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A Review Article Novel Approach To Classification of Capacity Urban and Rural Roads with Detection of Traffic Noise across Higher Density

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Abstract- In order to accurately predict the short-term traffic flow, this paper presents a k-nearest neighbor (KNN) model. Short-term urban expressway flow prediction system based on k-NN is established in three aspects: the historical database, the search mechanism and algorithm parameters, and the predication plan. At first, preprocess the original data and then standardized the effective data in order to avoid the magnitude difference of the sample data and improve the prediction accuracy. At last, a short-term traffic prediction based on k-NN nonparametric regression model is developed in the Matlab platform. Utilizing the Shanghai urban expressway section measured traffic flow data, the comparison of average and weighted k-NN nonparametric regression model is discussed and the reliability of the predicting result is analyzed. Results show that the accuracy of the proposed method is over 90 percent and it also rereads that the feasibility of the methods is used in short-term traffic flow prediction.

Keywords- Prediction; Short-term Traffic flow; Nonparametric Regression Model; k-NN; Urban Expressway.

I. INTRODUCTION

Over the past decade, use of motorized vehicles has been significantly increased with rapid growth of urbanization in India. This robust increase in population has given a challenge for the development of modern society which has turned into a major concern in metropolitan cities in developing countries like India. At present, the world population crosses seven billion and population residing at urban areas are nearly half of seven billion counts which is expected to raise up to 60 % over worlds entire population by the end of 2025 [1]. Indian cities are well connected with urban roads and rural roads everywhere but, there exists poor transportation network/connectivity with negligible intra and intercity facilities [2].

Hence, traffic flow in heterogeneous conditions is highly complex and is difficult to predict the flow behaviour on urban roads. Driver's comfort, convenience, traffic volume, lane width, grade type, geometric design ravel delay and safety are the major concerns on Indian urban roads which are to be taken care. Monitoring traffic volume and level of service which represents quality transport has become indispensable [3]. In recent years, traffic congestion and decreasing level of service has become major issues in most of the metropolitan cities and results its impact on urban economy and its environment [1], [4,5], [6]. Good transportation facilities are needed to be provided as it plays a major role in growing India's economy [7], [8] [9], [10]. From past studies, it was found that, obtained traffic volume plays a vital role in determining the existing conditions and even possible to predict the future traffic volume conditions [9], [11].

There are certain factors which are responsible for decreasing level of service and traffic congestion i.e., speed and travel time, traffic interruptions and restrictions. This downfall of level of service has become a serious threat as it creates difficulty for vehicle manoeuvring. Similarly, traffic congestion also creates air pollution and noise pollution which is caused by the delays in traffic jams. This traffic congestion and poor level of service on Indian roads have huge impact on its economic growth [1], [9].

There are few commonly used methods like, Cluster Analysis, Genetic Algorithm, Fuzzy Set Theory and Neural Network etc., which are used to determine the Level of service of a particular road section. This paper aims to develop sound understanding of Level of Service (LOS) on urban and rural roads in Indian conditions from the previous studies conducted. The detailed information on various parameters that are used to define LOS are also reported and presented. The classifications of LOS grades along with its operating characteristics are also provided.

II. PROBLEM STATEMENT

Present study also aims to develop traffic flow model for corridor simulation. It comprises combination of two mid-blocks and two intersections. In first intersection turning movements are not incorporated and is included in second

intersection. To represent multiple vehicle types, a multi cell representation was adopted. The position and speed of vehicles are assumed to be discrete in developed model. The speed of each vehicle changes in accordance with its interactions with other vehicles and is governed by pre-assigned (stochastic) rules.

Due to complexity involved in multi cell representation, cross traffic is eliminated and only through traffic is considered. The vision of this model is to incorporate traffic movement partially. The term partially is used here because the cross traffic and turning traffic is not taken in to consideration. Also model is aiming to check the feasibility of using CA for multi cell representation. Simulation result shows that the model performs reasonably well in predicting the travel time.

III. MOTIVATION FOR THE STUDY

Many studies have been carried out in simulating heterogeneous traffic flow. These studies are at microscopic level with car-following rules for vehicle movement. Many of them are restricted by the requirement of high computational resources. Cellular automata (CA) has been efficiently used in the recent past by many researchers for the homogeneous traffic flow model and shows a new computationally efficient way to simulate the traffic flow. Moreover, it is observed that CA vehicle updation rules give vehicular dynamics like shock waves, stopgobehaviour, and fundamental relationship of traffic flow parameters.

IV. DETECTION OF TRAFFIC NOISE

Environmental noise is increasing year after year and be-coming a growing concern in urban and suburban areas, especially in large cities, since it does not only cause an-noyance to citizens, but also harmful effects on people. Most of them focus on health-related problems [1], being of particular worry the impact of noise on children [2], whose population group is especially vulnerable. Other investigations have also shown the effects of noise pollution in con-centration sleep and stress [3].

