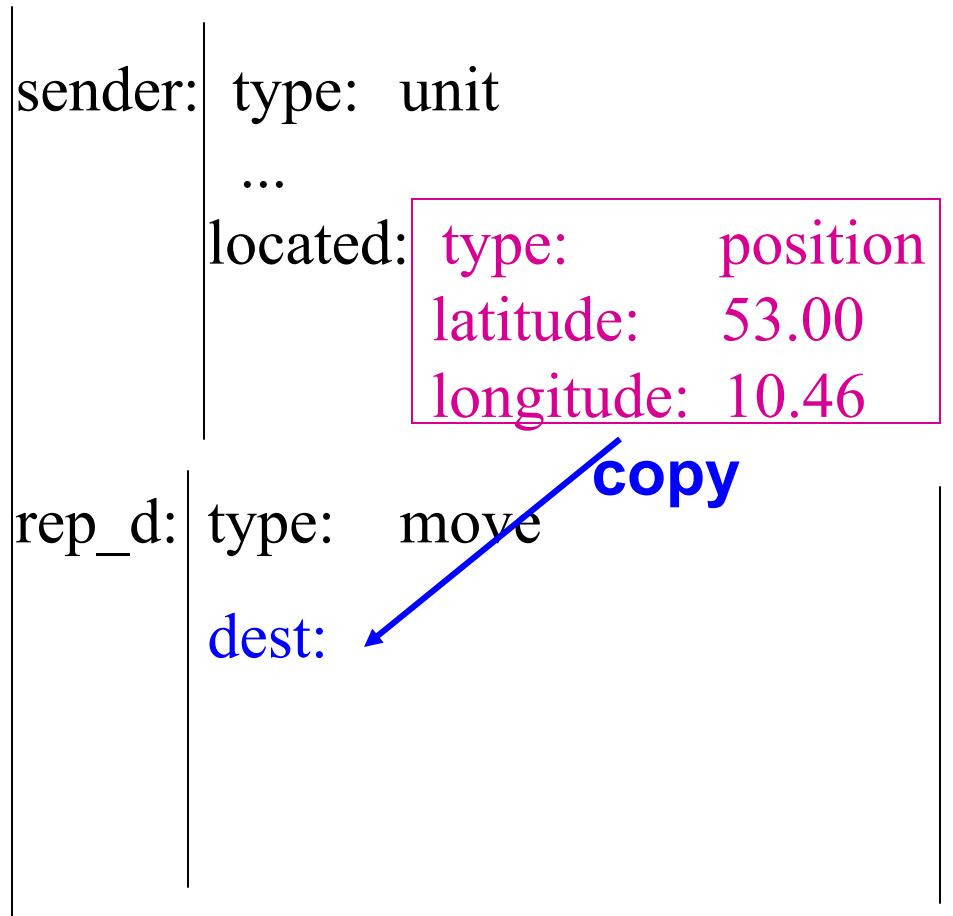
**Information
Extraction**
transforms
report
into **formal
representation.**

```
type: report
sender: ...
reporting_data:
  type: move
  theme: type: battletank
           name: T80
           count: 3
```

Example

Platoon B:
3 hostile T80
approaching.

Semantic Augmentation
adds to the representation
(here: adding of
the move's destination).



Example

ontological rule:

set_value(M,[rep_d,dest],L):-

get_value(M,[rep_d,type],move),
get_value(M,[rep_d,subcat],approach),
get_value(M,[rep_d,agent,hostility],hostile),
get_value(M,[sender,located],L).

matrix path value

sender:	type: unit
	...
	located: L
rep_d:	type: move
	dest:

