Road Traffic Speed Prediction using Multi-Source Data

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Abstract :Traffic flow forecasting is of great importance for traffic safety, energy conservation and protection of the environment. Nonetheless, making reliable assumptions about traffic volumes is a difficult problem in the face of many external uncertainties. Many previous types of research only explore the usefulness of a single factor in their prediction and do multi-factor research rarely. As for the prediction of traffic flow, many past types of research focus primarily on the temporal distribution of traffic flow at a single point on the road, ignoring the correlation between spaces. As regards global forecasting, the mechanical view of traffic as images was logically far-fetched. Given the effects of several exogenous variables and the interaction between monitor locations, we are proposing a hybrid model to simultaneously predict traffic flow in multiple positions by combining the layer-wise structure with the Markov transition matrix (MTM). Specifically, we use the layer wise structure to capture traffic flow's periodicity, pattern, and nonlinearity characteristics and then generate the MTM that captures the dynamics expressed in the data and generates the corresponding distributions. We apply the methodology on the traffic data, and the experiment tal results show that we can achieve satisfactory predictions using our model, which shows the value of the transition matrix in traffic forecasts. We also introduce the point of interest and analyze its impact on the results of forecasts.

Keywords-Markov transition matrix (MTM), traffic, Xiamen

INTELLIGENT TRANSPORTATION SYSTEM (ITS), TOPIC-ENHANCED GAUSSIAN PROCESS AGGREGATION MODEL (TEGPAM)

I. INTRODUCTION TO DOMAIN

The exponential rise within the variety of motorized vehicles creates tie up on urban roads, with the expansion of cities and also the improvement of living standards for folks. This not solely affects the travel expertise of people, however additionally reduces the transport potency, resulting in a decline in social productivity with all. if potential traffic patterns may well be forecast properly, positive steps may well be taken prior to to avoid tie up and also the associated negative impacts. several analysisers have undertaken relevant research to tackle this drawback by mistreatment historical traffic knowledge, that plays a major role within the intelligent transport system. Anacleto et al. [8] extended the linear multi-regressive dynamic model to resolve the measure error caused by errors in knowledge assortment, and additionally incontestible however shut the approximate prediction limit is to truth prediction limit. The growing graded self-organizing map model was imply by Chiou et al. [9] to assist to assist patterns into associate degree acceptable variety of clusters, so develop a genetic programming model for every cluster so as to predict traffic flow characteristics. Besides, Polson and Sokolov [10] developed a Bayesian particle filter to trace

non-linear and discontinuous flows in flow dynamics. Work et al. [11] used partial equation (PDE) to form the model appropriate for any route network. a site is that the target subject of a bug. it's a term utilized in computer code engineering. Formally it represents the target subject of a particular programming project, whether or not narrowly or loosely outlined. A Networking Domain mistreatment during this project. A network domain is associate degree body grouping of multiple non-public pc networks or hosts among an equivalent infrastructure. Domains is known employing a domain name; domains which require to be accessible from the general public web is allotted a globally distinctive name among the name System (DNS).

How does a domain network work?

The name System (DNS) is that the telephone book of the web. ... net browsers move through net Protocol (IP) addresses. DNS interprets domain names to science addresses thus browsers will load net resources. every device connected to the web contains a distinctive science address that different machines use to seek out the device.

ISSUES AND CHALLENGES

- Forecasting the traffic flow is greatly significant for traffic safety, energy conservation, and environmental protection.
- However, in the face of many external uncertainties, making accurate predictions about traffic volumes is a challenging issue.
- Road traffic speed prediction is a challenging problem in intelligent transportation system (ITS) and has gained increasing attentions.

II. RELATED WORK

[1] J. Zhang, F.-Y. Wang, K. Wang, W.-H. Lin, X. Xu, and C. Chen, ‘‘Data driven intelligent transportation systems: A survey,’’ IEEE Trans. Intell. Transp. Syst., vol. 12, no. 4, pp. 1624–1639, Dec. 2011.

