Artificial Intelligence (AI) Technology Assisted Emergency Management in Oil Industry

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Abstract. Emergency management is considered to be a response to the risk of major accidents and disasters, while oil companies pay more attention to the post-emergency response and post-treatment, but do not care about the whole process of emergency management. Despite not necessarily receiving the most coverage, production safety accidents caused by unreasonable emergency management have become an urgent problem in petroleum industry. As the most advanced productive force in modern society, artificial intelligence is considered to lead the future, integrate into all aspects of today’s society, and even bring about industrial revolution. With the development of science and technology, artificial intelligence has been applied to all aspects of emergency management in petroleum industry, including intelligent prevention and emergency preparedness, monitoring and early warning, emergency response and rescue, post-recovery and reconstruction. The application of artificial intelligence can not only improve the level of emergency management, reduce the cost of labor expenditure, avoid casualties of emergency management personnel and field staff, but also improve the production efficiency of enterprises and maintain the safety of production in petroleum industry. The most important thing is that AI can involve the whole process of emergency management and bring industrial upgrading to the petroleum industry.

Keywords. Artificial intelligence; emergency management; oil industry.

1. Introduction
Artificial intelligence technology is being integrated into all walks of life. Traditional emergency management technology and means are becoming increasingly unsuitable for dealing with frequent and complex natural disasters, accident disasters, public health and social safety accidents. There are more and more examples of the integration of artificial intelligence and emergency management. Explosion-proof robots are used in the process of petrochemical fire emergency rescue. They can not only fire extinguishing on the spot, but also bring intelligent detection system with them. The data collected from the scene are transmitted back to the rear command system to provide numbers for the follow-up scientific and reasonable emergency rescue.

At present, the research of emergency management in China’s petroleum industry is still at the stage of framework design, which is characterized by the construction of emergency information system, emergency management function, emergency preparedness plan and emergency management stage, while the empirical analysis of data is less, and the comprehensive mining and utilization of emergency management information is less.
2. Artificial Intelligence (AI) Technology
The concept of artificial intelligence was put forward by Professor John McCarthy, an American scientist, at the Dartmouth Conference in 1956. The definition of AI has not been unified in the world at present, because it involves many issues, including not only technical issues, but also social and ethical issues. This research only introduces it from the technical level. We can think that AI is a modern technology to study, simulate, develop and utilize human brain activity. It is mainly based on human brain activity and intelligent activity law, and integrates neurophysiology, cybernetics, computer science and linguistics. Such disciplines, to carry out systematic development, and ultimately achieve the effect and purpose of machine instead of human brain thinking, but unlike human brain thinking, it has significantly higher computing and processing capabilities. Artificial intelligence research field is very extensive, mainly involving knowledge representation, machine learning, machine behavior, machine perception, machine thinking. After years of development, application scenarios are becoming more and more extensive and mature. More mature scenarios include automatic theorem proving, pattern recognition, machine vision, game theory, natural language understanding, automatic programming, combinatorial optimization problems, artificial neural network, intelligent information retrieval, data mining and knowledge discovery, intelligent expert system [1]. Integration, distributed artificial intelligence and multi-agent, intelligent control, intelligent simulation, intelligent management and intelligent decision-making, intelligent multimedia system, etc. With the needs of human production and life, artificial intelligence has penetrated into almost all walks of life, such as intelligent audio with functions such as natural language understanding and intelligent information retrieval, which can provide accessible human-computer interaction; smart home system makes TV, refrigerator and even curtains serve people in real time; The internet browser loaded with machine learning can master user search rules skillfully and automatically push advertisements and commodity links for users. In short, artificial intelligence technology has become more and more mature to serve human beings. The field of artificial intelligence will be more and more used to serve the petroleum industry. Emergency management, as the most important part of the petroleum field, will also accelerate the layout in this field.

3. Emergency Management
Emergency incidents are usually unexpected, sudden outbreaks of negative events caused by some reason. Emergency incidents often affect the normal production and life of human beings, and even endanger life safety. Effective and reasonable response is needed, which is called emergency management. As the pillar industry of the country, the situation of safety production in oil industry is still serious. Safety accidents occur from time to time. Emergency management in the oil industry is more difficult because of the spread of hazards and uncertainty. Emergency management should involve the whole process of emergencies. Complete emergency management should include four stages, emergency prevention and emergency preparedness, monitoring and prediction, emergency disposal and rescue, post-accident recovery and reconstruction. In the whole emergency management stage, decision makers will adopt various reasonable, institutionalized and procedural methods and measures [2]. In the whole process of emergency management, various reasonable, institutionalized and procedural methods and measures will be adopted to prevent emergencies or carry out effective emergency rescue and rescue after emergencies.

