Project Development Phase

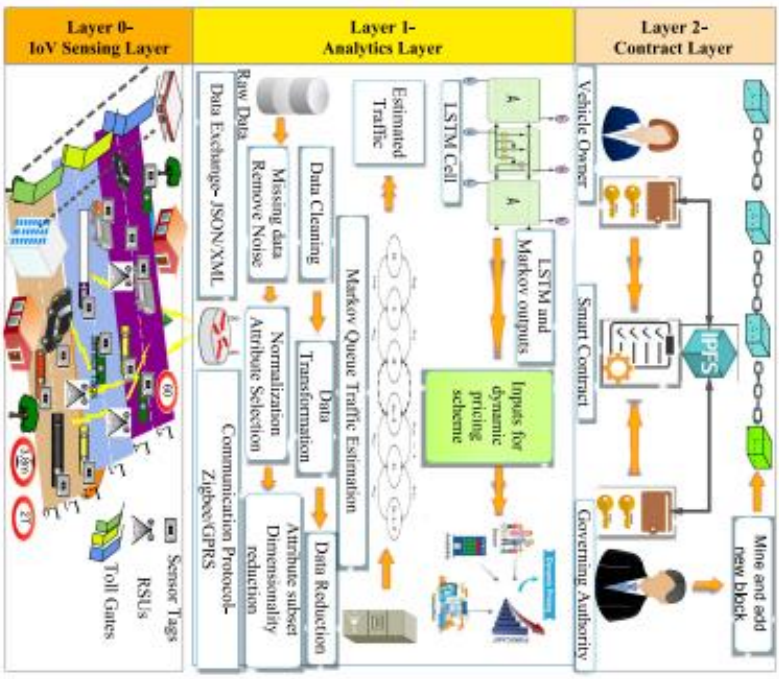
Utilization Of Algorithms, Dynamic Programming, Optimal Memory Utilization

Team ID	NM2023TMID04427
Project Name	Project – Tracking Public Infrastructure And Toll Payments Using Blockchain

Research Contributions

The contributions of the paper are summarized below.

- A Markov queue-estimation traffic model based on Jeffry prior Bayesian inference is proposed to predict traffic arrivals for efficient lane management.
- A novel SI-LSTM model is proposed on historical traffic and weather data-sets to predict the real-time responsive traffic.
- Queue-estimation, SI-LSTM outputs and lane-type fed as inputs to a dynamic pricing algorithm price fixation of toll payments at ITG.



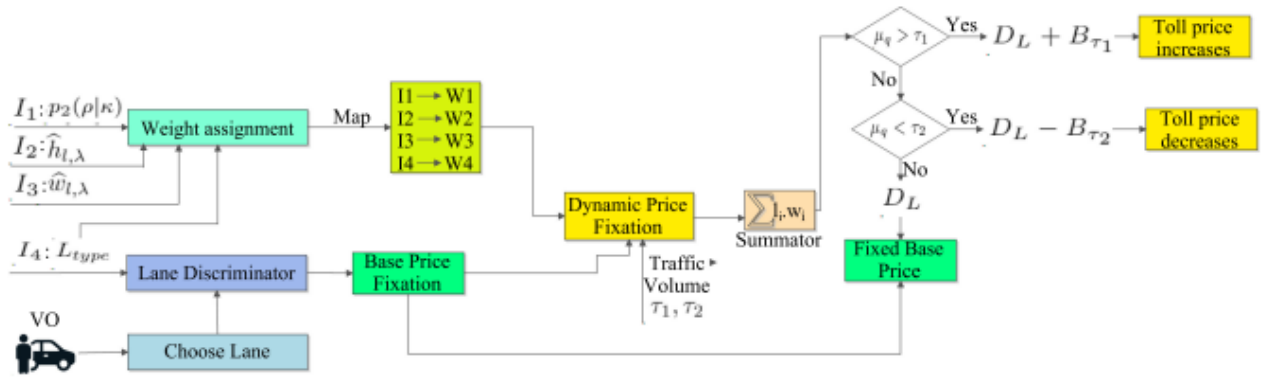
Organization

The rest of the paper is organized as follows. Section II discusses the system model and the proposed scheme. Section III discusses the proposed scheme DwaRa, which integrates DL and BC to finalize dynamic toll pricing and secure funds transfer. Section IV discusses the performance evaluation and finally, Section V concludes the paper.

