

How to Represent the Content of Free-form Battlefield Reports

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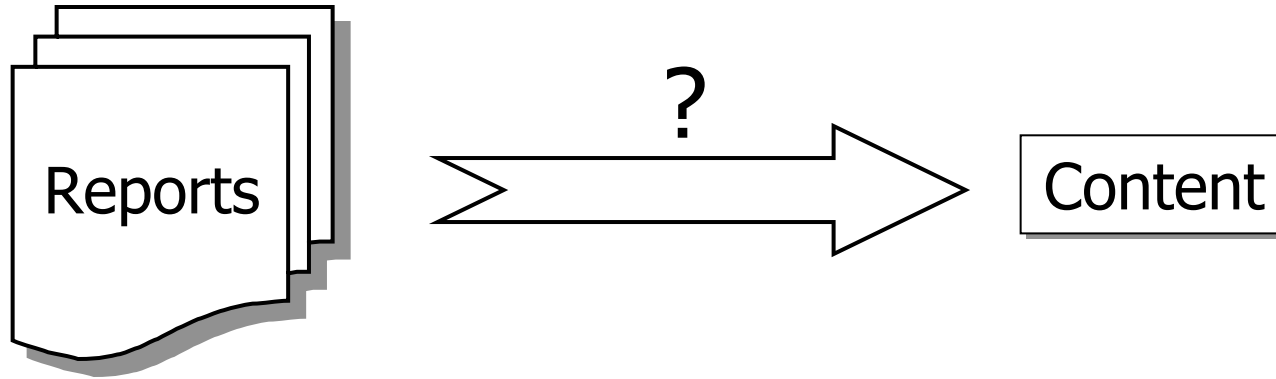
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- 1. Starting Situation
- 2. Information Extraction
- 3. Project Sokrates
- 4. Representation of Meaning
- 5. Conclusion

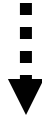


- There are a lot of **natural language texts** (military reports, emails, web pages, scientific reports, documents, ...) which can't be evaluated due to missing specialists.
 - Which technical possibilities exist of automating the **content extraction**?
- Practical approach: **Information Extraction (IE)**

- **Information extraction (IE)** is the task of identifying, collecting and normalizing information from natural language text.
- Relevant information about the **Who, What, When, etc.** is looked for.
- The information of interest is described through domain-specific lexicon rules and patterns called *templates*.
- During the IE task these templates are filled with the collected information.
- The templates are **domain and task specific**, i.e. for each new task and domain they must be newly created.

Partial analysis of a military free-form report from our Bosnia scenario :

when this report was given



who reports



"09. September 10.45 Uhr von VN - Militärbeobachtern in BIJELJINA: 2 BRDM 2 und 1 PT 76 durchfahren in rascher Fahrt auf Straße 14 – 1 die Ortschaft SULJIN HAN (CQ 5458) nach Westen."

