EXPERT SYSTEM OPERATING IN DIALOGUE AND AUTONOMOUS MODES

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What is the expert system

- Expert system (ES) is a software tool, which makes use of the knowledge contributed by experts in a particular field, to help diagnosing and solving problems in that field
- An example of ES is the MS Windows operating system troubleshooting software, designed to provide solutions and suggestions to problems which the user may face throughout using the OS (e.g. hardware failures)

Components of ES

- Knowledgebase – the place, where the expert knowledge is gathered in the form of Knowledge Units (KUs), typically questions with the list of answers to those questions
- Knowledge Processor – a program, which extracts KUs from the Knowledgebase
- Responder – a human or a program (which is associated with the particular question), answering the questions contained in KUs
- Coordinator – a program, which forwards KUs from Knowledge Processor to Responder and forwards answers to questions from Responder to Knowledge

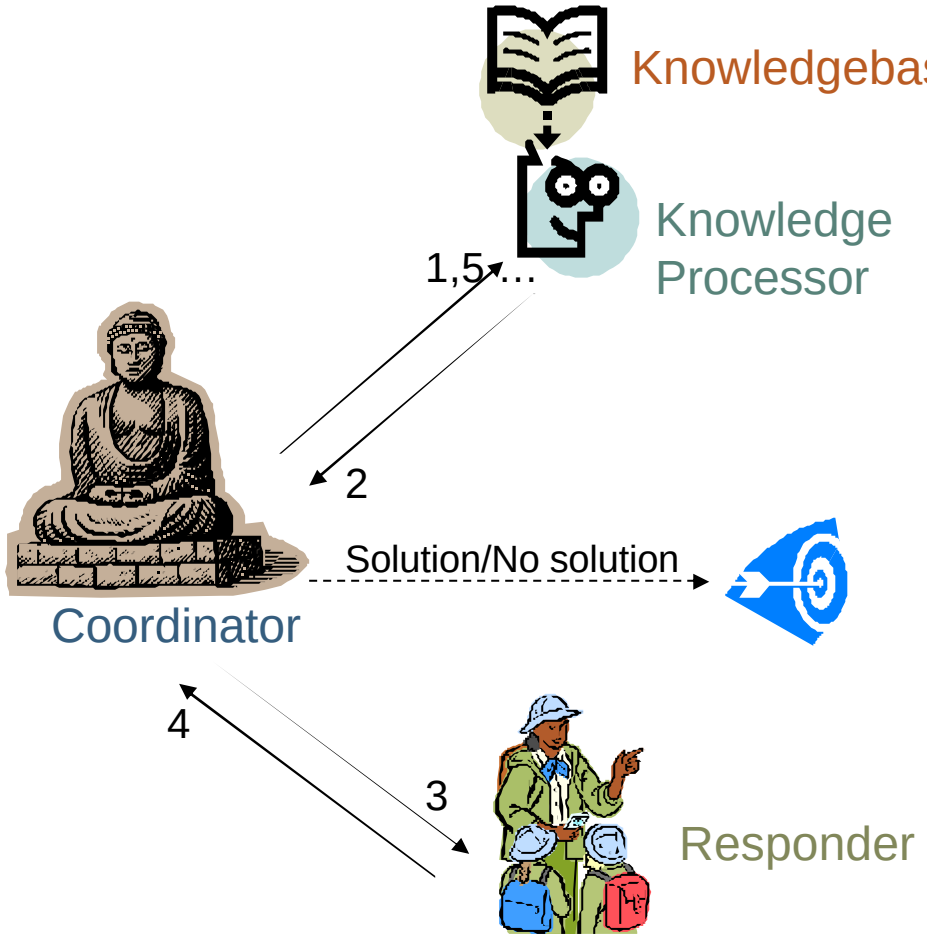
The Knowledgebase

The knowledgebase contains KUs of the following types

- A unit containing a question and a list of answers
  - “Has the service certificate expired ? “
    - Yes
    - No
- A unit containing conclusion about the problem
  - “The services fails because of invalid certificate”
- An empty unit
  - “No solution”

The knowledgebase is organised by experts intoa tree-like structure of KUs

How the system works



1) Coordinator asks the Knowledge Processor for KU
2) Knowledge Processor extracts the KU from the Knowledgebase (on the base of the information supplied by Coordinator) and gives it to Coordinator
3) If the KU contains question, Coordinator forwards it to Responder to answer the question. Otherwise Coordinator displays the KU – either conclusion about the problem or 'No solution' – to the launcher of ES, and the process ***finishes***
4) Responder chooses the answer and forwards it to Coordinator
5) Coordinator gives the answer to Knowledge Processor. **Process continues with step 2.**

Two modes of operation

- The ES has two modes of operations:
  - Dialogue
  - Autonomous

Differences	
Dialogue mode	**Autonomous mode**
Responder is a **user**	Responder is a **program**
Responder and Coordinator communicate via HTTP	Responder and Coordinator communicate via XMPP
Responder - Coordinator communication is *not* logged	Responder - Coordinator communication is logged

Use case for CERN ALICE experiment and summary

- Using the expert system for ALICE would enable the expert knowledge gained throughout the process of monitoring and controlling data taking runs to be *re-used in robust and automatic way*
- The system offers two modes of operation: dialogue and autonomous
  - The dialogue mode is to assist the user to determine a problem or find a solution to his problem interactively.
  - The autonomous mode can be used for the regular automated check of the work of the system. In case a problem is found the system can be used to fix it (i.e. restart the service which is not responding) or inform the expert about the problem
- The knowledgebase is updated via the web interface

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