At present, emergency management in petroleum industry mainly focuses on emergency disposal and aftermath of emergencies. It often pays less attention to emergency preparedness and early warning stage. Moreover, when emergencies occur, due to time constraints, backward means of data processing and analysis, imperfect historical data analysis, emergency disposal decisions are often made. To some extent, it is impossible for the oil industry to deal with emergencies scientifically and reasonably.
4. Application of Artificial Intelligence in Emergency Management of Petroleum Industry

4.1. Emergency Prevention and Preparedness
The application of artificial intelligence technology in emergency prevention and preparedness mainly includes emergency plan compilation and emergency support. Emergency plan is a work plan for dealing with emergencies, which is formulated in advance to effectively prevent and control the occurrence of emergencies and minimize accidents and damage caused by them. Intelligent information retrieval can be used to retrieve and predict almost all disasters and emergencies that may occur in the production and operation of the petroleum industry worldwide for specific operations. Data mining is carried out according to the production experience and industrial characteristics of the petroleum industry, and a more scientific, reasonable escape plan is given in the process of emergency plan formulation, which conforms to the public behavior habits [5]. Therefore, aiming at a specific task, the use of artificial intelligence technology can specify a more detailed and comprehensive emergency plan. The application of neural network can optimize the material reserve and allocation mode of emergency rescue in petroleum industry, and cope with emergencies more timely and effectively.

4.2. Monitoring and Early Warning Stage
The application of artificial intelligence technology in the monitoring and early warning stage mainly includes emergency information monitoring, risk analysis and assessment, event early warning and so on. Monitoring and early warning are actually based on real-time collected data, including temperature data, pressure data, real-time voice data, video surveillance data. Machine learning can be used to determine normal data in real time. Once abnormal data is detected in production process, intelligent diagnosis and early warning can be carried out through intelligent expert diagnosis system. At present, in petrochemical plants, mechanization basically liberates human physical strength [7]. Under normal production conditions, managers only need to inspect workshops at regular intervals to monitor abnormalities. Internal exercises only need to inspect workshops at regular intervals to monitor abnormal production conditions, while external exercisers only need to monitor real-time production conditions according to workshop managers and process technology. The personnel and internal operation instructions carry out on-site operation to maintain the safe operation of the entire petrochemical plant. The whole process of monitoring and early warning is to monitor pressure, temperature, liquid level and material level through people, DCS system and instruments, and to warn by alarm [9]. This traditional monitoring and early warning process is based on the normal operation of each link in the production process. Once a problem occurs in one link, it may lead to the failure of the whole monitoring and early warning. Intelligent patrol robot equipped with vision, hearing, touch and olfaction sensors can conduct real-time data analysis, timely monitoring and early warning.

4.3. Emergency Disposal and Rescue
The application of artificial intelligence technology in emergency disposal and rescue mainly includes rescue plan formulation, on-site rescue, on-site decision-making and command, etc. Reasonable rescue plan is the premise of emergency response and rescue, and the guarantee of the success of emergency response process. Artificial intelligence is just such a magic technology, which can use emergency expert system to obtain a large number of successful accident handling cases in time, and formulate emergency rescue plans for specific accidents. In the future, emergency rescue robots will use robotic mobile platform, carry intelligent monitoring sensors and dismantling tools, integrate super-strong obstacle surmounting (overturning, flying, underwater walking), monitoring and early warning (leakage monitoring, monitoring and early warning), automatic fire extinguishing, emergency escape route navigation, intelligent emergency disposal (dismantling, rescuing people). The key technologies such as stable emergency communication (airtight space, deep sea, high mountains) and long endurance can realize emergency rescue and rescue operations in any environment. A large number of emergency cases, emergency plans, emergency knowledge and other emergency expert systems can
provide effective solutions through in-depth learning in the process of emergency response and rescue, and make real-time and effective decisions [11]. Because of its unexpectedness and uncertainty, emergency decision makers often make on-site decisions based on historical experience. The time to collect data and build models to solve problems by conventional means is insufficient, and it is impossible to quantitatively compare the scientificity and advantages of decision-making. In view of the above characteristics, decision makers can use artificial intelligence, big data and cloud computing technology to establish decision support systems, improve decision-making computing ability, information collection ability, timely processing of a large number of diverse and heterogeneous field data, access similar successful emergency response solutions in a short time, and finally make the most reasonable and effective. Decision-making.

4.4. Post-recovery and Reconstruction
The application of artificial intelligence technology in the post-recovery and reconstruction stage mainly involves investigation, assessment and accountability. With the combination of AI and big data technology, it can reproduce the history and provide technical and information support for accident investigation and accountability investigation.

5. Conclusion
AI assisted emergency management in petroleum industry essentially integrates AI technology into emergency management, making AI technology and emergency prevention and preparedness stage, monitoring and early warning, emergency response and rescue, and post-recovery and reconstruction. Integration of artificial intelligence technology can not only obtain the optimal emergency material reserve, more timely and prepared emergency monitoring and early warning, more effective emergency response decision-making and plan, more reasonable or fair accident investigation results. The most important thing is that AI can involve the whole process of emergency management and bring industrial upgrading to the petroleum industry.

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