

INTISARI

Hasil survei oleh *INRIX Research* tahun 2017 Kota Yogyakarta menduduki peringkat ke-60 dunia sebagai kota termacet secara global dan nomor 4 di Indonesia. Kemacetan terjadi di jam padat kendaraan saat pagi dan sore. Kemacetan diakibatkan volume komuter dalam jumlah besar yang berasal dari peri-urban. Faktor lain yang mengakibatkan kemacetan yaitu banyak perubahan dan pemanfaatan lahan yang kurang sesuai. Seiring dengan semakin besarnya ketergantungan dan penggunaan gawai pintar, informasi kemacetan sangat cepat menyebar. Informasi kemacetan menjadi salah satu fenomena sehari-hari yang marak di media sosial. Informasi kemacetan disampaikan dalam bentuk pesan teks, dan gambar, dengan atau tanpa informasi lokasi (geolokasi) melalui beragam media, salah satunya *Twitter*.

Penelitian ini menganalisis kemacetan Kota Yogyakarta dengan memperhatikan faktor perubahan penggunaan dan pemanfaatan lahan serta menampilkan pola kemacetan dalam tampilan geovisualisasi *Heat-maps* dan *Space-time Cube* (STC). Informasi kemacetan lalu lintas diperoleh melalui data *crowdsourced* dengan metode *web scrapping API Twitter* tahun 2013-2020, sedangkan perubahan penggunaan dan pemanfaatan lahan diperoleh melalui Citra Satelit SPOT-6 dan SPOT-7 tahun 2013-2016. Berdasarkan laporan kemacetan lalu lintas hasil *web scrapping Twitter*, diperoleh jumlah laporan kemacetan antara tahun 2013 sampai dengan tahun 2020 sebanyak 20.351 dengan durasi waktu paling tinggi pada pukul 16.00-17.00 WIB dan kondisi paling lengang pada jam 23.00-24.00 WIB. Adapun perubahan lahan dari tahun 2013-2016 sebesar 1% atau seluas 1.814 Ha. Hasil analisis kemacetan yang disajikan dalam tampilan *Heat-maps* dan *Space-time Cube* (STC) selanjutnya dinilai efektivitasnya oleh 35 koresponden.

Hasil pemetaan diperoleh distribusi kejadian kemacetan berada di pusat perbelanjaan, tempat pariwisata dan tempat transportasi publik. Menurut Rencana Tata Ruang Wilayah lokasi kejadian kemacetan dari tahun 2013-2020 dominan berlokasi di kawasan permukiman, dan perdagangan dan jasa. Geovisualisasi *Heat-maps* mampu memberikan informasi densitas melalui warna sehingga pembaca mudah memahami pola densitas dan distribusi kemacetan. *Space-time Cube* (STC) mempunyai kelebihan variabel waktu sehingga mampu menampilkan pergerakan secara 3D. Dari evaluasi yang dilakukan pada uji efektivitas geovisualisasi *Heat-maps* dan *Space-time Cube* (STC), didapatkan konfirmasi bahwa efektivitas desain geovisualisasi tertinggi diperoleh untuk, variabel warna, disusul variabel *zoom* (perbesaran), variabel durasi waktu, dan paling rendah variabel frekuensi.

Kata kunci: kemacetan, penginderaan jauh, *web scrapping*, *heat-maps*, *space-time cube*

ABSTRACT

Based on results of a survey by INRIX Research in 2017 the city of Yogyakarta was ranked 60th in the world as the most congested city globally and ranked 4th in Indonesia. Congestion occurs during traffic jams in the morning and evening. Congestion is caused by the large volume of commuters coming from peri-urban areas. Another factor that causes congestion is a lot of changes and inappropriate land uses. Nowadays humans are increasingly very dependent on smart devices, through which congestion information could spread very quickly. Information on local congestion is one of the consistent hot topics on social media. Traffic jam information can be conveyed in the form of text messages, and images, which are either geolocated or not, for example through Twitter app.

This research analyzes the congestion in the city of Yogyakarta by taking into account the changes in land use and utilization and displays the congestion pattern in the Geovisualization of Heat-maps and Space-time Cube (STC). Traffic congestion information was obtained through crowdsourced with the Twitter API web scraping method in 2013-2020, while changes in land use and use were obtained through SPOT-6 and SPOT-7 Satellite Imagery in 2013-2016. Based on traffic jam reports from Twitter web scraping, the number of traffic jam reports between 2013 and 2020 was 20,351 with the highest time duration at 16.00-17.00 WIB and the quietest conditions at 23.00-24.00 WIB. The land change from 2013-2016 was 1% or an area of 1,814 Ha. The results of the congestion analysis presented in the Heat-maps and Space-time Cube (STC) display were then assessed for effectiveness by 35 correspondents.

The results of the mapping show that the distribution of traffic jams is in shopping centers, tourism places and public transportation places. Based on the Regional Spatial Plan, the location of congestion from 2013-2020 is mostly in residential areas, as well as trade and service areas. Geovisualization Heat-maps are able to provide density information through color so that readers can easily understand density patterns and congestion distribution. The Space-time Cube (STC) has the advantage of being a time variable so that it can display movement in 3D. From the evaluation carried out on the effectiveness of the Geo-visualization Heat-maps and Space-time Cube (STC), it was confirmed that the highest geo-visualization design effectiveness was obtained for the color variable, followed by the zoom variable, the time duration variable, and the lowest frequency variable.

Keywords: congestion, remote sensing, web scraping, heat-maps, space-time cube