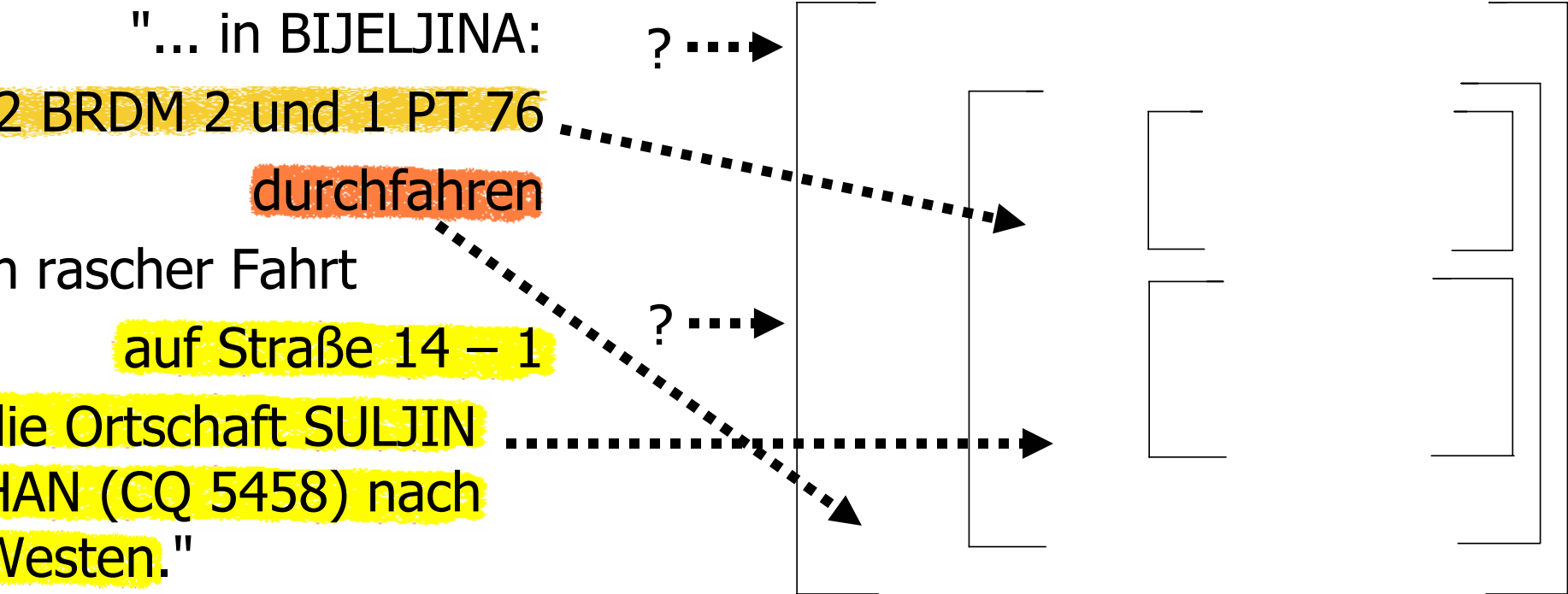
where

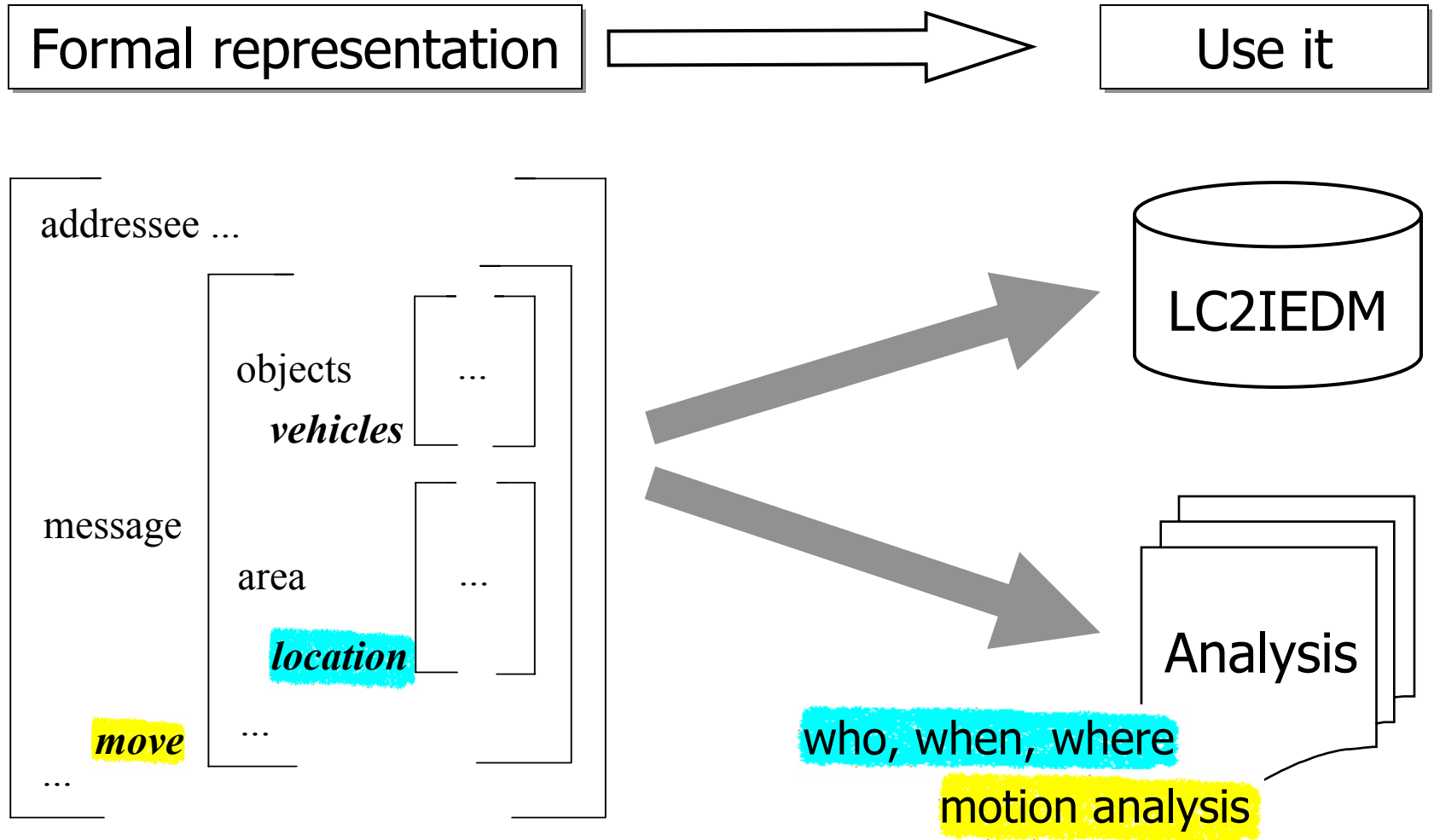
who

direction

what

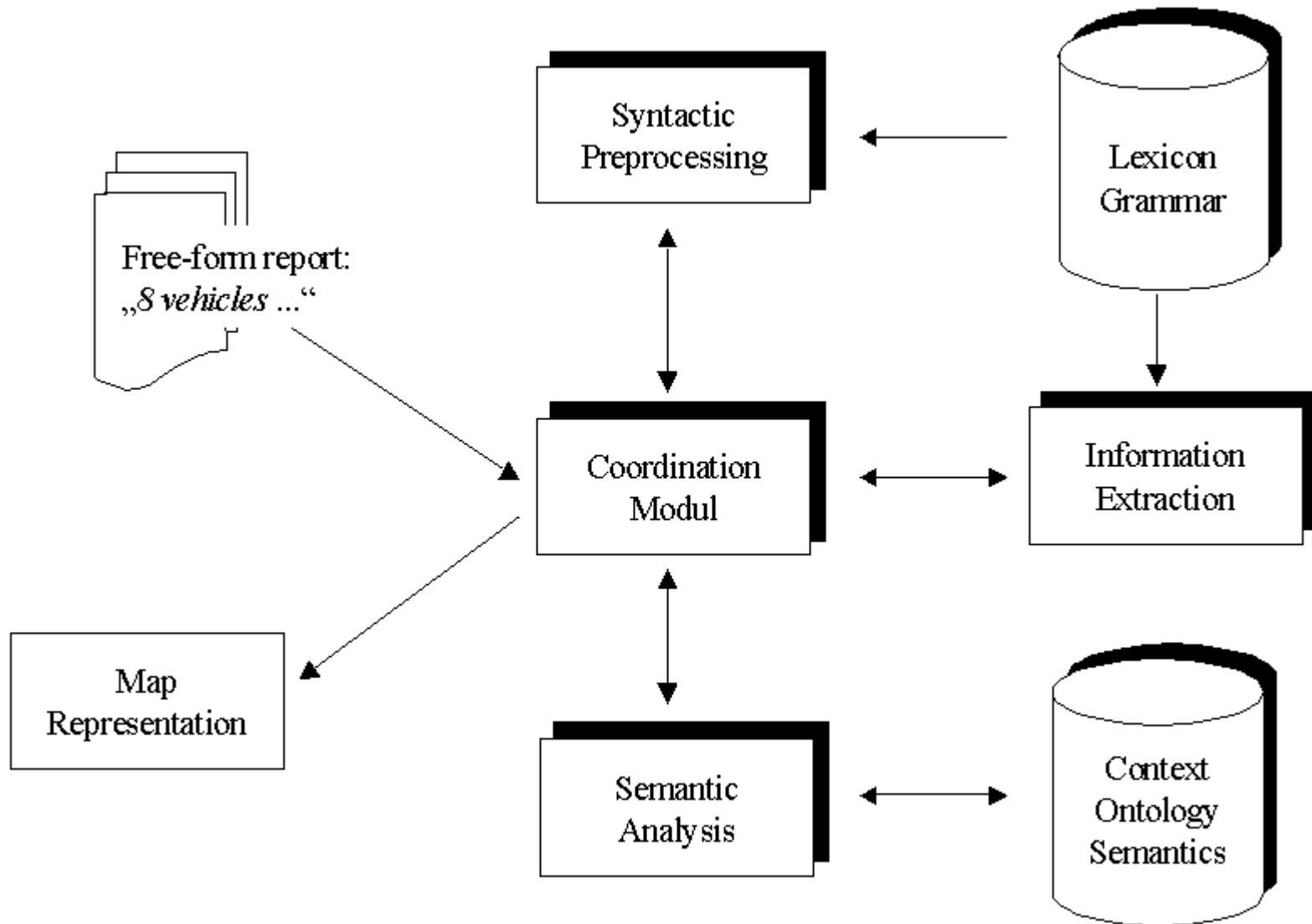
how





The research project Sokrates:

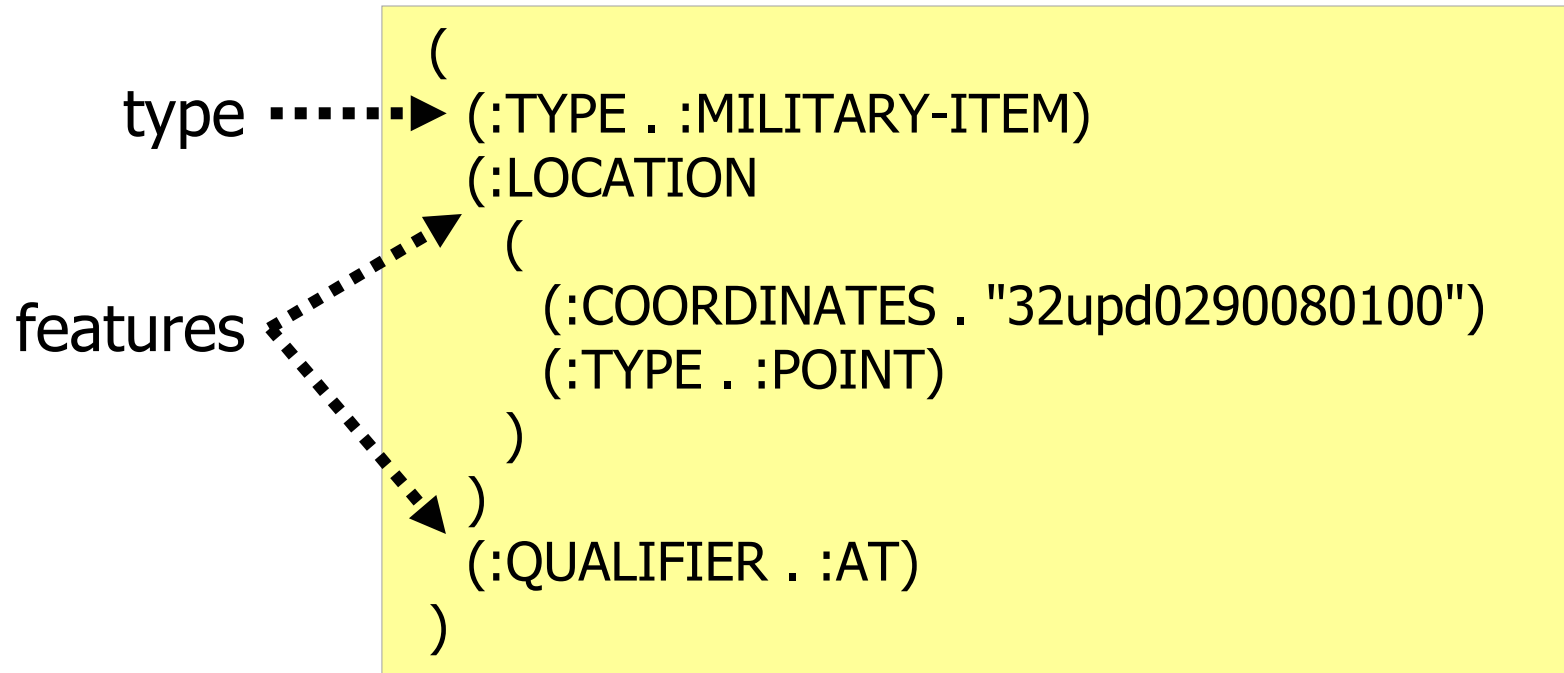
- The overall objective of the Sokrates project is to analyze written German battlefield reports (type **move**).
- The applicability of the information extraction technology in the military domain was shown.
- Combines IE with the semantic analysis, in which ontologies are used.
- The result of the analysis is stored in the LC2IEDM database. These stored results can be used for different purposes.
- One purpose is that location changes of units initiate automatically changes of tactical symbols on the tactical map.
- A prototype of the system was realized.