For the last twenty years, intelligent transportation systems (ITS) have emerged as associate economical method of up the performance of transportation systems, enhancing travel security, and providing additional decisions to travelers. a major amendment in ITS in recent years is that way more knowledge square measure collected from a range of sources and might be processed into varied forms for various stakeholders. the provision of an outsized quantity of knowledge will probably cause a revolution in ITS development, dynamical associate ITS from a standard technology-driven system into a additional powerful multifunctional data-driven intelligent installation (D two ITS) : a system that's vision, multisource, and learning algorithmic program driven to optimize its performance. what is more, D two ITS is trending to become a privacy-aware people-centric additional intelligent system. during this paper, we offer a survey on the event of D two ITS, discussing the practicality of its key parts and a few preparation problems related to D two ITS Future analysis directions for the event of D two ITS is additionally given.

[2] C. L. P. Chen and C.-Y. Zhang, ‘‘Data-intensive applications, challenges, techniques and technologies: A survey on big data,’’ Inf. Sci., vol. 275, pp. 314–347, Aug. 2014.

This paper is aimed to demonstrate a close-up read regarding huge information, together with huge information applications, huge information opportunities and challenges, we tend to also because the progressive techniques and technologies we presently adopt to subsume the large information issues. we have a tendency to additionally discuss many underlying methodologies to handle the information deluge, as an example, granular computing, cloud computing, bio-inspired computing, and quantum computing. [3]X.Sun,H.Zhang,W.Meng,R.Zhang,K.Li,andT.Peng,‘‘Primaryresonanceanalysisandvibrationsuppressionf ortheharmonicallyexcitednonlinear suspension system using a pair of symmetric viscoelastic buffers,’’ Nonlinear Dyn., vol. 94, no. 2, pp. 1243–1265, 2018.

The suspension module system model has been established supported MIMO (multiple input and multiple output) state feedback linearization. we've completed decoupling between double suspension points, and therefore the new decoupling technique has been applied to CMS04 magnetic suspension vehicle in national mid-low-speed rail technology experiment field of urban center town in China. Double mechanical system model is incredibly correct for investigation stability property of rail technology system. Once magnetic flux signal is taken back to the suspension system, the suspension module's anti jam capability for resisting suspension load selection has been tried. Also, the external force interference has been increased. As a result, the lustiness and stability properties of double-electromagnet suspension system are increased.

[4] A. Rahim et al., ‘‘Vehicular social networks: A survey,’’ Pervasive Mobile Compute., vol. 43, pp. 96–113, Jan. 2018.

A conveyance Social Network (VSN) is AN rising field of communication wherever relevant ideas ar being borrowed from 2 completely different disciplines, i.e., conveyance ad-hoc networks (VANETs) and mobile social networks (MSNs). This rising paradigm presents new analysis fields for content sharing, information dissemination, and delivery services. supported social network analysis (SNA) applications and methodologies, interdependencies of network entities are often exploited in VSNs for prospective applications. VSNs involve social interactions of commuters having similar objectives, interests, or quality patterns within the virtual community of vehicles, passengers, and drivers on the roads. during this paper, considering social networking in a very conveyance atmosphere, we tend to investigate the potential applications of VSNs and communication design. VSNs enjoy the social behaviors and quality of nodes to develop novel recommendation systems and route designing. we tend to gift a progressive literature review on socially-aware applications of VSNs, information dissemination, and quality modeling. Further, we tend to provide an summary of various recommendation systems and path designing protocols supported crowd sourcing and cloud-computing with future analysis directions.

PROPOSED SYSTEM

Given the effects of several exogenous variables and the interaction between monitor locations, we are proposing a hybrid model to simultaneously predict traffic flow in multiple positions by combining the layer-wise structure with the Markov transition matrix (MTM). Specifically, we use the layerwise structure

to capture traffic flow's periodicity, pattern, and nonlinearity characteristics and then generate the MTM that captures the dynamics expressed in the data and generates the corresponding distributions. We apply the methodology on the traffic data, and the experimental results show that we can achieve satisfactory predictions using our model, which shows the value of the transition matrix in traffic forecasts. We also introduce the point of interest and analyze its impact on the results of forecasts

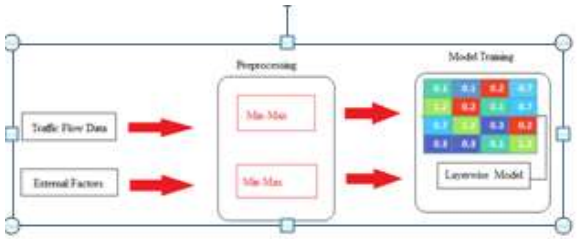

Fig. 1 Proposed System

III. METHODOLOGY

A Markov transition matrix is a square matrix that describes the probabilities of moving within a dynamic system from one state to another. In each row are the probabilities of moving from that row to the other states, from the state represented. The rows of a Markov transition matrix therefore each add to one.

