LT-Innovate
Solution Proposal
For Daimler

Ulm, 13 February 2014

THE FORUM FOR EUROPE'S
LANGUAGE TECHNOLOGY INDUSTRY

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THE LT-INNOVATE TEAM

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Philippe Wacker, Secretary-General, LT-Innovate

REFERENCES

LT-INNOVATE.EU

By Industry

Automotive: Volkswagen, Porsche, Hyundai, Rolls Royce, SEW-Eurodrive

Technology: Microsoft, Google, Adobe, Cisco, Dell, Motorola, Samsung, HP, NOKIA, HERE, Philips, Expedia, QCRI, Empolis, Sipgate, Materna, ASC, MTP, ITEA, Cedat

Other: CAS, Zawatzky, Caterpillar, US department of justice, Chinese Academy of Science, Pons, Duden , Roche diagnostics, Pepsi, Sberbank, Canon, Pfizer, HUK-Coburg

LT-Innovate

THE FORUM FOR EUROPE'S
LANGUAGE TECHNOLOGY INDUSTRY


180 LT vendors
in 25 countries

Yearly LT-Innovate Summit (June) & LT-Innovate Award


To explore strange new worlds, to seek out new data and new knowledge, to boldly go where LT has not gone before...
http://bit.ly/13UAaST
Discover the world of Language Technologies: Download LT2013!

Workshops

INNOVATION BROKERAGE

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Improve framework conditions

Innovation Brokerage

PURPOSE OF THIS PRESENTATION

- Address Daimler's needs as they were expressed at the LT-Innovate Summit in June 2013.
- Provide a high-level description of a solution and get feedback to better understand the requirements.
- Highlight the added value of working with a consortium of Language Technology innovators.

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The Intelligent Car: Vision and Concept

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VISION

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Problem Statement

- The number of functionalities available in a car becomes so high that it becomes almost impossible for a driver to learn all the functionalities and to handle them in a safe way, i.e. without being distracted from where his/her real focus should be: road and traffic

Vision

- The driver should be able to interact with the car via a conversational speech dialog to use all available (networked) functionalities in a natural way without having to learn too many new commands.
- To enable this we envisage bringing together cutting edge language technologies with ever growing knowledge and information resources combining the strengths of innovation leaders in our industry.

OUR PROPOSAL

- A consortium of partners with expertise in Speech Recognition, Speech Synthesis, Linguistic & Semantic Text Analysis, Dialogue and Project Management.

- We provide a concept consisting of three main software functional blocks, which is customizable to the needs addressed by Daimler via:
  - Adaptable Language models (local and in private cloud, statistical and rule based)
  - Adaptable Dialogue models (local and in private cloud)
  - Interaction with expert system and its expert base containing required car domain expertise and persistent facts and rules about the driver
  - Hidden interaction with web pages by the dialogue system
  - I/O Interfacing with car equipment for car status monitoring, history and control

- We will provide a total speech-dialog based system (Intelligent Car Assistant) composed of a set of integrated components from different partners in the consortium.

INTELLIGENT CAR ASSISTANT

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- The dialog engine can conduct a rather advanced dialog with the user based on:
  - Level of linguistic & semantic text analysis (expression, shallow or deep)
  - Inclusion of domain expertise (facts & rules) via an expert system

  and
  - Different levels of dialog complexity realised in a technologically uniform way, implementing functionalities like:
    - Driver assistance system (car core functions)
      - providing information about car functions (" what is…, "how do I…")
      - triggering actions of the car ("switch on/off", "increase…", "play…", "show…")
    - Comfort functions (additional on-board information)
      - Information needing reasoning

        ("which route is better, if I want..", "do we have renaissance music with lute")
    - Intelligent assistant (dynamic information + reasoning)
      - Information from devices linked to the car system ("show me the week 13 appointments from my smartphone",..)
      - Information from the web ("what is the mountain on the right?... Its history? … People born near by?")