Finally, it is worth mentioning that noise exposure does not only affect health, but can also affect social and economic aspects [4].Among noise sources, road-traffic noise is one of the main noise pollutants in cities. According to the World Health Organization (WHO), at least one million healthy life years are lost every year from traffic-related noise in western Europe [5].
For instance, it was recently stated that transportation noise alone accounts for 36% of the total burden of disease attributable to urban planning, an even higher percentage than the one caused by air pollution [6].

V. LITERATURE REVIEW

Rosa Ma Alsina-Pagès, Methods for Noise Event Detection and Assessment of the Sonic Environment by the Harmonica Index: Noise annoyance depends not only on sound energy, but also on other features, such as those in its spectrum (e.g., low frequency and/or tonal components), and, over time, amplitude fluctuations, such as those observed in road, rail, or aircraft noise passages. The larger these fluctuations, the more annoying a sound are generally perceived. Many algorithms have been implemented to quantify these fluctuations and identify noise events, either by looking at transients in the sound level time history, such as exceedances above a fixed or time adaptive threshold, or focusing on the hearing perception process of such events.

In this paper, four criteria to detect sound were applied to the acoustic monitoring data collected in two urban areas, namely **Andorra la Vella,** Principality of Andorra, and Milan, Italy. At each site, the 1 s A-weighted short LAeq,1s time history, 10 min long, was available for each hour from 8:00 a.m. to 7:00 p.m. The resulting 92-time histories cover a reasonable range of urban environmental noise time patterns. The considered criteria to detect noise events are based on: (i) noise levels exceeding by +3 dB the continuous equivalent level LAeqT referred to the measurement time (T), criteria used in the definition of the Intermittency Ratio (IR) to detect noise events; (ii) noise levels exceeding by +3 dB the running continuous equivalent noise level; (iii) noise levels exceeding by +10 dB the 50th noise level percentile; (iv) progressive positive increments of noise levels greater than 10 dB from the event start time. Algorithms (iii) and (iv) appear suitable for notice-event detection; that is, those that (for their features) are clearly perceived and potentially annoy exposed people.

Joan ClaudiSocoró, Development of an Anomalous Noise Event Detection Algorithm for Dynamic Road Traffic Noise Mapping: Dynamic road traffic noise maps should display, in real time, the noise levels generated by road infrastructures measured by the sensors located on the road. For this reason, any acoustic event produced by another source that could alter the measured noise levels (e.g. an aircraft flying over, nearby railways, church bells, crickets, etc.) should be detected and eliminated from the map computation to provide a reliable picture of the actual road noise impact. To that end, it becomes necessary to devise strategies to automatically identify anomalous noise events captured by the network of sensors. This work describes a first version of the anomalous noise event detection algorithm designed in the LIFE DYNAMAP project. The proposed algorithm follows a “detection-by-classification” approach based on a semisupervised two-class classifier that does not require training with on-site collected “anomalous noise events” samples, thus being location-independent. Instead, it optimizes a decision threshold based on distance distributions with respect to the predominant “road traffic noise” class to maximize

detection accuracy. The experimental results reveal that our proposal outperforms the baseline two-class supervised detector especially in scenarios in which anomalous events show higher noise levels and, thus, are more likely to alter the levels represented in dynamic road traffic noise maps.

FrancescAlías, Detection of Anomalous Noise Events for Real-Time Road-Traflc Noise Mapping: The DYNAMAP's project case study: Environmental noise is increasing year after year, especially in urban and suburban areas. Besides annoyance, environmental noise also causes harmful health effects on people. The Environmental Noise Directive 2002/49/EC (END) is the main instrument of the European Union to identify and combat noise pollution, followed by the CNOSSOS-EU methodological framework. In compliance with the END legislation, the European Member States are required to publish noise maps and action plans every five years.

The emergence of Wireless Acoustic Sensor Networks (WASNs) has changed the paradigm to address the END regulatory requirements, allowing the dynamic ubiquitous measurement of environmental noise pollution. Following the END, the LIFE DYNAMAP project aims to develop a WASN-based low-cost noise mapping system to monitor the acoustic impact of road infrastructures in real time. Those acoustic events unrelated to regular traffic noise should be removed from the equivalent noise level calculations to avoid biasing the noise map generation. This work describes the different approaches developed within the DYNAMAP project to implement an Anomalous Noise Event Detector on the low-cost sensors of the network, considering both synthetic and real-life acoustic data. Moreover, the paper reflects on several open challenges, discussing how to tackle them for the future deployment of WASN-based noise monitoring systems in real-life operating conditions.

