

DBMS PROJECT OVERVIEW

1)Title :

TOLLGATE MANAGEMENT SYSTEM

2)Team Members:

- i)VUNDELA VIPUL KUMAR REDDY PES1UG22CS709
- ii)VELURU S L DHEERAJ PES1UG22CS684

3)Purpose :

The toll gate management system aims to make toll collection easier, faster, and more secure by automating the process. It reduces the need for manual work, speeds up toll payments, and keeps track of transactions, daily income, and vehicle logs accurately. The system allows for flexible toll rates based on vehicle types and includes features to handle emergencies. Administrators can manage staff and toll gates, while users can view their payment history. Toll managers can monitor all transactions and create reports, ensuring transparency and accountability. Designed to work across multiple locations, this system focuses on meeting operational needs and improving user experience.

4)Scope:

Transaction Management

- Tracks all toll payments with detailed logs for transparency.
- Provides accurate records of daily, weekly, and monthly income.

Vehicle Logs and Toll Rates

- Maintains detailed logs of vehicles passing through toll gates.
- Supports dynamic toll rates based on vehicle types (e.g., cars, trucks, bikes).

User Features

- Enables users to view their toll payment history.

Administrative Control

- Administrators can manage staff details and assign roles.
- Administrators can add tollgate

Staff Management

- Staff can log in to perform specific tasks, such as adding vehicle details manually.

5) Description :

Managing toll operations efficiently is a complex and time-sensitive task. Traditional methods, such as manual toll collection and record-keeping, often lead to errors, inefficiencies, and delays. These challenges result in issues like inaccurate transaction tracking, delays in toll processing, difficulties in handling dynamic fare structures, and a lack of transparency in daily income and vehicle logs.

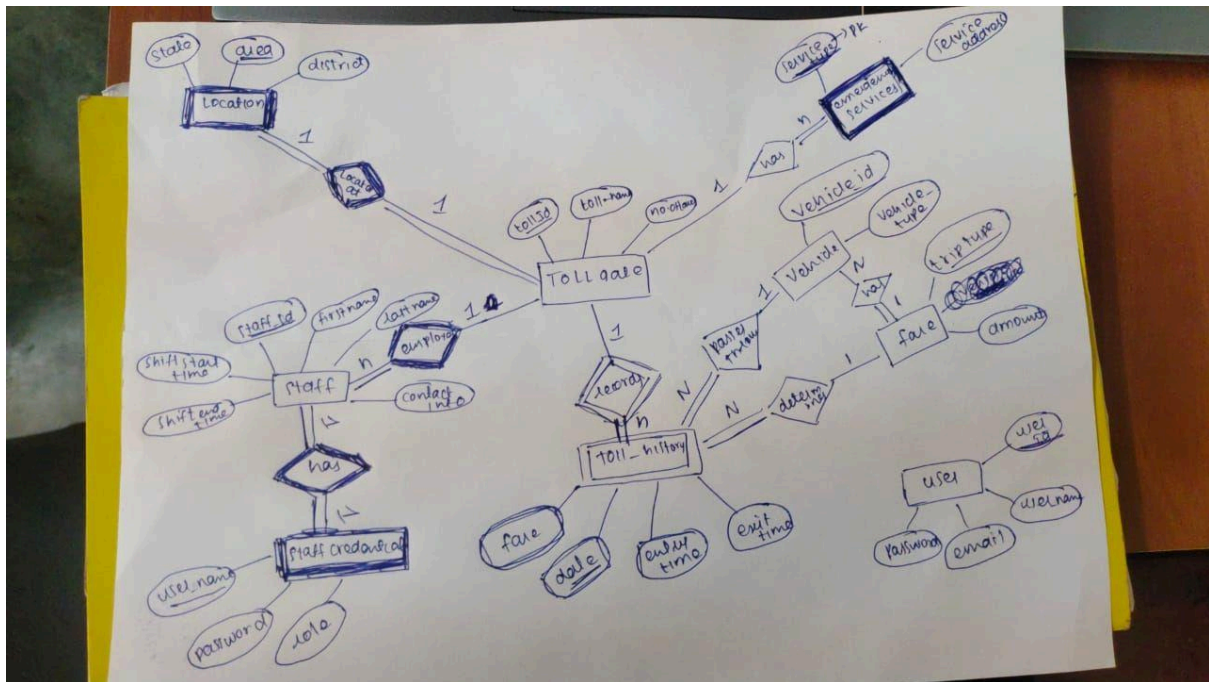
The absence of an integrated system creates the following specific challenges:

1. **Inefficient Toll Collection:** Manual toll collection slows down processing, increasing wait times and the risk of revenue leakage.
2. **Limited Fare Management:** Difficulty in implementing dynamic fare structures based on vehicle types and toll policies.
3. **Manual Record-Keeping:** Tracking daily income, transactions, and vehicle details manually is prone to errors and inefficiencies.
4. **Delayed Emergency Response:** Limited systems to handle emergency scenarios, such as priority access or toll fee exemptions for VIP or emergency vehicles.
5. **Lack of Transparency and Insights:** Limited ability to generate reports for analysing revenue, vehicle logs, and toll usage trends.

