Research and Development of AI Convergence Hazardous Chemicals Detection System

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***Abstract*—The Seowon University consortium and the National Fire Service are developing the AI Convergence Hazardous Chemicals Detection System using artificial intelligence technology and firefighting data with support from the Ministry of Science and ICT and the National IT Industry Promotion Agency. This research and development is the study to detect and analysis the types of hazardous chemical substances from the initial chemical accident video images using artificial intelligence technology. In this paper, we introduce the first-year research results and future research of the three-year project from 2022 to 2024.**

Keywords— hazardous chemicals detection system, artificial intelligence, firefighting data, video image processing

I. INTRODUCTION

With the growth of Korea's chemical industry and the increase in handling of chemicals, the importance of responding to chemical disasters is increasing along with the increase in production and distribution[1,2]. The number of human casualties due to chemical accidents was 241 (13 dead, 228 injured), and although the number of cases decreased compared to the previous year, the number of human casualties increased. The occurrence of chemical disasters showed a temporary high incidence in April when the temperature began to rise. - August (30 cases), September (22 cases), July (20 cases), etc. It was found that most chemical accidents occurred during the summer when the temperature was high.

II. AI CONVERGENCE HAZARDOUS CHEMICALS DETECTION SYSTEM

Due to the development of the chemical industry and the deterioration of chemical facilities, the damages of recent chemical accidents have become large and the size of damages from accidents is increasing. Seowon University(VAIV Company inc., WooKyoung Information Technology), together with the National Fire Agency, is developing an “AI convergence Hazardous Chemicals Detection System” based on artificial intelligence technology and firefighting field data with support from the Ministry of Science and ICT and the National IT Industry Promotion Agency(NIPA).

In this research project, we develop the artificial intelligence system using video clips of actual chemical disasters and related information to analysis and detect the types of hazardous chemical substances and types of accidents (leaks, fires, and explosions)[3].

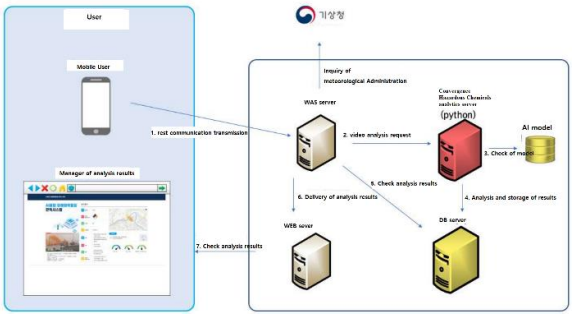

Fig. 1 Design of AI Convergence Hazardous Chemicals Detection System

The analysis and detect results of the hazardous chemical inspection system are being conducted from 2022 to 2024 for the purpose of supporting prompt and correct initial response to firefighters dispatching at the scene of a chemical disaster.

III. CONCLUSION

As a result of the first year, this study established 440,000 image artificial intelligence learning data for 10 types of chemicals, and applied an artificial intelligence reading model for chemical detection to achieve 46% reading accuracy (target value) for Top 1. 40%) and 66% reading accuracy (target 50%) for Top 3.

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