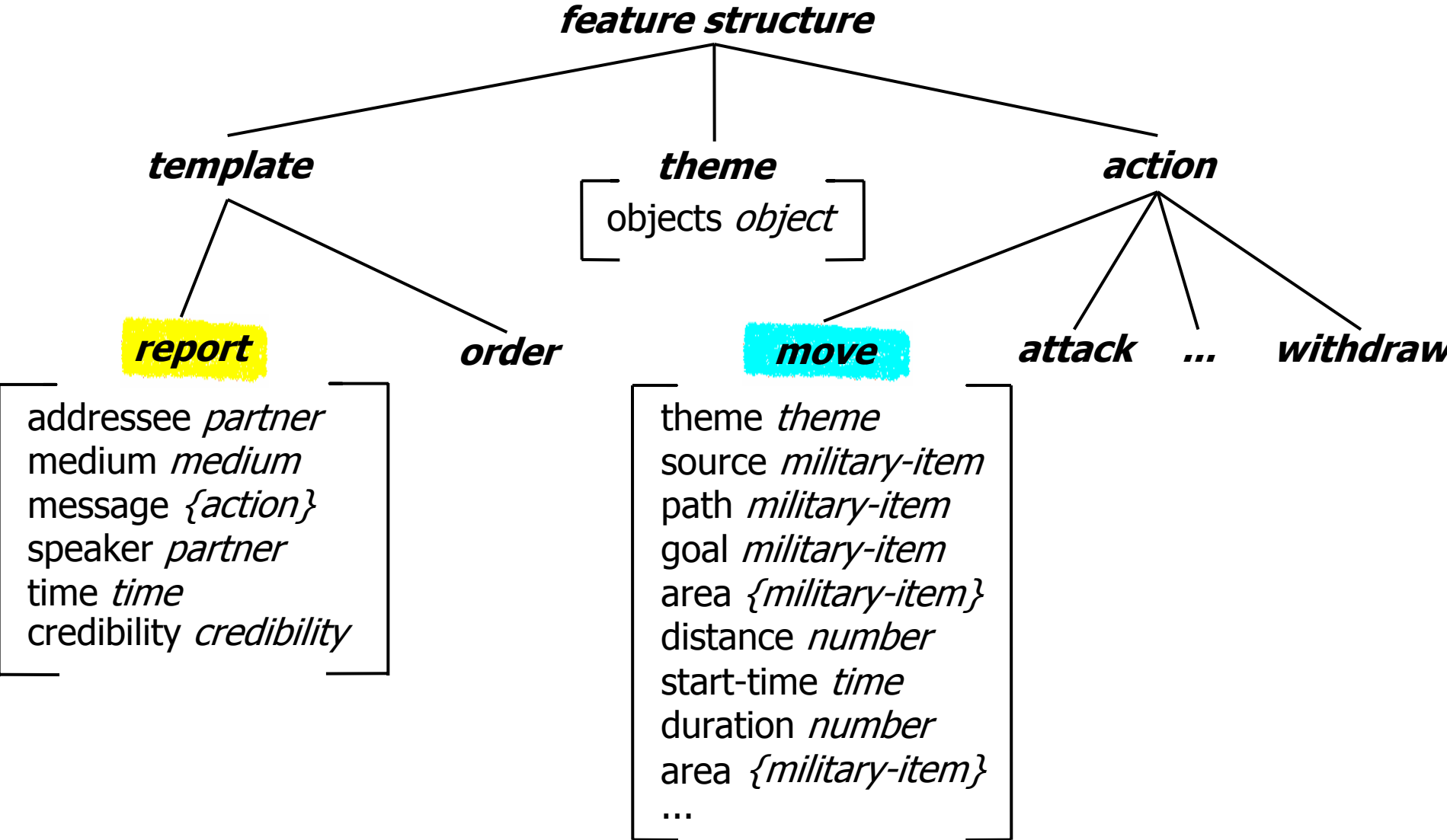


The screenshot displays a Windows desktop environment with several open applications:

- SOCRATES Kartendarstellung:** A map application window showing a tactical map with various symbols (blue squares, green squares, red diamonds) and a red line. The interface includes a toolbar with navigation icons, a list of map features to display (Einheiten, Orte, Taktische Symbole, Hintergrund, Eigene Lage, Feind Lage), and animation controls (Start, Stop, Reset). The coordinates **10,402 : 53,0028** are shown at the bottom.
- Meldungsgenerator:** A window titled "Meldungsgenerator" with a section "Vorgegebene Meldungen" containing a list of messages. The selected message is: "17. Oktober 04.30 Uhr von 6./PzMrs332-ZugB bei Brockhöfe: 3 eigene Leopard2A5 marschieren von Ebstorf nach Barum über Westerweyhe." Buttons for "Kopieren", "Schließen", and "Generator" are at the bottom.
- COSMoS ver. 1.41 alpha:** A window titled "COSMoS ver. 1.41 alpha" with a menu bar (Datei, Bearbeiten, Module Menu, Hilfe) and a toolbar. It features tabs for "Eingabe", "Trace", "Ausgabe", "Repository", and "Veranschaulichung". The "Eingabe Meldung" field contains the same message as the generator. Buttons for "Meldung löschen" and "Baumstruktur zeigen" are present. The FGAN and KIE logos are visible at the bottom.

- Representation of meaning by **typed feature structures** (FS)
- A FS consists of a set of features (name + value) and a type:



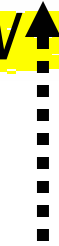
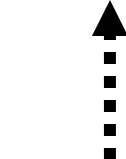
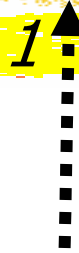
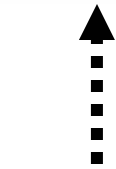


when this report was given

who reports



"09. September 10.45 Uhr von VN - Militärbeobachtern in BIJELJINA: 2 BRDM 2 und 1 PT 76 durchfahren in rascher Fahrt auf Straße 14 - 1 die Ortschaft SULJIN HAN (CQ 5458) nach Westen."



where

who

direction

what

how

part	<i>09.September 10.45 Uhr</i>
phrase	date
feature structure A	((:TYPE . :TIME) (:MINUTE . 45) (:HOUR . 10) (:MONTH . 9) (:DAY . 9))
synt. funct.	
feature structure B	(:TIME ((:TYPE . :TIME) (:MINUTE . 45) (:HOUR . 10) (:MONTH . 9) (:DAY . 9)))