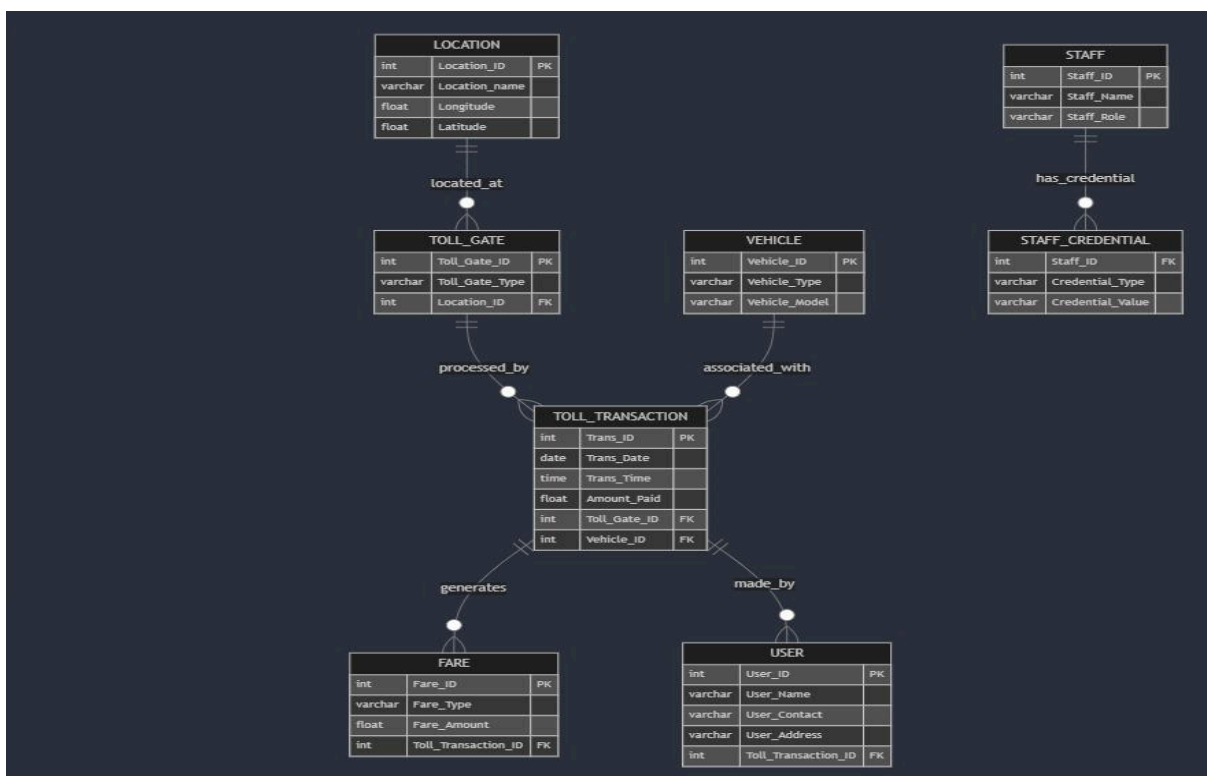
These challenges impact the efficiency, revenue, and overall user experience of tollgate operations, emphasising the need for an automated solution.

This project aims to overcome these challenges by developing an integrated Tollgate Management System. The system will automate toll collection, enable dynamic fare management, provide real-time transaction tracking, and offer actionable insights through analytics and reporting. It will enhance operational efficiency, ensure transparency, and support better decision-making for toll operations across multiple locations.

