

A LITERATURE SURVEY ON STREET QUALITY IDENTIFICATION

Domain: Internet of Things (IOT)

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PAPER 1: Street quality identification device

AUTHORS: Varun Adibhatla, Graham Henke, Patrick Atwater

PUBLISHED YEAR: 2015

JOURNAL: Bloomberg data for good exchange conference, New York City 28

SUMMARY: In this paper, we describe the design and development of SQUID (Street Quality Identification Device), a low-cost sensor platform mounted on official city vehicles to passively measure street surface quality by combining a microcomputer, accelerometer, GPS and a camera to build an image database of the underlying street surface quality across the entire city. The collection of this data, at scale, would thus represent a low-cost baseline to make strategic and operational decisions about street resurfacing. Street Quality Identification Device (SQUID) is the combination of a microcomputer and associated sensors installed in a non-intrusive form factor to passively collect data in a scalable manner towards achieving a citywide map of street defects. In this section, we describe the design and development of the device itself, the data that it will emit and the decision making that can be facilitated by a citywide map of street defects. SQUID is built using consumer grade electronic components. The core component is the Raspberry Pi 2, a small Linux-based computer. The Pi processes and stores all data collected from attached sensors and peripherals. The three primary components for collecting data are an accelerometer, a GPS unit, and a camera.

PAPER 2: Design of Surface Quality Identification Device

AUTHORS: Vangala Indhrani, K Mounika, Srinivasan Ashok Kumar

PUBLISHED YEAR: 2022

JOURNAL: Futuristic Communication and Network Technologies: Select Proceedings of VICFCNT 2020, 77-82

SUMMARY: A novel surface quality identification device for vehicles is a low-cost sensor platform mounted on vehicles to identify the quality of the streets. Design and development of street quality identification device have been proposed, and it is mounted on public vehicles. The proposed device designing and development are made with microcomputers, accelerometer, GPS, camera to build an image database and Internet of things (IOT). By combining of all the above, we can collect data and represent a low-cost device to identify the street surface quality. And the concept of surface quality identification device has been proposed for real-time applications.

PAPER 3: Quality control of road project: identification and validation of a safety indicator

AUTHORS: A Calvi, F D'Amico

PUBLICATION YEAR: 2006

JOURNAL: Advances in transportation studies

SUMMARY: Driver behavior in both normal and abnormal (stress, fatigue, risk) circumstances are not taken into account by geometrical indicators. Such circumstances are often created by road environment and way of driving. Repeated transversal accelerations and other dynamic stresses while driving, for example, may induce abnormal behaviors. A new, advanced, and effective indicator has been proposed and validated to assess road infrastructure safety which considers investigating transversal acceleration variability as an unbiased indicator of discomfort. Its main theoretical assumption is that a driver on a self-explaining road will assume a safe, correct trajectory and local transversal accelerations depend on the geometrical curvature of the road. The road is not self-explaining and may be unsafe if correction of the vehicle's trajectory is greater than what the road curvature imposes. Local transversal accelerations are biased by the driver's corrections of trajectory if they do not depend on actual road curvature. The proposed indicator accounts for the frequency and amplitude of anomalous

corrections of trajectory. Use of an advanced driving simulator has verified the theoretical hypothesis of high correlation between the proposed indicator and the observed accident rate. The authors also present an analysis of the correlation between such an indicator and a geometrical parameter. The numerical results of two Italian case studies also confirmed such a theoretical hypothesis through numerical results. Correlation parameter values are much higher than expected. Additional case study validations are suggested before model generalization, although outcomes are extremely promising.