- Multiple languages can be realised via different language models

INTELLIGENT ASSISTANT - EXAMPLES

Example 1: live information streams

- Interaction between car and driver about latest political and financial news.
- Driver:
  - "Inform me about the recent political situation in Ukraine."
  - "What are the currency rates today and are there any dramatic changes, which can influence my business meetings today?"
- Car:
  - Collects latest news about Ukraine from the web, analyzes the context, facts and relations between them, informs the driver about it.
  - Checks for recent changes in currency rates, analyzes mobile calendar (extracting topics) and gives information, if serious changes in rates have been registered recently. Informs driver about it.

Example 2: dynamic context handling

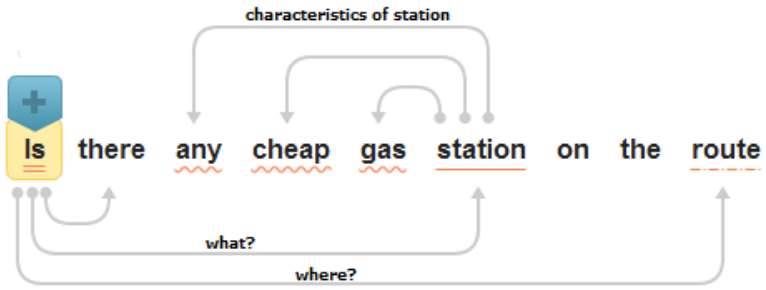
- Interaction with driver tuned on user profile, collected from the history of communication with him and external sources.
- Driver:
  - "Which prominent places will be on my way to Edinburgh?"
- Car:
  - Analyses the route and informs the driver about prominent places, connected with the route.
  - Before advising prominent places the system investigates user's profile, and tune places according to his interests from Facebook and information collected during previous dialogues
  - The system takes into account drivers childhood dream to see Loch Ness lakeside – he mentioned it several hours ago during a dialog with the assistant

- => Human-like interaction between driver and the car with the inter-connection of different data streams on board, online in the web and driver's mobile device
- The above are just 2 examples, the system should understand much more flexible/complex language from the User.

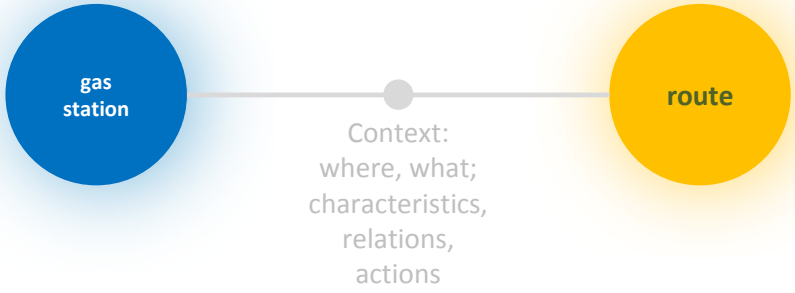
INTELLIGENT ASSISTANT – BEHAVIOUR

- Driver uses the car as smart assistant, asks open-ended questions, gets optimal feedback.
- HOW: Natural Language Understanding component analyzes text similar to humans (all the major EU languages and more) thank to deep linguistic analysis:
  - Understands user sentences using syntactic and semantic processing,
  - generates reply to users' questions.
- BEFORE: Limited direct interaction between driver and the car
- AFTER: Human-like interaction between driver and the car