In the first-order Markov model, the center of which is the Markov transition matrix, there is a simple assumption that the transformation of each state depends only on its prior state. This matrix is commonly used in various kinds of fields for data processing. Each matrix entity is a non-negative real number representing the probability of a single-time step from status it o state j.

Modules

1.Load Dataset – This module is used to loads the dataset which consists of the details of the traffic flow. The traffic data for this experiment was collected from the detectors distributed at intersections and different lanes in the city. Technologies such as advanced photoelectric image processing and pattern recognition were utilized to preprocess the real-time data of passing vehicles.

2.View Traffic – Used to view the traffic. **Traffic** on **roads** consists of **road** users including pedestrians, ridden or herded animals, vehicles, streetcars, buses and other conveyances, either singly or together, while using the public way for purposes of travel. ... Organization typically produces a better combination of travel safety and efficiency.

3.Traffic flow forecast – traffic flow forecast displays with time, lane and speed of the current lane. HMM exhibits good results in the analysis of non-stationary and obviously fluctuating feature data systems, and the actual road traffic system is also a complex and non-stationary system. Essentially, traffic flow as an observation sequence is continuous numerical data. Considering that is the fourdimensional vector traffic flow at four entrances of an intersection, while is the traffic state at the intersection in a certain period, the state of is one of all hypothetical states.

- **Comparison** – Gives the comparison of the model with the previous model.

3.2 algorithm

Hidden Markov models (HMM) represent one of methods that are suitable for congestion predication .in this paper a new model and contrast is proposed to define the traffic states during peak hours in two dimensional space(2D). The proposed model uses mean speed and contrast to capture the variability in traffic patterns.

Hidden markov models:

- Set of status: process moves from one state to another generating sequence of
- previous state
- States are not visible ,but each state randomly generates one of M observations (visible states)
- To define status
- Markov chain property :probability of each subsequent state depends only on what was the hidden markov model the following probabilities have to be specified :
- Matrix of transition probabilities A=(aij),

  aij = P(Si|sj),matrix of observation probabilities B=(bi(vm)),

  bi (vm) = p(vm | si) and a vector of initial probabilities $\pi = (\pi)$,

  π =p (si) Model is represented by M=(A,B π)

IMPLEMENTATION

Fig 4:Menu

This is a menu which consists of Load dataset, view traffic, external parametrs, traffic flow forecasting, previous model comparison

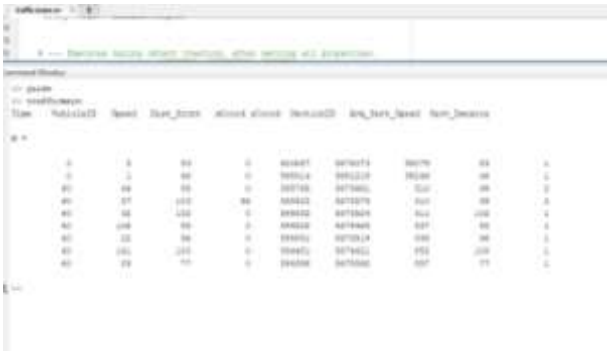

Fig 5:Load Dataset

This module loads the dataset and displays dataset which consists of Time, vehicle id, speed, dist_front,section ID, avg_sect_speed, sect density