← syntactical phrase

← FS of the phrase

← syntactical function

← in FS **move**

part	<i>von VN - Militärbeobachtern</i>	<i>in BIJELJINA:</i>
phrase	who reports	location of who reports
feature structure A	((:TYPE . :UNIT) (:NAME . "VN-Militärbeobachter") (:ABBREVIATION . "VN-MilBeob"))	((:TYPE . :TOWN) (:NAME . "bijeljina") (:QUALIFIER . :EXACTLY-AT))
synt. funct.		
feature structure B	(:SPEAKER ((:TYPE . :UNIT) (:NAME . "VN-Militärbeobachter") (:ABBREVIATION . "VN-MilBeob") (:LOCATED ((:TYPE . :TOWN) (:NAME . "bijeljina") (:QUALIFIER . :EXACTLY-AT) ...	

part	2 BRDM 2	und	1 PT 76
phrase	NP-1	conj	NP-2
feature structure A	((:TYPE . :TANK) (:ABBREVIATION. "brdm-2") (:COUNT . 2))	:SET	((:TYPE . :TANK) (:ABBREVIATION . "pt76") (:COUNT . 1))
synt. funct.	subject		
feature structure B	(:OBJECTS (:SET ((:TYPE . :TANK) (:ABBREVIATION . "brdm-2") (:COUNT . 2)) ((:TYPE . :TANK) (:ABBREVIATION . "pt76") (:COUNT . 1))) ...)		

part	<i>durchfahren</i>	<i>in rascher Fahrt</i>
phrase	VP	PP
feature structure A	(:TYPE . :MOVE)	((:VALUE . :FAST) (:TYPE . :PROPERTY))
synt. funct.	predicate	adverbial
feature structure B	(:TYPE . :MOVE)	(:QUALIFIERS (:SET (((:VALUE . :FAST) (:TYPE . :PROPERTY))))))

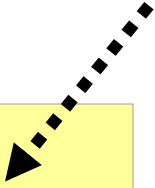
part	<i>auf Straße 14 - 1</i>	<i>die Ortschaft SULJIN HAN (CQ 5458)</i>
phrase	PP	NP
feature structure A	((:TYPE . :WAY) (:NAME . "14-1") (:QUALIFIER . :ON))	((:LOCATION ((:COORDINATES . "cq5458") (:TYPE . :POINT))) (:NAME "suljin han") (:TYPE . :TOWN))
synt. funct.	adverbial	object
feature structure B	(:AREA (:SET (((:TYPE . :WAY) (:NAME . "14-1") (:QUALIFIER . :ON)) ((:LOCATION ((:COORDINATES . "cq5458") (:TYPE . :POINT))) (:NAME "suljin han") (:TYPE . :TOWN)))))	

part	<i>nach Westen.</i>
phrase	PP
feature structure A	((:QUALIFIER . :TOWARDS) (:DIRECTED-TO . :WEST) (:TYPE . :DIRECTION))
synt. funct.	adverbial
feature structure B	(:GOAL ((:QUALIFIER . :TOWARDS) (:DIRECTED-TO . :WEST) (:TYPE . :DIRECTION)))

Equipment:

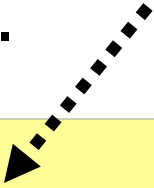
- Examples: "Auto", "Bus", "LKW", "PKW", "Panzer", "Haubitze", "Wiesel", "Marder", "Leopard", "AML – 90", "BRDM 2", "BM - 22 Mehrfachraketenwerfer 220 mm", "2 feindliche T80", "Fahrzeug", ...

```
(
  (:TYPE . :TANK) (:COUNT . 2)
  (:NAME . "t80") (:ABBREVIATION . "t80")
  (:QUALIFIERS
    (:SET
      (
        :HOSTILE
      )
    )
  )
)
```



Units:

- Examples: "Infanteriezug", "PzMrsKp (GE) in Wriedel (Zug bei Brockhoefe (32UND8610075100))", ...