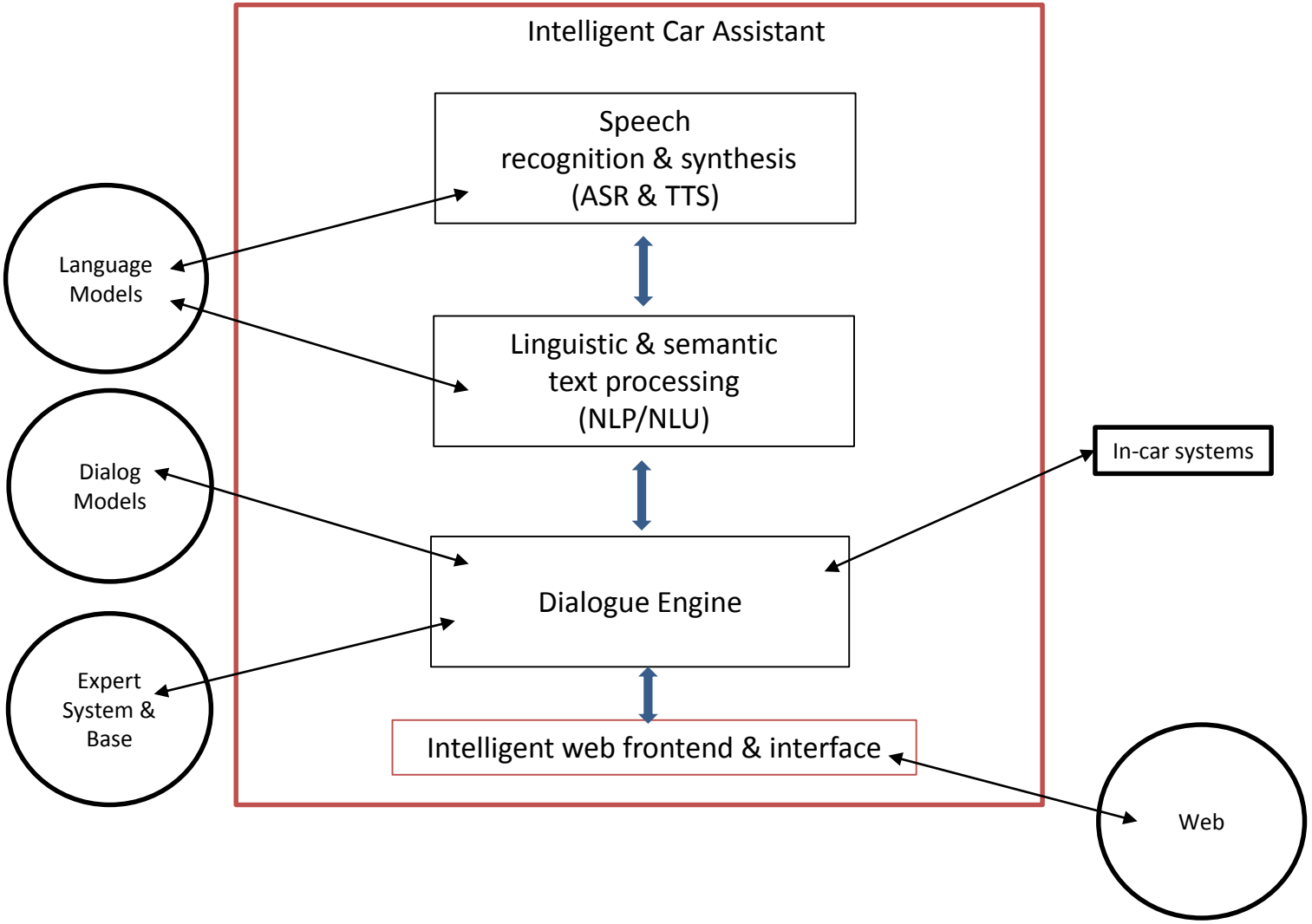
Syntactic structure is analyzed



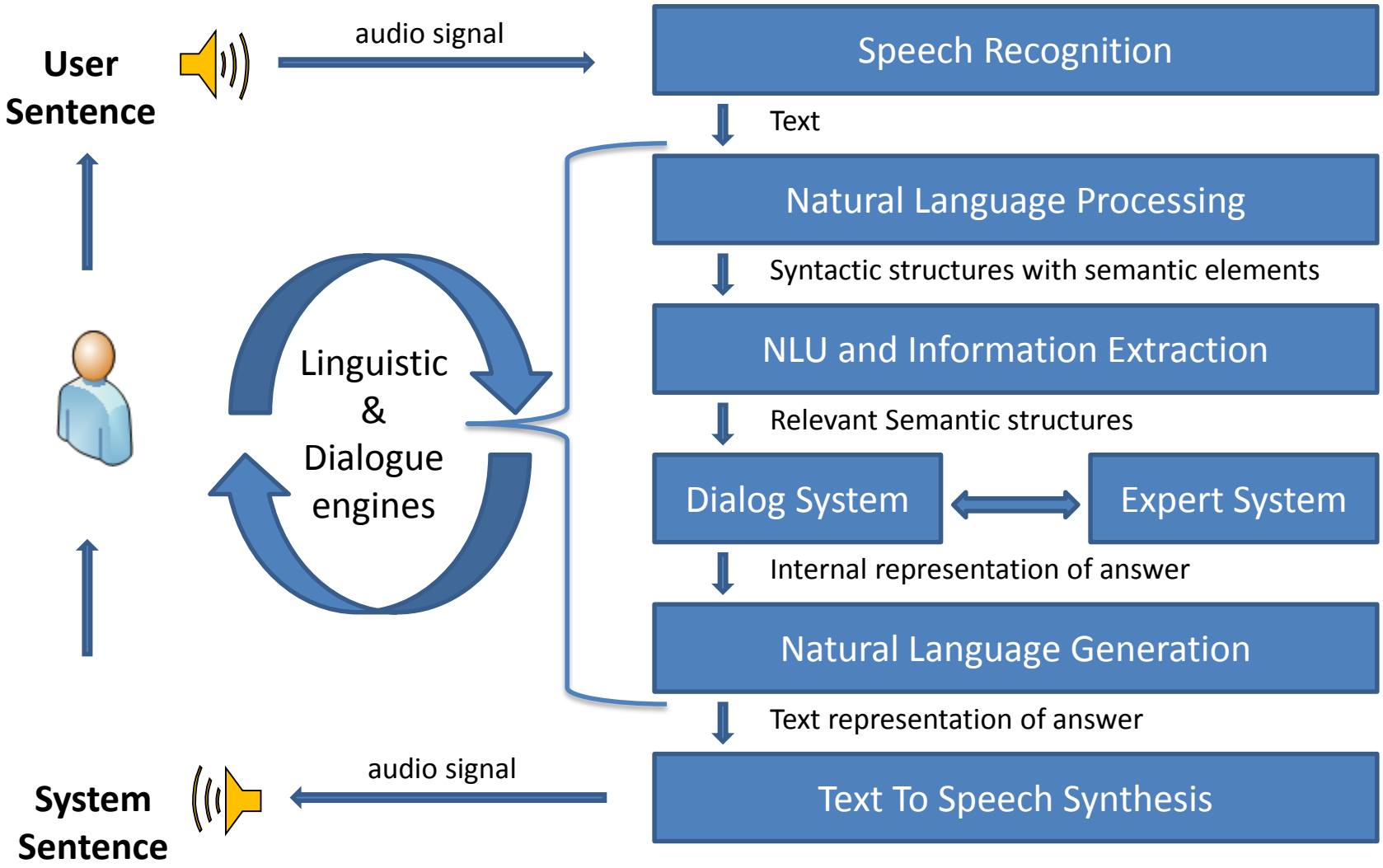
Conceptual representation



INTELLIGENT CAR ASSISTANT CONCEPT



USER-SYSTEM INTERACTION CYCLE



NATURAL LANGUAGE PROCESSING

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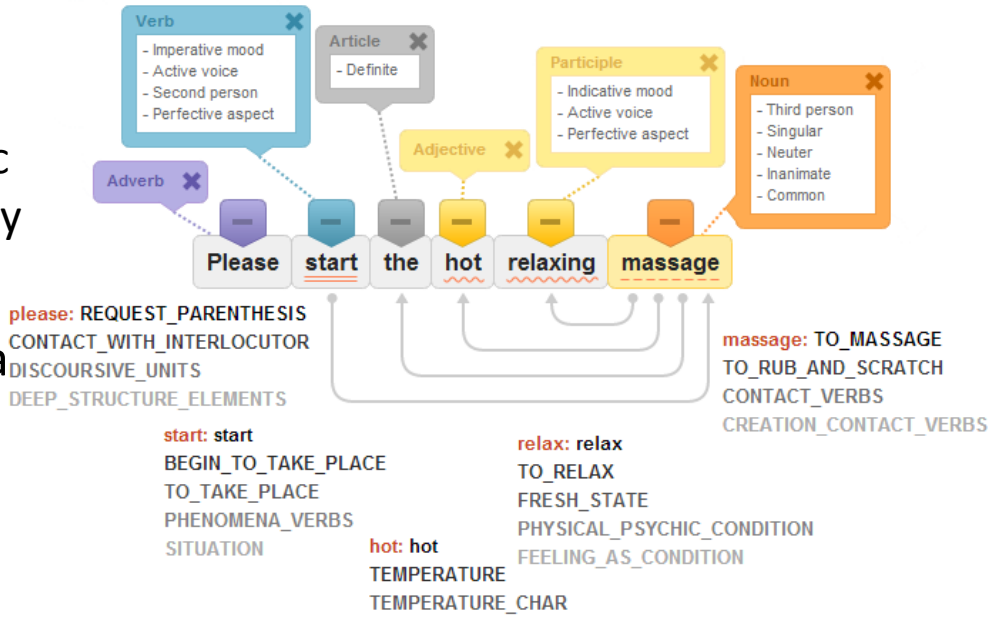
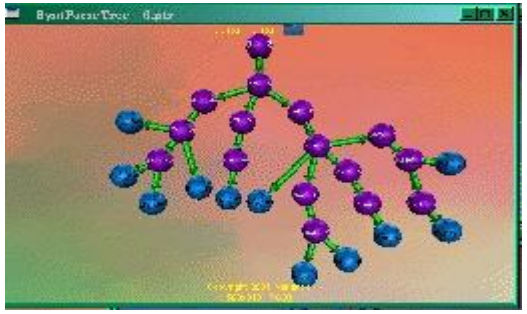
- Find syntactic structure hypotheses
  - Less Q&A iterations with system
  - Variability of sentences and questions with the same semantic structure considered automatically

- Option 1: Model-Based Interlingua approach
  - All algorithms in Information Extraction and Dialog modules are language independent
  - Less time to create rules and debug system
- Option 2: for both NLP and NLU, complete separation of universal algorithms and Language Models
  - Software Compatible with very many languages
  - Language Models don't contain software
  - Very efficient development for new languages and domains
  - Allows multi-strategy approach including very deep NLP/NLU analysis
  - Also including morphological parsing

Example implementation:



Other Example implementation:



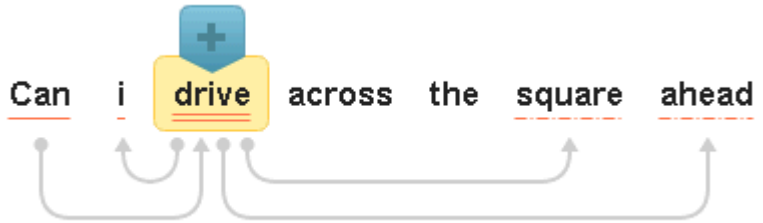
Probabilistic deep Parse forest with very extensive semantic annotation. Includes morphologic parsing