6)ER Diagram :



7)Relation Schema :



8)Queries

Creating Database :

```
1 • CREATE DATABASE IF NOT EXISTS `tollgate_management` /*!40100 DEF
2 • USE `tollgate_management`;
3 -- MySQL dump 10.13 Distrib 8.0.33, for Win64 (x86_64)
4 --
```

Creating tables :

```
DROP TABLE IF EXISTS `emergency_services`;
/*!40101 SET @saved_cs_client      = @@character_set_client */;
/*!50503 SET character_set_client = utf8mb4 */;
CREATE TABLE `emergency_services` (
  `tollgate_id` int NOT NULL,
  `service_type` varchar(255) NOT NULL,
  `service_address` varchar(255) DEFAULT NULL,
  PRIMARY KEY (`tollgate_id`,`service_type`),
  CONSTRAINT `emergency_services_ibfk_1` FOREIGN KEY (`tollgate_id`) REFERENCES `tollgate` (`tollgate_id`)
) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_0900_ai_ci;
/*!40101 SET character_set_client = @saved_cs_client */;
```

```
DROP TABLE IF EXISTS `fare`;
/*!40101 SET @saved_cs_client      = @@character_set_client */;
/*!50503 SET character_set_client = utf8mb4 */;
CREATE TABLE `fare` (
  `trip_type` varchar(255) NOT NULL,
  `vehicle_type` varchar(255) NOT NULL,
  `amount` decimal(10,2) DEFAULT NULL,
  PRIMARY KEY (`trip_type`,`vehicle_type`)
) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_0900_ai_ci;
/*!40101 SET character_set_client = @saved_cs_client */;
```

```
--
-- Dumping data for table `fare`
--
```

```
LOCK TABLES `fare` WRITE;
/*!40000 ALTER TABLE `fare` DISABLE KEYS */;
INSERT INTO `fare` VALUES ('One-way','2-wheeler',20.00),('One-way','4-wheeler',50.00),('One-way','eme
/*!40000 ALTER TABLE `fare` ENABLE KEYS */;
UNLOCK TABLES;
```

```

DROP TABLE IF EXISTS `location`;
/*!40101 SET @saved_cs_client      = @@character_set_client */;
/*!50503 SET character_set_client = utf8mb4 */;
CREATE TABLE `location` (
  `tollgate_id` int NOT NULL,
  `state` varchar(255) DEFAULT NULL,
  `area` varchar(255) DEFAULT NULL,
  `district` varchar(255) DEFAULT NULL,
  PRIMARY KEY (`tollgate_id`),
  CONSTRAINT `location_ibfk_1` FOREIGN KEY (`tollgate_id`) REFERENCES `tollgate` (`tollgate_id`)
) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_0900_ai_ci;
/*!40101 SET character_set_client = @saved_cs_client */;

--
-- Dumping data for table `location`
--

LOCK TABLES `location` WRITE;
/*!40000 ALTER TABLE `location` DISABLE KEYS */;
INSERT INTO `location` VALUES (1,'Maharashtra','Pune','Pune'),(2,'Haryana','Gurgaon','Gurgaon'),(3,'T
/*!40000 ALTER TABLE `location` ENABLE KEYS */;

DROP TABLE IF EXISTS `staff`;
/*!40101 SET @saved_cs_client      = @@character_set_client */;
/*!50503 SET character_set_client = utf8mb4 */;
CREATE TABLE `staff` (
  `staff_id` int NOT NULL AUTO_INCREMENT,
  `first_name` varchar(255) DEFAULT NULL,
  `last_name` varchar(255) DEFAULT NULL,
  `tollgate_id` int DEFAULT NULL,
  `shift_start_time` time DEFAULT NULL,
  `shift_end_time` time DEFAULT NULL,
  `contact_info` varchar(15) DEFAULT NULL,
  PRIMARY KEY (`staff_id`),
  KEY `tollgate_id` (`tollgate_id`),
  CONSTRAINT `staff_ibfk_1` FOREIGN KEY (`tollgate_id`) REFERENCES `tollgate` (`tollgate_id`)
) ENGINE=InnoDB AUTO_INCREMENT=28 DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_0900_ai_ci;
/*!40101 SET character_set_client = @saved_cs_client */;

--
-- Dumping data for table `staff`
--

LOCK TABLES `staff` WRITE;
/*!40000 ALTER TABLE `staff` DISABLE KEYS */;
INSERT INTO `staff` VALUES (3,'Bob','Johnson',3,'08:00:00','16:00:00','5551234567'),(4,'Alice','Will