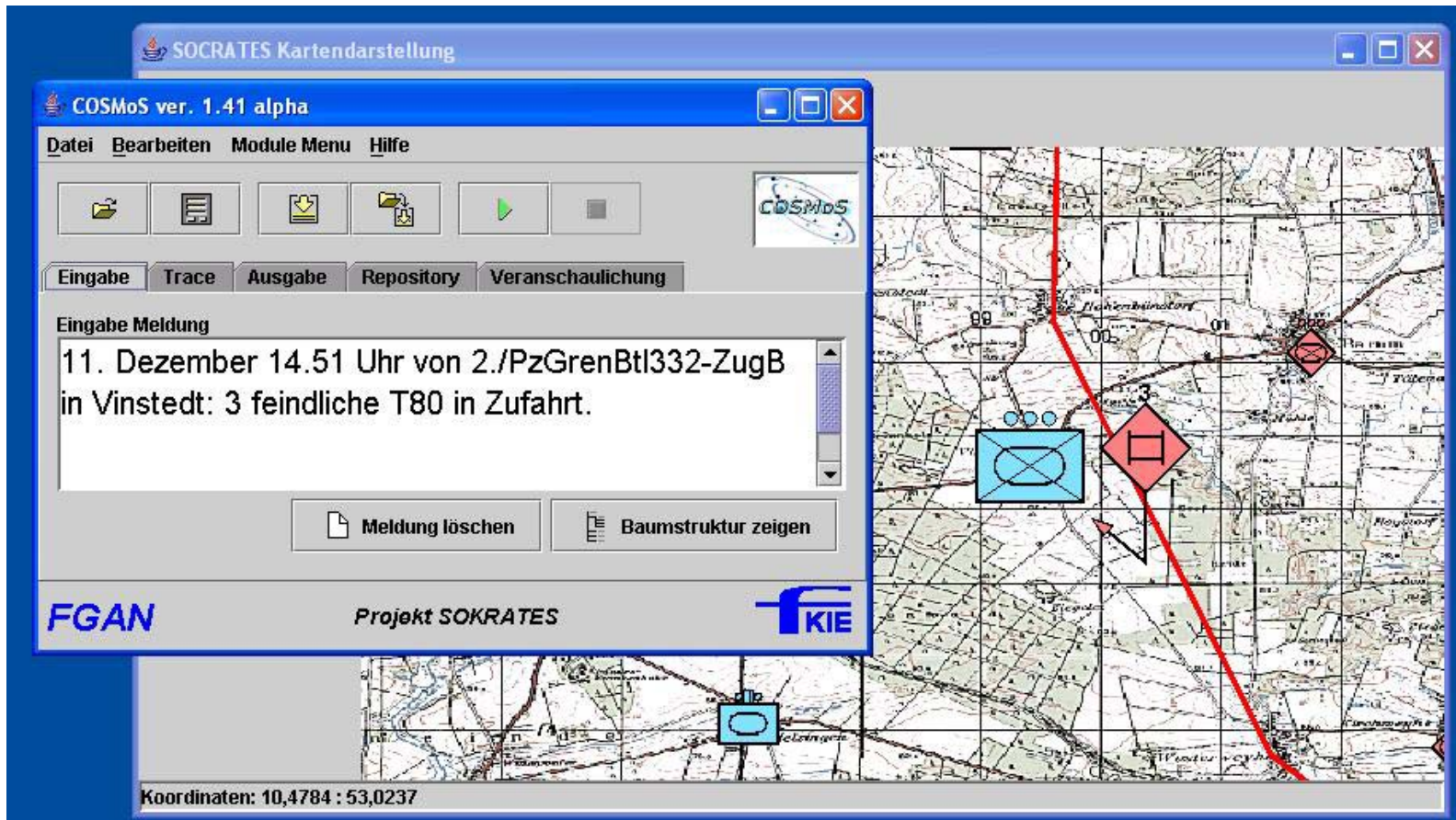
Example

Platoon B:
*3 hostile T80
approaching.*

Semantic Augmentation
adds to the representation
(here: adding of
the move's destination).

sender:	type: unit
	...
located:	type: position
	latitude: 53.00
	longitude: 10.46
rep_d:	type: move
	dest: type: position
	latitude: 53.00
	longitude: 10.46

Example



Platoon B: 3 hostile T80 approaching.

Additional Remark

Some ontological processes (semantic augmentations) are **facultative**, e.g., the processes which infer

- a unit's type
- its subtype
- its size
- its affiliation

from the type and the number of equipment reported.

These processes can be activated or shut down to **adjust** the system **to situational requirements** as well as to the needs and to the style of its operator.

Example

reporting_data:

type: move

agent:

type: unit

cat: combat

arm_cat: armour

mobility : Indtrc

size: plt

hostility: hostile

theme: type: battletank

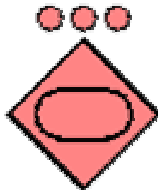
...

Platoon B:
*3 hostile T80
approaching.*

Semantic Augmentation
adds to the representation
(here unit determination).

Example

Platoon B:
3 hostile T80
approaching.



reporting_data:

type: move

agent: type: unit

cat: combat

arm_cat: armour

mobility : lndtrc

size: plt

hostility: hostile

theme: type: battletank

...

Example

The screenshot displays the SOKRATES Kartendarstellung software interface. The main window shows a topographic map with a red path and several icons. A COSMoS window is overlaid on the map, displaying a message in German: "11. Dezember 14.51 Uhr von 2./PzGrenBtl332-ZugB in Vinstedt: 3 feindliche T80 in Zufahrt." The COSMoS window has a menu bar with "Datei", "Bearbeiten", "Module Menu", and "Hilfe". Below the menu bar are icons for file operations and a "COSMoS" logo. The window also has tabs for "Eingabe", "Trace", "Ausgabe", "Repository", and "Veranschaulichung". At the bottom of the COSMoS window, there are buttons for "Meldung löschen" and "Baumstruktur zeigen". The main window title bar reads "SOKRATES Kartendarstellung". The bottom status bar shows coordinates: "Koordinaten: 10,5139 : 53,0007". Logos for "FGAN" and "KIE" are visible at the bottom of the interface.

Platoon B: 3 hostile T80 approaching.

Benefits

The system is **modular** by itself:

- It may run on a distributed environment, *e.g., the data base interaction module together with the data base.*
- Its modules can be substituted easily, *e.g., German IE-module \Leftrightarrow English IE-module.*

It can be used as a module in C2 information systems.

Benefits

The system can be **adjusted** as required

- to the needs and to the style of the operator
- to situational demands
(the more reports coming in the more automaticity)

Benefits

The system enhances **interoperability** towards the **semantic level** (Alberts & Hayes: “the cognitive level”)

- *by transforming natural language*
 - *into APP-6A conform map*
 - *into C2IEDM data base entries*
- *by analyzing the data with respect to their semantics*

This is only possible by using **ontological** means.

Benefits

Modularity and Adjustability

add to **AGILITY**, especially to **Resilience** and **Adaptation**;

INTEROPERABILITY stands for itself.