NLU AND INFORMATION EXTRACTION

- Understanding, Extracting Entities, and Meaning from User Sentence
- Final Disambiguation
- Anaphora and distant links Resolution
- Using language-independent structures with semantic and syntactic information
- Preparation for entering Dialogue System by retaining only relevant information

Question profile

Example implementation:
Query type: command
Topic: Auto functional
Intention: start massage
Param: -
Where: back seat

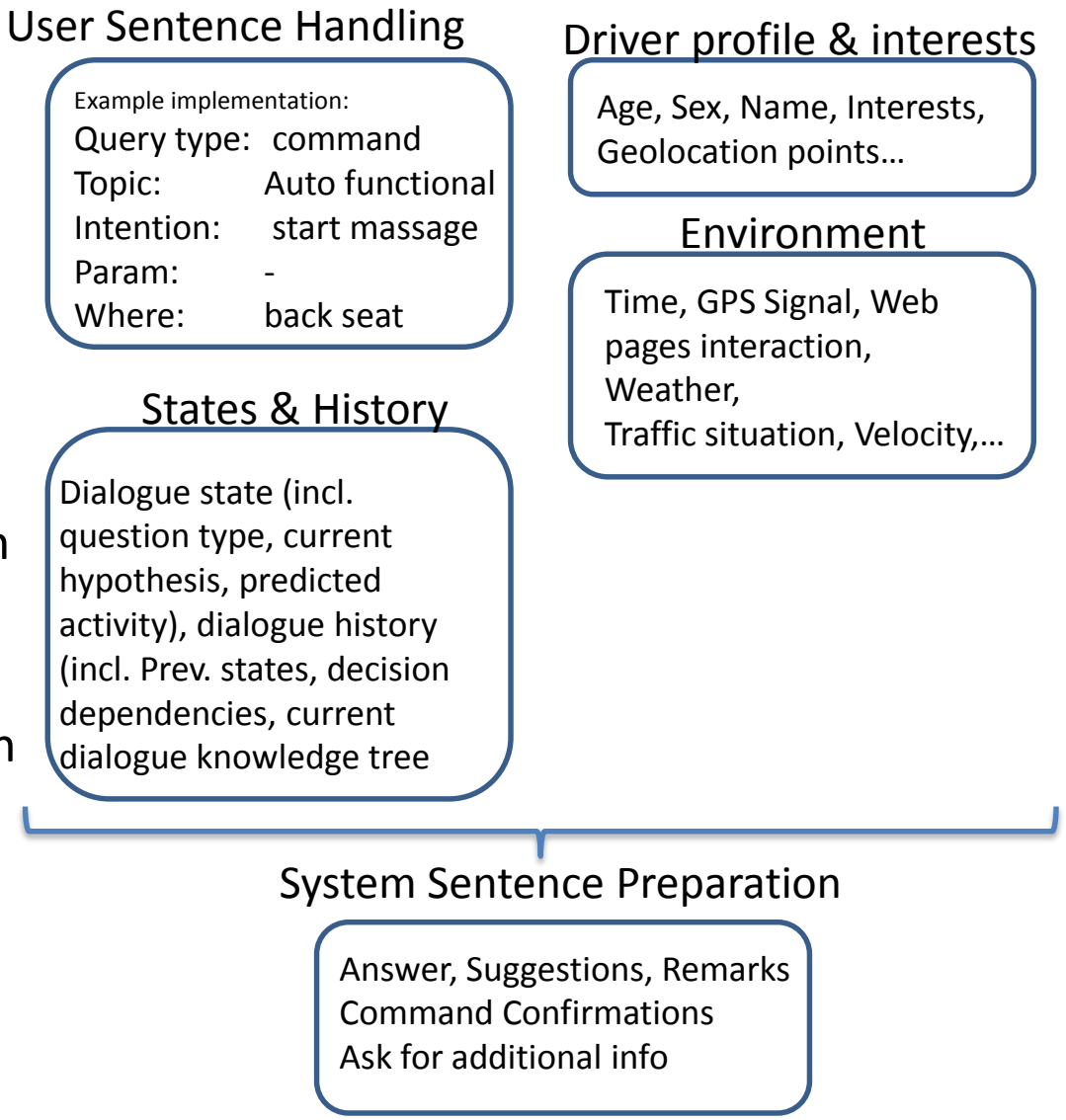


Question profile

Example implementation:
Query type: question
Topic: Geo Location
Intention: to drive across
Param: square
Where: ahead