```



```

CREATE TABLE `staff_credential` (
  `staff_id` int NOT NULL,
  `username` varchar(255) NOT NULL,
  `password` varchar(255) NOT NULL,
  `role` varchar(50) NOT NULL,
  PRIMARY KEY (`staff_id`),
  UNIQUE KEY `username` (`username`),
  CONSTRAINT `staff_credential_ibfk_1` FOREIGN KEY (`staff_id`) REFERENCES `staff` (`staff_id`) ON DELETE CASCADE
) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_0900_ai_ci;
/*!40101 SET character_set_client = @saved_cs_client */;

--
-- Dumping data for table `staff_credential`
--

LOCK TABLES `staff_credential` WRITE;
/*!40000 ALTER TABLE `staff_credential` DISABLE KEYS */;
INSERT INTO `staff_credential` VALUES (23,'Kopparapu @8','$2a$10$S661RGvyoF.ZmgfT9XQWYOeUzf2Fz1d5zEQVccK1Ev8UQCwvra
/*!40000 ALTER TABLE `staff_credential` ENABLE KEYS */;
UNLOCK TABLES;

CREATE TABLE `toll_history` (
  `tollgate_id` int NOT NULL,
  `vehicle_id` varchar(255) NOT NULL,
  `vehicle_type` varchar(255) DEFAULT NULL,
  `fare` decimal(10,2) DEFAULT NULL,
  `date` date NOT NULL,
  `entry_time` time NOT NULL,
  `exit_time` time DEFAULT NULL,
  PRIMARY KEY (`tollgate_id`,`vehicle_id`,`date`,`entry_time`),
  KEY `vehicle_id` (`vehicle_id`),
  CONSTRAINT `toll_history_ibfk_1` FOREIGN KEY (`tollgate_id`) REFERENCES `tollgate` (`tollgate_id`),
  CONSTRAINT `toll_history_ibfk_2` FOREIGN KEY (`vehicle_id`) REFERENCES `vehicle` (`vehicle_id`)
) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_0900_ai_ci;
/*!40101 SET character_set_client = @saved_cs_client */;

--
-- Dumping data for table `toll_history`
--

LOCK TABLES `toll_history` WRITE;
/*!40000 ALTER TABLE `toll_history` DISABLE KEYS */;
INSERT INTO `toll_history` VALUES (1,'AP07','heavy vehicle',100.00,'2022-01-03','09:00:00','09:30:00'),(1,'D

```

```

DROP TABLE IF EXISTS `tollgate`;
/*!40101 SET @saved_cs_client      = @@character_set_client */;
/*!50503 SET character_set_client = utf8mb4 */;
CREATE TABLE `tollgate` (
  `tollgate_id` int NOT NULL AUTO_INCREMENT,
  `tollgate_name` varchar(255) DEFAULT NULL,
  `no_of_lanes` int DEFAULT NULL,
  PRIMARY KEY (`tollgate_id`)
) ENGINE=InnoDB AUTO_INCREMENT=15 DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_0900_ai_ci;
/*!40101 SET character_set_client = @saved_cs_client */;

--
-- Dumping data for table `tollgate`
--

LOCK TABLES `tollgate` WRITE;
/*!40000 ALTER TABLE `tollgate` DISABLE KEYS */;
INSERT INTO `tollgate` VALUES (1,'Mumbai-Pune Expressway Toll Plaza',4),(2,'Delhi-Gurgaor');
/*!40000 ALTER TABLE `tollgate` ENABLE KEYS */;
UNLOCK TABLES;

DROP TABLE IF EXISTS `users`;
/*!40101 SET @saved_cs_client      = @@character_set_client */;
/*!50503 SET character_set_client = utf8mb4 */;
CREATE TABLE `users` (
  `id` int NOT NULL AUTO_INCREMENT,
  `username` varchar(50) NOT NULL,
  `password` varchar(255) NOT NULL,
  `email` varchar(100) NOT NULL,
  PRIMARY KEY (`id`),
  UNIQUE KEY `email` (`email`)
) ENGINE=InnoDB AUTO_INCREMENT=10 DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_0900_ai_ci;
/*!40101 SET character_set_client = @saved_cs_client */;

--
-- Dumping data for table `users`
--

LOCK TABLES `users` WRITE;
/*!40000 ALTER TABLE `users` DISABLE KEYS */;
INSERT INTO `users` VALUES (1,'mh10','$2a$10$1yoiB7CwvPu6esEt4ufhset0vft3Ve1V8v73f5q9uo2hZ');
/*!40000 ALTER TABLE `users` ENABLE KEYS */;
UNLOCK TABLES;
/*!50003 SET @saved_cs_client      = @@character_set_client */;
/*!50003 SET @saved_cs_results    = @@character_set_results */;