Jens Schröder, Automatic acoustic siren detection in traffic noise by part-based models: State-of-the-art classifiers like hidden Markov models (HMMs) in combination with mel-frequency cepstral coefficients (MFCCs) are flexible in time but rigid in the spectral dimension. In contrast, part-based models (PBMs) originally proposed in computer vision consist of parts in a fully deformable configuration. The present contribution proposes to employ PBMs in the spectro-temporal domain for detection of emergency siren sounds in traffic noise,standard generative training resulting in a classifier that is robust to shifts in frequency induced, e.g., by Doppler-shift effects. Two improvements over standard machine learning techniques for PBM estimation are proposed: (i) Spectro-temporal part ("appearance") extraction is initialized by interest point detection instead of random initialization and (ii) a discriminative training approach in addition to standard generative training is implemented. Evaluation with self-recorded police sirens and traffic noise gathered on-line demonstrates that PBMs are successful in acoustic siren detection. One hand-labeled and two machines learned PBMs are compared to standard HMMs employing mel-spectrograms and MFCCs in clean and multi condition (multiple SNR) training settings.

Results show that in clean condition training, hand-labeled PBMs and HMMs outperform machine-learned PBMs already for test data with moderate additive noise. In multi condition training, the machine learned PBMs outperform HMMs on most SNRs, achieving high accuracies and being nearly optimal up to 5 dB SNR. Thus, our simulation results show that PBMs are a promising approach for acoustic event detection (AED).

Satya Ranjan Samal, Analysis of Traffic Congestion Impacts of Urban Road Network under Indian Condition: Traffic congestion has been an area of major bother across the globe. The existing infrastructure is not able to cope with the new traffic demand. Furthermore the restriction of the space and outside activities influencing the traffic congestion. The emerging country like India, where the traffic conditions comprise heterogeneous traffic with no lane discipline, further creates more complicated scenarios for the researcher. A substantial portion of working hours is getting wasted on the roads because of traffic congestion, which imposes the negative effect on the overall economy. There has been numerous of literature and studies for analysis of the traffic congestion and its impacts. However, the result has not been much satisfying. In the present study congestion forecast is aimed under mixed traffic with no lane discipline towards identifying the inherent viability of the diversified traffic situation and presents better recommendations in controlling and evading these prolonged traffic jams.

The urban highway systems were considered as a study area. Required particulars were collected by a License Plate Matching method using video graphic survey for the day rush timing considered from 8:00 AM to 10:00 AM and off peak hours to estimate the travel time of a distinct class of motorized vehicles for selected sections of the urban roadway. Congestion indices for both the up and down traffic of a particular road were evaluated from the data collected from the video recording. Traffic congestion impacts were analyzed and possible mitigation measures have been suggested. The study mainly focused on traffic jam indices with regarded to travel time reliability measures to observe the functional effectiveness of the urban road network.

M. AbsarAlam, Urban Transport Systems and Congestion: A Case Study of Indian Cities: Traffic congestion is a public policy issue and solicits a policy response which can strike a balance between urbanization and urban mobility. In the case of India, several policy initiatives have been undertaken but have not yielded desired outcomes. This is primarily because the focus has

only been on public transport improvement measures, while traffic demand management measures have largely been neglected. This paper studies the traffic scenario in select Asian cities and the policy measures undertaken by their respective governments. It revisits relevant policies in India and assesses the gaps that deter the desired impact of such policies on reducing traffic congestion. It also suggests policy measures to overcome these gaps and the way ahead.

Pala Gireesh Kumar, Level of Service of Urban and Rural Roads- A Case study in Bhimavaram: With rapid growth of population in urban and rural areas, purchase of motorized vehicles is also grown and the demand for proper transportation network which can give good compatibility to the road users has become a major challenge in India. Level of Service (LOS) is one such parameter in terms of compatibility that gives a quality measure for the operational conditions within a traffic stream, i.e., generally in terms of service that is provided by the road to the user.

This paper investigates on the existing level of service models for urban and rural roads given by researchers globally. To determine the Level of service of a particular road section, there are few commonly used methods like, Cluster Analysis, Genetic Algorithm, Fuzzy Set Theory and Neural Network etc., which are used, were discussed and reported in this paper. A new approach for finding level of service was introduced, i.e., using volume to capacity ratio (v/c), average speed of the vehicles; percentage speed reduction is also discussed and presented.

VI. CONCLUSION

Simulation models have been widely used to understand and predict traffic flow phenomena such as shock waves, queuing, and congestion. These models have also been applied in deriving flow characteristics like speed, density, and volume. Traditional car-following models use Newtonian laws of motion to describe traffic flow. Though such models are able to simulate traffic flow with high accuracy, they require large computational time making them unsuitable for real time applications. Compared with more detailed models, the has the advantage that it has a very limited set of parameters to be adjusted. In this context, KNN has emerged as an efficient tool in modelling traffic flow. Several studies demonstrated the modelling simplicity and computational efficiency of KNN in traffic flow modelling.

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