PAPER 4: A Systematic Measurement of Street Quality through Multi-Sourced Urban Data: A Human-Oriented Analysis

AUTHORS: Lingzhu Zhang, Yu Ye , Wenxin Zeng and Alain Chiaradia

PUBLICATION YEAR: 2019

JOURNAL: Many studies have been made on street quality, physical activity and public health. However, most studies so far have focused on only few features, such as street greenery or accessibility. These features fail to capture people's holistic perceptions. The potential of fine grained, multi-sourced urban data creates new research avenues for addressing multi-feature, intangible, human-oriented issues related to the built environment. This study proposes a systematic, multi-factor quantitative approach for measuring street quality with the support of multi-sourced urban data taking Yangpu District in Shanghai as case study. This holistic approach combines typical and new urban data in order to measure street quality with a human-oriented perspective. This composite measure of street quality is based on the well-established 5Ds dimensions: Density, Diversity, Design, Destination accessibility and Distance to transit. They are combined as a collection of new urban data and research techniques, including location-based service (LBS) positioning data, points of interest (PoIs), elements and visual quality of street-view images extraction with supervised machine learning, and accessibility metrics using network science. According to these quantitative measurements from the five aspects, streets were classified into eight feature clusters and three types reflecting the value of street quality using a hierarchical clustering method. The classification was tested with experts. The analytical framework developed through this study

contributes to human-oriented urban planning practices to further encourage physical activity and public health.

PAPER 5: Inspect Road Quality by Using Anomaly Detection Approach

AUTHORS:

PUBLICATION YEAR:

JOURNAL: IEEE (Institute of Electrical and Electronics Engineers)

SUMMARY: Road quality can be representative of a country's development status, affect transportation speeds and traveler safety. However, there is no standard or set of rules to protect people from the dangers of damaged roads. This study proposes a method for evaluating road quality, which has been made possible by the recent rapid development of information technology and machine learning algorithms, and the popularity and widespread use of smartphones. The proposed inspection method is a road quality inspection APP which collects raw data from smartphone sensors, including GPS and accelerator sensors. Once the data is collected, the server side of the proposed system runs an anomaly detection algorithm to interpret the recorded oscillating amplitude of a specific section of road. The calculated results are then added to the Google Maps app, and abnormal road sections are marked in different colors.

PAPER 6: Street Quality Mapper: Real-time Pothole Identification and Street Quality Mapping using Signal Processing

AUTHORS:

PUBLICATION YEAR:

JOURNAL: IEEE (Institute of Electrical and Electronics Engineers)

SUMMARY: Street Quality Mapper is a go-to solution created to solve the issues faced by over 35,75,000 vehicles who hit the roads of Mumbai on any given day. SQM consists of a complete map of the street quality surface of a city and gives a bird's eye view of the roads, enabling the administrator to keep an eye on the state of roads in real time and take informed decisions to improve the road condition. Other beneficiaries include ambulances and the fire department, as they deal with

time-sensitive cases and transit of fragile instruments like medical equipment. By using the system, they can make proper decisions and select the best suited route. Signal processing is used to analyse acceleration fluctuations to determine the road quality and ascertain the presence of potholes on the street. The streets are color-coded based on the road quality and the potholes are plotted on the street maps.

PAPER 7: The visual quality of streets: A human-centred continuous measurement based on machine learning algorithms and street view images

AUTHORS: Yu Ye Tongji, China Wei Zeng Shenzhen, Qiaomu Shen, Xiaohu Zhang, Yi Lu

- **PUBLISHED YEAR:** 2019
- **JOURNAL:** Environment and Planning B Urban Analytics and City Science

SUMMARY: This study proposes a workable approach for quantitatively measuring the perceptual-based visual quality of streets using machine learning algorithms and street view images. SegNet was used to extract pixels representing key elements affecting the visual quality of streets, while an artificial neural network was used to train an evaluation model to achieve a citywide, high-resolution evaluation of the visual quality of the streets. The results from the artificial neural network showed a satisfactory accuracy. This study contributes to the development of human-centred planning and design by providing continuous measurements of an 'unmeasurable' quality across large-scale areas. It also provides insights on the perceptual-based visual quality and detailed mapping of various key elements in streets, which can assist in more efficient street renewal by providing accurate design guidance. Street view images, machine learning, urban design, street, visual quality.

