INTISARI

KLASIFIKASI TINGKAT BAHAYA KEBOCORAN GAS LPG BERBASIS *CONVOLUTIONAL NEURAL NETWORK* DAN VARIAN *RECURRENT NEURAL NETWORK*

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Kehadiran gas berbahaya dapat memberikan bahaya serius terhadap manusia. Gas tersebut penting untuk dapat diklasifikasi tingkat bahayanya guna mengambil tindakan pencegahan yang tepat. Salah satu jenis gas berbahaya yang dapat muncul adalah bocornya gas *liquid petroleum gas* (LPG), yang dapat mengalami pembentukan gas beracun karbon monoksida (CO). Penelitian ini melakukan perancangan piranti *electronic nose* sederhana untuk deteksi gas menggunakan mikrokontroler Arduino Nano dan sensor gas, seperti sensor MQ2, MQ6, MQ7, dan MQ9. Rancangan piranti *electronic nose* ini digunakan untuk klasifikasi tingkat bahaya kebocoran gas LPG dengan menggunakan metode varian *recurrent neural network* (RNN), yaitu *long short-term memory* (LSTM) dan *gated recurrent unit* (GRU), serta kombinasi antara varian *recurrent neural network* (RNN) dengan *convolutional neural network* (CNN). Penelitian ini juga melakukan perbandingan hasil performa klasifikasi dengan beberapa metode klasifikasi populer, seperti *multi layer percetron* (MLP) dan *support vector machine* (SVM). Penelitian menghasilkan rancangan piranti *electronic nose* sederhana, serta hasil klasifikasi menunjukkan bahwa metode yang diusulkan mencapai nilai performa yang berbeda dan memberikan nilai yang lebih baik daripada metode klasifikasi populer, seperti MLP dan SVM. Dari kelima rancangan model yang diusulkan, performa terendah dimiliki oleh metode varian RNN, yaitu LSTM dengan nilai akurasi mencapai 97,680557%, sedangkan performa tertinggi dimiliki oleh metode kombinasi CNN dengan LSTM dan GRU dengan nilai akurasi mencapai 98,180556%.

Kata kunci: LPG (*Liquid Petroleum Gas*), *Long Short-Term Memory* (LSTM), *Gated Recurrent Unit* (GRU), *Convolutional Neural Network* (CNN)

ABSTRACT

CLASSIFICATION OF GAS HAZARD LEVEL BASED ON CONVOLUTIONAL NEURAL NETWORK AND VARIANT RECURRENT NEURAL NETWORK

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The presence of hazardous gases can pose a serious hazard to humans. The gas is important to be able to classify the level of danger in order to take appropriate precautions. One type of dangerous gas that can appear is the leakage of liquid petroleum gas (LPG), which can experience the formation of toxic gas carbon monoxide (CO). This study designed a simple electronic nose device for gas detection using an Arduino Nano microcontroller and gas sensors, such as the MQ2, MQ6, MQ7, and MQ9 sensors. The design of this electronic nose device is used to classify the danger level of LPG gas leaks using the variant recurrent neural network (RNN) method, namely long short-term memory (LSTM) and gated recurrent unit (GRU), as well as a combination of variants of recurrent neural network (RNN).) with a convolutional neural network (CNN). This study also compares the classification results with several popular classification methods, such as multi-layer percetron (MLP) and support vector machine (SVM). The research resulted in the design of a simple electronic nose device, and the classification results showed that the proposed method achieves different performance values and gives better values than popular classification methods, such as MLP and SVM. Of the five proposed model designs, the lowest performance is owned by the RNN variant method, namely LSTM with an accuracy value of 97.680557%, while the highest performance is owned by the combination method of CNN with LSTM and GRU with an accuracy value of 98.180556%.

Keywords: LPG (liquid petroleum gas), Long Short-Term Memory (LSTM), Gated Recurrent Unit (GRU), Convolutional Neural Network (CNN)