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MERAMAL BACAAN MAKSIMUM HARIAN NITROGEN DIOKSIDA MENERUSI PENDEKATAN KALUT

(Forecasting Maximum Daily Reading of Nitrogen Dioxide Through Chaotic Approach)

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ABSTRAK

Peramalan ke atas bahan pencemar udara Nitrogen Dioksida (NO_2) adalah sangat penting kerana udara yang mengandungi NO_2 memberi kesan bahaya kepada kesihatan manusia dan boleh menyebabkan pelbagai penyakit kronik seperti emphysema dan bronkitis kronik. Data siri masa NO_2 yang dikaji dicerap mengikut jam di stesen yang terletak di kawasan perindustrian, iaitu Petaling Jaya, Selangor. Peramalan melalui pendekatan kalut melibatkan dua langkah, iaitu pembinaan semula ruang fasa dan proses peramalan. Sebelum model peramalan dibina, data siri masa diuji terlebih dahulu untuk mengenal pasti kehadiran dinamik kalut. Melalui plot ruang fasa dan kaedah Cao, didapati bahawa sifat kalut hadir dalam siri masa NO_2. Bagi langkah peramalan, kaedah penghampiran purata setempat digunakan untuk meramal siri masa NO_2. Keputusan peramalan menunjukkan nilai pekali korelasi yang sangat memuaskan, iaitu 0.7635. Sebagai inovasi dalam kajian ini, peramalan dilakukan terhadap nilai bacaan maksimum data pada setiap hari. Peramalan nilai maksimum harian data siri masa NO_2 menunjukkan hasil peramalan yang cemerlang dengan nilai pekali korelasi 0.9139. Secara keseluruhan, hasil peramalan bagi kedua-kedua kaedah ini sangat memuaskan. Oleh itu, peramalan nilai maksimum harian data siri masa boleh dicadangkan untuk meramal data siri masa bahan pencemar yang lain, iaitu PM_{10}, SO_2, O_3 dan CO. Diharapkan dengan penemuan ini dapat membantu pihak bertanggungjawab seperti Jabatan Alam Sekitar dalam mengawal pencemaran NO_2 terutamanya di kawasan perindustrian.

Kata kunci: pencemar udara; pendekatan kalut; peramalan

ABSTRACT

Forecasting of Nitrogen Dioxide (NO_2) air pollutants is very important because the air containing NO_2 can be harmful to human health and can cause chronic diseases such as emphysema and chronic bronchitis. The NO_2 time series are analyzed hourly at industrial area, Petaling Jaya, Selangor. Forecasting using chaotic approach that involves the reconstruction of phase space and forecasting process have been employed in this research. Before the forecasting model can be built, the time series are tested in advance to determine whether the nature is chaotic or not. Through phase space plot and Cao method, chaotic dynamic are found present in the NO_2 times series. For forecasting process, the forecasting is made with local mean approximation method. The result shows that correlation value is 0.7635. As an innovation, prediction made onto maximum reading of daily time series. The forecasting model using maximum reading of daily time series shows the excellent result with a correlation coefficient value of 0.9139. Overall, forecasting result for both methods provide an excellent finding. Therefore, the forecasting model using maximum reading of daily time series can be suggested to forecast the other air pollutants such as PM_{10}, SO_2, O_3 dan CO. These findings are expected to help stakeholder such as Department of the Environment to manage NO_2 pollution especially in the industrial area.

Keywords: air pollutant; chaotic approach; forecasting

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