THE DEVELOPMENT OF A TRACKING ALGORITHM FOR AMBULANCE DETECTION USING SQUARING OF RGB AND HSV COLOR PROCESSING TECHNIQUES

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Thesis submitted in fulfillment of the requirements
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AUGUST 2016

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LIST OF SYMBOLS

P_{max}	new pixel level
P_{in}	input pixel level
f_{min}	minimum value of desired range
f_{max}	maximum value of desired range
$P_{new,RGB}$	new pixel color value
$P_{in,RGB}$	input pixel color value
min_{RGB}	lowest pixel value
max_{RGB}	highest pixel value
$P_{j(rj)}$	histogram with intensity levels of image
n	total number of pixels
n_j	total number of gray level pixels
r_j	gray level
A	original binary image
B	symmetric structuring element
A_1	first input image
C	constant
k	clusters

LIST OF ABBREVIATIONS

RGB	Red, Green, Blue
YCbCr	Luminance; Chroma:Blue; Chroma:Red
HSV	Hue, Saturation, Value
HIS	Hue, Intensity, Saturation
HSL	Hue, Saturation, Lumination
CCTV	Camera Closed-circuit Television
CMYK	Cyan, magenta, yellow, key (black)
Eq.	equation
et al.	and others
i.e.	that is
EMAS	Expressway Monitoring and Advisory System
CHART	Coordinated Highway Action Response Team
ADRS	Accident Detection and Reporting System
ESP	Emergency Service Provider
APID	All Purpose Incident Detection
DES	Double Exponential Smoothing
ATMS	Advanced Traffic Management Systems
ARRS	Traffic Accident Recording and Reporting System
MOG	Mixture of Gaussian Model
GPRS	General Packet Radio Service
GSM	Global System for Mobile Communications
GPS	Global Positioning System
RFID	Radio Frequency Identification

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ABSTRACT

One of the factors that often leads to traffic congestion in cities is traffic lights at a road intersection. Customarily, traffic lights are pre-programmed with fixed timers and does not consider vehicle intensity at intersections. It does not have an intelligent sensor to self-learn the road conditions and number of vehicles so that the controller will react based on the traffic information at a particular intersection. Furthermore, emergency vehicles such as ambulance, fire engines and police cars, also face similar problems whenever they reach a traffic light. It is difficult to those emergency vehicles to bypass the congested traffic at traffic lights due to unintelligent traffic light system. Moreover, present smart traffic light system requires to adapt with new algorithms and technologies, for instance vision sensors that are able to detect emergency vehicles that needs to pass by a traffic light. In the future, it is expected that the detection from a tracking algorithm will automatically switch the traffic light signals based on the road conditions. In this study, a tracking algorithm is developed by means of image processing technique in detecting ambulance. Through the combination of two color space, the tracking algorithm can detect the ambulance with higher percentage of detection and is insensitive to the varying illumination of sun light. HSV color space and RGB color has been used to analyze the light of the emergency vehicle as well as a feature for classification. By the combination of morphological approach to select the region of interest, the tracking algorithm delivers promising results as the tracking algorithm achieved 90% of ambulance detection at road intersections.

ABSTRAK

Salah satu faktor kesesakan trafik di sebuah bandar yang sibuk adalah disebabkan oleh lampu isyarat di persimpangan jalan. Kebiasanya, lampu isyarat yang digunapakai sekarang telah diprogramkan dengan masa, di mana ia tidak mengambil kira keadaan trafik dan kenderaan di persimpangan. Ia tidak mempunyai sensor pintar untuk mempelajari keadaan semasa yang berlaku dan akan bertindak balas berdasarkan maklumat lalu lintas di persimpangan. Tambahan pula, bagi kes kecemasan seperti ambulan, kereta bomba dan kereta peronda polis, mereka juga menghadapi masalah apabila sampai di lampu trafik. Adalah sukar untuk kenderaan kecemasan untuk melepasi trafik sesak di lampu isyarat dan keadaan ini memerlukan satu sistem yang lebih bijak. Berpandukan keperluan itu, satu algoritma pengesanan automatik yang dapat mengesan kehadiran kenderaan kecemasan secara automatik dibina. Algoritma ini menggunakan teknik pemprosesan imej untuk menganalisa imej dan mengesan kehadiran kenderaan kecemasan tersebut. Untuk masa akan datang, pengesanan dari algoritma pengesanan akan bertindak balas sebagai suis atau isyarat untuk pengawal lampu isyarat. Dalam kajian ini, objektif utama adalah untuk membangunkan algoritma pengesanan untuk mengesan ambulans menggunakan teknik pemprosesan imej. Menggunakan gabungan dua ruang warna, algoritma pengesanan boleh mengesan ambulans dengan peratusan yang lebih tinggi dan tidak begitu sensitif terhadap perubahan pencahayaan dari cahaya matahari. Ruang warna HSV dan warna RGB telah digunakan untuk menganalisis lampu kenderaan kecemasan dan ia menjadi salah satu ciri-ciri untuk klasifikasi. Dengan gabungan pendekatan morfologi untuk memilih rantau yang menarik, algoritma pengesanan yang memberikan hasil yang memberangsangkan seperti yang dinyatakan dalam bab keputusan dan perbincangan. Kajian dan pembangunan algoritma pengesanan mencapai 90% kadar kejayaan dalam mengesan kehadiran kenderaan kecemasan.

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