DIALOGUE AND EXPERT SYSTEM

- Managing dialogue, states, queries, environment parameters and external information
- Create answers hypothesis and make decision to start any command, ask additional question, or answer to user with information needed
- Dynamic handling of context through the whole dialogue with the help of NLP and IE modules



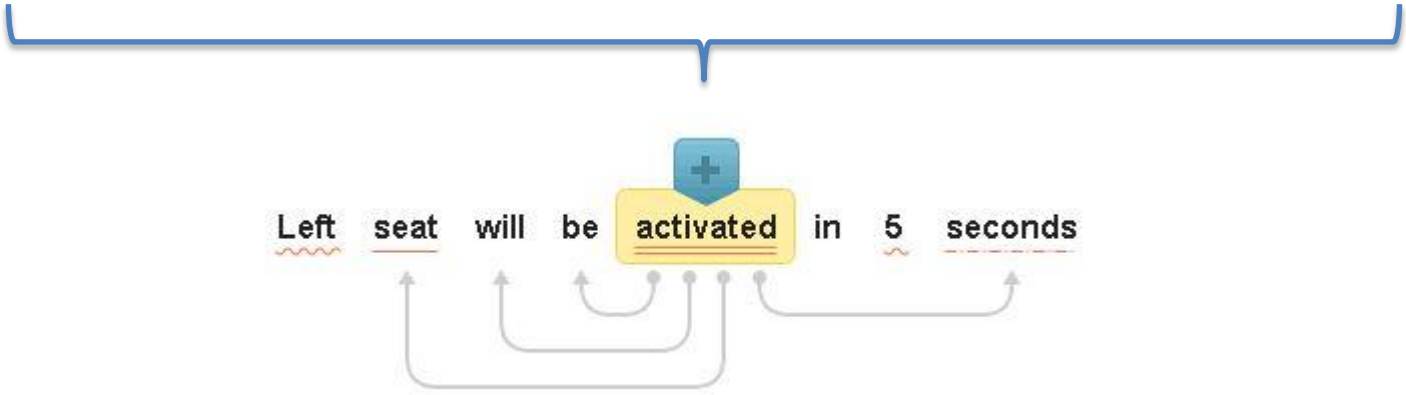
NATURAL LANGUAGE SYNTHESIS

- Converting answer from internal representation to the NL-like sentence
- Adjusting templates with setting specific words and entities in right morphological form (tense, number, case, gender)

Present tense
Formal style

Massage activation
Delay 5 seconds
Left seat

Answer templates



MANAGEMENT: PRINCIPLES AND SETUP

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1. Organization principles

Centralized administration and Financial management, **single point of customer contact** and direct peer-to-peer communication when needed. Regular live/online communication with partners. **Clear allocation of roles and responsibilities** to all partners.

A unified approach to documentation, delivery and quality assurance

2. Client communication

Communication plan agreed with customer prior to project commencement.

Information availability to ensure that the necessary information is shared at the right time, maintained and stored via proper collaboration tools.

Transparency through regular **status and financial reports tailored to the customer's needs.**

Experienced, multilingual project managers with proved records of customer satisfaction and quality of deliverables.

3. Risk Management

Regular risk assessment and monitoring according to an agreed risk management plan.

Special security measures for data, material and prototype handling.

Contingency and recovery planning.

4. Methodologies

Well-established Project Management methodologies based on Project Management Institute's principles driving projects to success for almost 20 years.