Problem Formulation

In DwaRa, there are three entities E = {ECSV , ERSU , EITG}. As depicted in Section II-A, at Layer 0, we consider p RSUs, as ERSU = {R1, R2, R3,...,Rp} with coverage ranges as C = {C1, C2,...,Cp}. Inside Cp, the pth RSU unit employs a smart low-powered RFID tagging mechanism for ECSV . The exchange facilitates a robust vehicle-to-road infrastructure (V2R) communication infrastructure. EITG embeds IoT sensor units to read tags T attached to ECSV

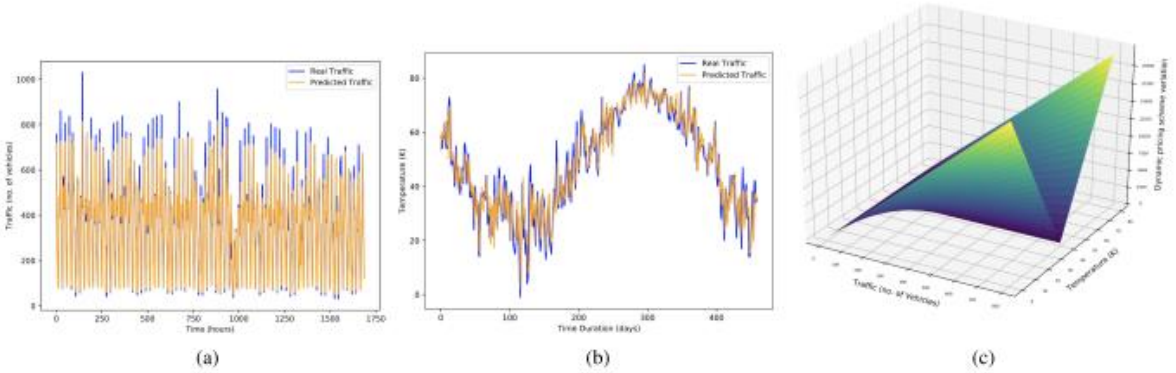
ECSV in pth range contains q vehicles V = {V1, V2, V3,...,Vq} embedded with RFID tags T = {T1, T2, T3,...,Tq} that communicates inside Cp. The tags are designed to process payments with low-powered computations with EITG and payment information is processed by ERSU in Cp. There are w EITG T = {I1, I2, I3,...,Iw}, where each of them have RFID scanners consisting of dipole antennas present to read tag information as sequences of electro-magnetic waves, transmitted through Tq.



The bias μq is compared with traffic volumes for maximal and minimal threshold points τ1 and τ2, respectively and defined as follows.

Secure and Automated Payments in DwaRa

In Algorithm 2, the post-fixation of DP w q , SCs are called to initiate toll payment transfer. Algorithm 3 presents the contract structure to automate payments between VO and GA. Dynamic price is first stored in Tdp to initiate the transfer. Firstly, entity role R = {V O, GA}, is registered based on registration request. The registration requires them to fetch keys from IPFS ledger as stored hashes, IPFSHV O and IPFSHGA for authentication of stakeholders. Once successful registration is done, a VO becomes eligible to pay a toll based on DP w q . Constraint C3 is satisfied as SCs execution is initiated only when sufficient funds are present in WV O and WGA.



(a) (b) (c)

SI-LSTM Predictions and Dynamic Pricing Scheme: The results of traditional traffic and weather estimates are presented based on the SI-LSTM model. Fig. 5(a) presents the original and predicted values based on the number of vehicles Vq. The model is trained for traffic and weather prediction t l,λ andwl,λ respectively with the previous 17 days as inputs and temperature vary from 0 to 80 Kelvin (K). The results are then tested on traffic prediction of 73 days and actual temperature, measured in K. Fig. 5(a) and 5(b) show the obtained results.