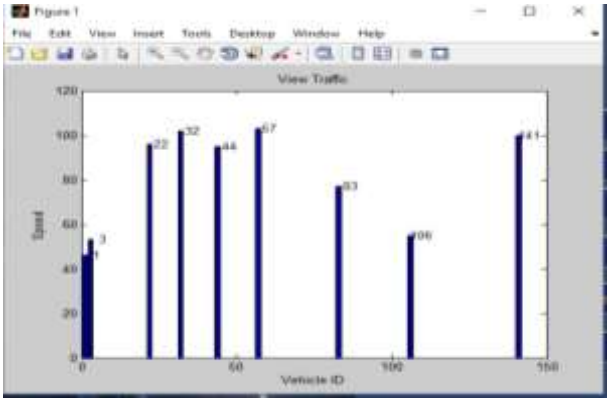

Fig 6: View Traffic

This module displays the traffic flow. It gives the vehicle ID vs Speed. At what speed each vehicle is moving on the road.

Fig 7: Traffic flow forecasting with vehicle ID, speed and vehicle counting

This module displays the traffic flow forecasting with vehicle ID, speed and vehicle counting

Conclusion

IN THIS PAPER WE PROPOSE A NOVEL HYBRID MODEL TO SIMULTANEOUSLY FORECAST THE TRAFFIC VOLUME FROM THE HISTORICAL TRAFFIC PATTERNS OF MULTIPLE LOCATIONS. TAKING INTO ACCOUNT THE TEMPORAL AND SPATIAL CHARACTERISTICS OF TRAFFIC DATA , THE PROPOSED MODEL, WHICH INCORPORATES LAYERWISE STRUCTURE AND MTM, INTEGRATES EXTERNAL FACTORS SUCH AS WEATHER , TEMPERATURE, HOLIDAYS, AND ACTUAL ROAD NETWORK SIZE. IT HAS ALSO BEEN ESTABLISHED THAT THE PROPER UTILIZATION OF POIS AND MTM WILL BENEFIT MODEL PERFORMANCE IMPROVEMENTS. THROUGH COMPARING VARIOUS MODELS IN TERMS OF PREDICTION ERROR, THE LSAE-MTM APPROACH WAS FOUND TO BE MORE SUCCESSFUL AND RELIABLE FOR PREDICTION OF TRAFFIC FLOWS.

REFERENCES

REFERENCE

[1] J. Zhang, F.-Y. Wang, K. Wang, W.-H. Lin, X. Xu, and C. Chen, ‘‘Datadriven intelligent transportation systems: A survey,’’ IEEE Trans. Intell. Transp. Syst., vol. 12, no. 4, pp. 1624–1639, Dec. 2011.

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[4] A. Rahim et al., ‘‘Vehicular social networks: A survey,’’ Pervasive Mobile Comput., vol. 43, pp. 96–113, Jan. 2018.

[5] X. J. Kong, X. Song, F. Xia, H. Guo, J. Wang, and A. Tolba, ‘‘LoTAD: Long-termtrafficanomalydetectionbasedoncrowdsourcedbustrajectory data,’’ World Wide Web, vol. 21, no. 3, pp. 825–847, 2017.

[6] R.-H. Zhang, Z.-C. He, H.-W. Wang, F. You, and K.-N. Li, ‘‘Study on self-tuning tyre friction control for developing main-servo loop integrated chassis control system,’’ IEEE Access, vol. 5, pp. 6649–6660, 2017.

[7] H. Xiong, X. Zhu, and R. Zhang, ‘‘Energy recovery strategy numerical simulation for dual axle drive pure electric vehicle based on motor loss model and big data calculation,’’ Complexity, vol. 2018, Aug. 2018, Art. no. 4071743.

[8]O.Anacleto,C.Queen,andC.J.Albers,‘‘Multivariate forecasting of road traffic flows in the presence of hetero scedasticity and measurement errors,’’ J. Roy. Stat. Soc. C, Appl. Statist., vol. 62, no. 2, pp. 251–270, 2013.

[9] Y.-C. Chiou, L. W. Lan, and C.-M. Tseng, ‘‘A novel method to predict traffic features based on rolling self-structured traffic patterns,’’ J. Intell. Transp. Syst., vol. 18, no. 4, pp. 352–366, 2014.

[10] N. Polson and V. Sokolov, ‘‘Bayesian particle tracking of traffic flows,’’ IEEE Trans. Intell. Transp. Syst., vol. 19, no. 2, pp. 345–356, Feb. 2018.