Agile development and lean six sigma implementation

MANAGEMENT: SPECIFIC KEY SERVICES

1. **Technology discovery and evaluation**
2. **Solution architecture process**
3. **Driving software development as part of project implementation**
4. **Complex multilingual software localization**
5. **Style Guides, Knowledge management, Terminology**
6. **Quality assurance**
   - Quality Criteria specified and agreed with customer a priori and refined throughout the project.
   - Our partners have in place well-established quality assurance processes for each step of the product development cycle including maintenance.
   - Functional, localization and linguistic testing in-lab, in-country or on-site covering 200 different language variants.
8. Development of technology to map content and glossaries/instructions to **speed up multilingual translation process**, and decrease the number of problems, errors and review/rework cycles;
9. Develop technology and carry out embedding this linked information (categories, instructions and terms) into the content using ITS 2.0. Develop the means (tools and processes) to **maintain ITS2.0 markup across the entire technological production chain during the entire content lifecycle**, including the updates.

SUPPORT & MAINTENANCE

- The consortium has the necessary structures in place for 24/7 multilingual customer support
- Maintenance and updates via sustained engineering for all deliverables of the project (including technology, documentation etc.)
- Proper knowledge transfer from the project to the maintenance team

CONSORTIUM

- **Why a Consortium?**
  - The expertise of each partner within the consortium ensures the best mix of available language technology solutions for Daimler
  - One Single Point of Contact within the consortium will take responsibility for evaluating and integrating, guaranteeing **full transparency** during selection procedures (determining the best performing, most productive and economically advantageous solution(s)) and the **adherence to standards** so that the various technologies can be seamlessly integrated, in line with Daimler's requirements.

CONSORTIUM

- **LT-Innovate**: a not-for-profit association of the European LT vendor industry, incorporated in the UK; 180 members in 25 countries; acts as consortium coordinator.
- **ABBYY**: a global leader in development of optical character recognition technologies, data capture and language software: headquartered in Moscow, Russia, more than 1500 employees in 15 countries, 30 million users in over 150 countries and one of the largest global research centers in language technologies.
- **EML**: EML European Media Laboratory GmbH was established as a private IT enterprise by Klaus Tschira, a co-founder of SAP. The EML develops software and technologies in automatic speech processing, with a focus on large scale, automatic conversion of speech into text (transcription) for a variety of markets. The EML Transcription Platform currently supports products like voicemail2text, speech analytics, media transcription, voice messaging and search, as well as voice control solutions.
- **Lingenio**: a 1999 spin-off of IBM research Heidelberg, developing and marketing machine translation products and dictionaries (series translate and translateDict) and language analysis software (e.g. for Duden Proof Factory), repeatedly awarded renowned national and international prizes for its performances and research. More than 20.000 calls daily of the translation service in the Pons.eu portal prove the quality and robustness of its translation service.
- **Lionbridge**: Lionbridge enables more than 800 world-leading brands to increase international market share, speed adoption of products and effectively engage their customers in local markets worldwide. Our Natural Language Solutions team helps companies world-wide develop their Language Technology solutions in more than 200 languages. As a result, our clients are growing revenue, enhancing brand loyalty and increasing efficiency across end markets and geographies. Facts: Founded: 1996, Employees: 4,500, Locations: Solution Centers in 26 countries, Revenue: $457 million (2012), NASDAQ: LIOX
- **Logrus International**: 20 years in business, finalists of Microsoft award in “Risk reduction” category in 2013. Logrus specializes in large-scale, technically-advanced projects. Logrus has conducted innovative ITS 2.0 project and proposes ITS 2.0 tagging of content in the project.
- **Natlanco**: An SME providing the core functionality of a virtual artificial intelligent professional solution, consisting of a multilingual linguistic & semantic analysis software and a dialogue software. Natlanco is based in Gent, Belgium and has a subsidiary in Jinan (China).

QUESTIONS

Thank You!