PAPER 8: Identification on the street: A field comparison of police street identifications and video line-ups in England

AUTHORS: Josh P. Davis, Tim Valentine, Amina Memon

PUBLICATION YEAR: 2015

JOURNAL: University of Greenwich, Eltham, London, SE9 2UG, UK

SUMMARY: This publication discusses a field comparison of police street identifications and video line-ups in England. Four authors, including Dr Josh P. Davis (University of Greenwich), Tim Valentine (Goldsmiths, University of London), Amina Memon (Royal Holloway, University of London) & Andrew J Roberts (Melbourne Law School), are working on related projects such as the LASIE FP7 project (Large Scale Information Exploitation of Forensic Data) and Family relationships in ‘super’ face recognition ability, shyness and personality. The research was funded by the Nuffield Foundation (AJU.33483) and the authors would like to thank two anonymous reviewers for their comments on an earlier version. A street identification or live showup provides an eyewitness with an opportunity to identify a suspect shortly after a crime. In England, the majority of suspects identified are subsequently included in a video lineup for the same witness to view.

In Study 1, robbery squad data from three English police forces recorded 696 crimes, the identification procedures employed and prosecution decisions. In Study 2, data of 59 crimes were collected in which suspects, identified in a street identification, were subsequently filmed for a video lineup. Across both studies, most (84%) suspects identified in the street were subsequently identified in a video lineup, indicative of a commitment effect, in which a witness conforms to their first identification decision. All suspects identified in two procedures were eventually cautioned or charged to appear in court. To reduce the likelihood of a mistaken identification of an innocent suspect caught up in an investigation, all possible steps should be taken to reduce the inherent suggestiveness of the street identification procedure.

PAPER 9: Identification of Road-Surface Type Using Deep Neural Networks for Friction Coefficient Estimation

AUTHORS: Eldar Šabanović , Vidas Žuraulis , Olegas Prentkovskis and Viktor Skrickij

PUBLICATION YEAR: 2020

JOURNAL: Transport and Logistics Competence Centre; Vilnius Gediminas Technical University, Saulėtekio

SUMMARY: Nowadays, vehicles have advanced driver-assistance systems which help to improve vehicle safety and save the lives of drivers, passengers and pedestrians. Identification of the road- surface type and condition in real time using a video image sensor, can increase the effectiveness of such systems significantly, especially when adapting it for braking and stability-related solutions. This paper contributes to the development of the new efficient engineering solution aimed at improving vehicle dynamics control via the anti-lock braking system (ABS) by estimating friction coefficient using video data. The experimental research on three different road surface types in dry and wet conditions has been carried out and braking performance was established with a car mathematical model (MM). Testing of a deep neural networks (DNN)-based road-surface and conditions classification algorithm revealed that this is the most promising approach for this task. The research has shown that the proposed solution increases the performance of ABS with a rule- based control strategy.

PAPER 10: Demystifying the Roles of Streets towards Improving Urban Quality of Life

AUTHORS: Zainuddin Ab Rahman, Sharifah Khalizah Syed Othman Thani, Rafiuddin Roslan

PUBLICATION YEAR: 2017

JOURNAL: Environment-Behaviour Proceedings Journal

SUMMARY: This paper aims to demystify how the quality of streets could facilitate the street culture and shaping greater urban qualities. Numerous scholars believed that certain streets had contributed an utmost factor in shaping man's civilisation, but the development of modern cities has contributed to a great loss of streets significance as spaces for socialising and dwelling in the local peoples' needs. The authors of the paper are Zainuddin Ab Rahman, Sharifah Khalizah Syed Othman Thani, and Rafiuddin Roslan. The paper is available online at www.e-iph.co.uk and is open access under the CC BYNC-ND license. Peer-review under responsibility of AMER (Association of Malaysian Environment-Behaviour Researchers), ABRA (Association of Behavioural Researchers on Asians) and cE-Bs (Centre for Environment-Behaviour Studies), Faculty of Architecture, Planning and Surveying, Universiti Teknologi MARA, Malaysia.

This paper aims to guide practitioners, policy makers and urban designers to incorporate the inclusive street design towards providing a better quality of urban life. It explores the characteristics and quality of urban streets that accommodate the street culture and shape the urban quality of life for urban dwellers. It also looks at the relationship between urban livability and quality of life, as well as the relationship between urban livability and quality of life. It also looks at the relationship between urban livability and quality of life, as well as the relationship between urban livability and quality of life. Finally, it looks at the relationship between urban livability and quality of life, as well as the relationship between urban livability and quality of life.