

USING THE CHAT-BOT @ES_ECONOMY_KARKAS_BOT FOR ON-LINE CONSULTING WITH AN EXPERT SYSTEM

In recent decades, with the advent of the smartphone, the concept of artificial intelligence has grown in popularity with messaging applications.

One of the main areas of artificial intelligence is the development of intelligent systems. This direction allows a person to model, analyze, structure and apply knowledge in poorly formalized subject areas. A striking representative of such systems is the expert system.

Expert systems (ES) are a class of computer systems that can be controlled at the expert level: advise, make a diagnosis with a certain degree of confidence, explain their findings. The core of the expert system is the knowledge base and decision-making algorithm (inference machine) [1 – 3].

There are several obstacles to the creation of expert systems, for example, the consistency of knowledge in the knowledge base, dynamic support of the knowledge base.

The "KARKAS" system (a tool for creating models of knowledge bases) uses common methods for representing knowledge (products and frames) and is based on a new approach to interpreting knowledge in the form of a hierarchical functional system that allows you to simulate the dynamic processes of the subject area. The site of the "KARKAS" system provides examples of various presentations of knowledge base models [3].

In the business environment, the TELEGRAM free messenger has become the corporate communications standard. This is due to the following reasons: a high degree of data encryption in it, stability of work, the ability to transfer large amounts of information, the openness of the protocol, cross-platform.

In addition, the developer of the TELEGRAM messenger provides a library of APIs for working with chat bots [4].

A bot (chat bot, interlocutor) is a program that imitates human communication based on elements of artificial intelligence. Today, bots can communicate with each other to achieve their goals, that is, they can be used as agents in multi-agent systems.

Naturally, the disadvantage of such communication was not quite a logical dialogue between the bot and the interlocutor. The interlocutor appeared an illusion that the bot understands it, although in reality this is not so. In other words, the chat bot lacks the implementation of interaction with the output machine, as it is widely used in expert and expert training systems.

Using the TELEGRAM messenger as an interlocutor when working with the "KARKAS" system gives more opportunities to consult an expert system via a smartphone, which, for example, is important for making effective decisions in the economic and financial field.

In other words, now you can send a text message to the @es_economy_karkas_bot bot (the bot is designed to consult with prototypes of expert systems in the economic and financial subject area) and receive instantly necessary information, that is, provide on-line consultation.

The @es_economy_karkas_bot bot allows you to conduct on-line consultation with the following prototypes of expert systems in accordance with the following teams.

The /fa command calls an ES prototype to analyze the financial condition of the enterprise. The purpose of this ES is to improve the quality of the result of assessing the financial condition of the enterprise. Assessment of the financial condition of the enterprise is carried out according to the following parameters: rate of return, rate of return on invested capital, duration of one revolution, coefficient of assets turnover, coefficient of utilization of funds in circulation, coefficient of financial stability, profitability of the self-financing process, self-financing coefficient [5].

The /bank_commercial team calls up the ES prototype for selecting a bank for financial services to the enterprise. The purpose of this ES is to select the most optimal bank option for financial services of an enterprise, depending on its needs for cash settlement, credit, deposit and trust operations. The list of possible values of the sub-goals of the consultation:

requirements for financial servicing of an enterprise — this is the urgency of cash payments, forms of cash payments (cash, non-cash), deposit, credit, cash settlement or trust operations;

claims on banks — solvent or insolvent, liquid or illiquid bank.

The scope of application of the ES prototype is different enterprises that need financial services from banks.

The /insurance_company team calls the ES prototype to select an insurance company. The purpose of this ES is to select the best option for an insurance company to insure commercial risks, depending on the degree of risk and insurance conditions.

Initial data:

to analyze the activities of the insurance company — this is the nature of financial activity, the presence or absence of free cash;

to determine the solvency of the insurance company — this is equity, insurance reserves;

to determine the liquidity of an insurance company — these are financial indicators (insurance and investment portfolio, company profits, registered capital, insurance premiums and payments).

The /creditworthiness team calls an ES prototype to determine the borrower's credit rating. The purpose of this ES is to assess the creditworthiness of an enterprise for a bank to issue a loan in order to reduce bank risk. Expected results: determining the value of the borrower's creditworthiness class depending on financial and quality indicators, which will then be taken into account by employees of a bank or other commercial organization when issuing a loan to a borrower.