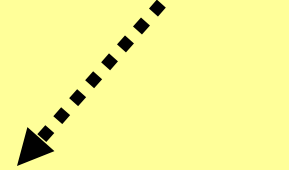


```
(:SPEAKER
  ( (:SECOND-PARTNER
    ( (:NAME . "Zug") (:TYPE . :UNIT) (:SIZE . :PLT) (:ABBREVIATION . "Zug")
      (:LOCATED
        ( (:TYPE . :TOWN) (:NAME . "brockhoefe") (:LOCATION ... ) (:QUALIFIER . :AT))))))
    (:FIRST-PARTNER
      ( (:NATIONALITY . :GE) (:ARM-CAT . :ARMOUR) (:SIZE . :COY)
        (:NAME . "Panzer Mörser Kompanie") (:TYPE . :UNIT)
        (:LOCATED
          ( (:TYPE . :TOWN) (:NAME . "wriedel") (:QUALIFIER . :EXACTLY-AT))))))
      (:TYPE . :MULTIPLE-PARTNER)
    )
  )
)
```

Locations:

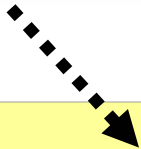
- Examples: "CQ 123456", "BANOVICI (YK 1234)", "die Straßenkreuzung kr3", "kr5 (CQ 072368)", "kr3", "Stellung 1.3 (CQ 072368)", "Straßenkreuzung (CQ 072368) südlich MILESKIJ (CQ 0737)", ...

```
(
  (:QUALIFIERS
    (:SET
      (
        ( (:TYPE . :TOWN) (:NAME . "mileskij") (:QUALIFIER . :SOUTH-OF)
          (:LOCATION ( (:COORDINATES . "cq737") (:TYPE . :POINT))))
      )
    )
  (:LOCATION ( (:COORDINATES . "cq72368") (:TYPE . :POINT)))
  (:TYPE . :CROSSING)
)
```



Nominal phrases:

- Examples: "1 LKW", "neun Busse", "1 beschädigter Panzer", "1 serbisches Fahrzeug", "1 großer LKW", "1 eigener Leo", "1 zerstörter T80", "11 kroatische Fahrzeuge", "zwölf wiesel 1 tow", "Vier alte leopard 1a5", "2 AML - 90 und 1 BRDM 2" "2 feindliche T80", "1 funktionsuntüchtiger bm - 22 mehrfachraketenwerfer 220 mm", "2 AML - 90 und 1 BRDM 2", ...




```
(  
  (:TYPE . :TANK)  
  (:ABBREVIATION . "bm22")  
  (:QUALIFIERS (:SET (:DAMAGED)))  
  (:COUNT . 1)  
)
```

Prepositional phrases:

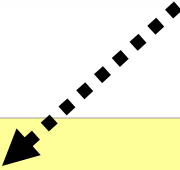
- Examples: "bei Ebstorf (CQ 123456)", "bei kr7 (32UPD0290080100)", "nach Osten", "in Richtung Straßenkreuzung (CQ 072368)", "in Stellung 1.3 (CQ 123456)", "von Ebstorf (CQ 123456) über Banovici (YK 45678) nach Berlin (CQ 56789)", "auf Straße 14 – 1", "bis Ebstorf (CQ 123456)", "durch Ebstorf (CQ 123456)", ...

```
(  
  (:TYPE . :TOWN)  
  (:NAME . "ebstorf")  
  (:LOCATION ((:COORDINATES . "cq123456")(:TYPE . :POINT)))  
  (:QUALIFIER . :THROUGH)  
)
```



Other phrases:

- Examples: "östlich der Straßenkreuzung (CQ 072368)", "in schneller Fahrt", "im Norden von MILESKIJ (CQ 0737)", ...



```
(
  (:TYPE . :TOWN)
  (:NAME . "mileskij")
  (:LOCATION
    (
      (:COORDINATES . "cq737")
      (:TYPE . :POINT)
    )
  )
  (:QUALIFIER . :IN-THE-NORTH)
)
```

- A short introduction to the promising field of information extraction (IE) through an example was given.
- Our research project Sokrates was presented.
- In the main part of the talk, the formalism (feature structures) to represent the **meaning** of free-form battlefield reports was described in detail.