BASIC PROCESSES OF VEHICLES MONITORING UNDER UNCERTAINTY

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The viability of any country is in many ways dependent on the efficiency of vehicle-aided cargo shifting [1]. The vehicle efficiency depends on the propriety of decision-making under uncertainty typical of modern times. For the reduction of these uncertainties decision support systems are used. Unfortunately, they are characterized by high specificity and complexity of decision-making methods. The report covers the possibility of creating a unified decision synthesis mechanism based on expertise knowledge sources relevant to the current uncertainty level.

Given is a company, which uses vehicles (mgo), equipped with detectors (dt) for cargo shifting project implementation. For the vehicle control a group of actors including a manager (C), dispatcher (D) and executor (P) is formed. The vehicle path goes through places of different levels of uncertainty. Required is a unified monitoring process, which provides for the synthesis of decisions corresponding to the level of uncertainty of a current situation.

The abstract scene (scene) of complicated vehicles control represents under present-day conditions a hierarchy of people, intelligent decision support systems (dss) and data exchange communication systems [1, 2].

On each level the actors make up decisions in accordance with their roles, expertise and resources. A typical decision-making problem is described by the tuple

$$\mathbf{U} = (X, V, U), \quad (1)$$

where: X – object parameters; V – states; U – possible decisions; **U** – the chosen decision.

In this case the actors P, D, C solve the Z_P, Z_D, Z_C decision-making problems depending on the buildup of the uncertainty degree and use three types of communication: local (com1), enterprise-wide (com2) and global (com3):

Scene = (mgo, dt, P, dssP, D, dssD, C, dssC, com1, com2, com3) (2)

Based on the synthesis of (1) and (2) five typical monitoring processes can be distinguished:

1. Set up of a data domain: proj, X,V, U on the levels of dssC, dssD, dssP;
2. Setting of X parameters values;
3. Decision synthesis: dssP → X, V_P, $\mathbf{U_P}$ → P;
4. Decision analysis:
   - if $U_P \in Z_P$ then fulfill the decision $\mathbf{U_P}$ and move to 5;
   - if $U_P \in Z_D$ then by com2 send U_P to the agent D and receive the answer of $\mathbf{U_D}$;
   - if $U_P \in Z_C$ then by com3 send U_P to the agent C and receive the answer of $\mathbf{U_C}$.
5. The fulfillment by the agent P of the decision $\mathbf{U_P}$ or $\mathbf{U_D}$ or $\mathbf{U_C}$.

The unification of decisions allows improving each of the steps without affecting other processes. By representing the processes in software agents, we receive a unified multi-agent architecture aimed at monitoring automation.

References

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