Initial data:

for the analysis of financial indicators: the value of absolute, current, total liquidity; capital structure; capital turnover; provision with own sources of financing;

for the analysis of qualitative indicators: analysis and assessment of the borrower's credit history, assessment of the borrower's market position, assessment of the liquidity of collateral, assessment of management efficiency and business qualities of the head.

The /enterprise_strategy command calls the ES prototype to select an enterprise strategy. The ES's goal is to select the most optimal enterprise strategy for its successful management. Class of tasks: analysis of the external environment, analysis of the immediate environment, analysis of the macroenvironment of the enterprise, as well as analysis of the definition of the mission and goals of creating the enterprise.

The /product_suppliers command calls the ES prototype to select product suppliers. The ES's goal is to improve the quality of the result of the selection of product suppliers, the quality and reliability of information on the availability of offers from suppliers on the market, and increase the efficiency of processing this information. The scope of application of the ES prototype is enterprises and firms that need to purchase products from different suppliers. Class of problems to be solved: analysis of suppliers' proposals, selection of a supplier based on certain criteria.

Imprint: information on suppliers' offers: cost of products, terms of delivery and payment, accuracy of compliance with contractual terms, volumes and terms of delivery, quality of goods and services, speed of replacement of low-quality products, range of products offered and speed of updating, ensuring product delivery; territorial availability of the supplier; supplier capabilities in terms of supply.

The /product_competitiveness team calls up an ES prototype to evaluate product competitiveness. The goal of this ES is to find competitive, sustainable products themselves. Scope: marketing activities. Expected results: assistance in making the right decision about

which product to produce and what to do with uncompetitive products to the head of the company or marketer.

The /credit_insurance team calls the ES prototype for commercial loan insurance. The purpose of this ES is to determine the conditions for insurance of a company's loan by an insurance company (provision of benefits, insurance under ordinary conditions, refusal) and the calculation of specific tariffs depending on the conditions adopted. The scope of application of the ES prototype is an assessment of the risks of commercial lending. Class of problems to be solved: analysis of the conditions of an enterprise loan insurance. The risk assessment of commercial lending may result in the provision of benefits, insurance under ordinary conditions or refusal of insurance. Sub-goals: assessment of risk size and calculation of tariff coefficients based on analysis of initial factors. Imprint: urgency, size and terms of the loan, the possibility of providing benefits, the experience of previous lending.

Integration of the chatbot with the consultation and dialogue modules of the "KARKAS" system consists in the exchange of information between them without user intervention, as well as the transmission and reception of requests for working with TELEGRAM servers using the TELEGRAM API and JSON with the secure HTTPS protocol.

Conclusions. The work presents the results of the integration of the chat bot @es_economy_karkas_bot by an expert system for organizing on-line counseling. An algorithm for the interaction of chatbot and agents of the expert system in the online mode is considered.

As a result, a fully functioning chat bot @es_economy_karkas_bot was created, which is integrated into the "KARKAS" system, which allows online consultation on prototypes of expert systems in the economic and financial subject area. After the deployment of the program, it is planned to significantly expand the functionality of the bot.

The "KARKAS" system is a toolkit for developing prototypes of knowledge bases for expert and expert training systems both in offline and online modes on smartphones. The representation of knowledge is based on a hierarchical functional system, which is generated by the "KARKAS" system on the basis of production rules and frames.

References

1. В. П. Бурдаев, "Модель функциональной системы динамической предметной области", *Искусственный интеллект*, №3, с.439 – 448, 2011.
2. В. П. Бурдаев, *Моделі баз знань*, Харків, Україна: ХНЕУ, 2010.
3. Система КАРКАС, [Електронний ресурс]. Доступно: <https://it-karkas.com.ua>. Дата звернення: 1.03.2020.
4. Telegram Bot API. [Електронний ресурс]. Доступно: <https://core.telegram.org/bots/api>. Дата звернення: 5.03.2020.
5. В. П. Бурдаев, "Модель бази знань для аналізу фінансового стану підприємства", на *Міжнарод. наук.- практ. конф. Економічний розвиток і спадщина Семена Кузнеця*, Харків, 2019, с. 204 – 205.