```

```

DROP TABLE IF EXISTS `vehicle`;
/*!40101 SET @saved_cs_client      = @@character_set_client */;
/*!50503 SET character_set_client = utf8mb4 */;
CREATE TABLE `vehicle` (
  `vehicle_id` varchar(255) NOT NULL,
  `vehicle_type` varchar(255) DEFAULT NULL,
  PRIMARY KEY (`vehicle_id`)
) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_0900_ai_ci;
/*!40101 SET character_set_client = @saved_cs_client */;

--
-- Dumping data for table `vehicle`
--

LOCK TABLES `vehicle` WRITE;
/*!40000 ALTER TABLE `vehicle` DISABLE KEYS */;
INSERT INTO `vehicle` VALUES ('AP05','4-wheeler'),('AP07','heavy vehicle'),(
/*!40000 ALTER TABLE `vehicle` ENABLE KEYS */;
UNLOCK TABLES;

```

Triggers:

```

/*!50003 CREATE*/ /*!50017 DEFINER='root'@'localhost'*/ /*!50003 TRIGGER `validate_username_before_insert` BEFORE INSERT ON `users` FOR EACH ROW BEGIN
  IF NOT (NEW.username REGEXP '^([a-zA-Z]{2})([0-9]{2})') THEN
    SIGNAL SQLSTATE '45000'
    SET MESSAGE_TEXT = 'Invalid input: Username must start with two alphabets followed by two numbers';
  END IF;
END */;;

```


Trigger Usage:

Register User

Invalid input: Username must start with two alphabets followed by two numbers

Procedure-1:

```
DELIMITER ;;  
CREATE DEFINER=`root`@`localhost` PROCEDURE `GetEmergencyServices`(  
    IN input_tollgate_name VARCHAR(255),  
    IN input_service_type VARCHAR(255)  
)  
BEGIN  
    SELECT es.service_type, es.service_address  
    FROM emergency_services es  
    JOIN Tollgate t ON es.tollgate_id = t.tollgate_id  
    WHERE LOWER(t.tollgate_name) = LOWER(input_tollgate_name)  
        AND LOWER(es.service_type) = LOWER(input_service_type);  
END ;;  
DELIMITER ;
```

Procedure-1 Usage:

Hospital

▼

Get Emergency Services

- **Service Type:** hospital
Address: Delhi-Gurgaon Expressway, Gurgaon, Haryana

Procedure-2:

```
DELIMITER ;;  
CREATE DEFINER=`root`@`localhost` PROCEDURE `GetFares`()  
BEGIN  
    SELECT trip_type, vehicle_type, amount  
    FROM Fare;  
END ;;  
DELIMITER ;
```

Procedure-2 Usage:

Trip Type	Vehicle Type	Fare Amount
One-way	2-wheeler	20.00
One-way	4-wheeler	50.00
One-way	emergency vehicle	0.00
One-way	heavy vehicle	100.00
Round trip	2-wheeler	40.00
Round trip	4-wheeler	100.00
Round trip	emergency vehicle	0.00
Round trip	heavy vehicle	200.00

Procedure-3:

```
> CREATE DEFINER=`root`@`localhost` PROCEDURE `AddTollgate`(  
    IN tollgateName VARCHAR(255),  
    IN numLanes INT,  
    IN state VARCHAR(255),  
    IN area VARCHAR(255),  
    IN district VARCHAR(255),  
    IN fireStationAddress VARCHAR(255),  
    IN hospitalAddress VARCHAR(255),  
    IN policeStationAddress VARCHAR(255)  
)  
> BEGIN  
    DECLARE tollgate_id INT;  
  
    START TRANSACTION;  
  
    INSERT INTO tollgate (tollgate_name, no_of_lanes)  
    VALUES (tollgateName, numLanes);  
  
    SET tollgate_id = LAST_INSERT_ID();  
  
    INSERT INTO location (tollgate_id, state, area, district)  
    VALUES (tollgate_id, state, area, district);  
  
> IF fireStationAddress IS NOT NULL THEN  
    INSERT INTO emergency_services (tollgate_id, service_type, service_address)  
    VALUES (tollgate_id, 'Fire Station', fireStationAddress);
```

Procedure Usage-3:

vi
1
Location
andhra
anantapur
tadipatri
Emergency Services
vif

```
mysql> select *from tollgate;
```

tollgate_id	tollgate_name	no_of_lanes
1	Mumbai-Pune Expressway Toll Plaza	4
2	Delhi-Gurgaon Expressway Toll Plaza	6
3	Hyderabad-Vijayawada Highway Toll Plaza	8
4	Chennai-Bangalore Highway Toll Plaza	2
5	Kolkata-Durgapur Expressway Toll Plaza	5
6	Ahmedabad-Vadodara Expressway Toll Plaza	3
7	Bengaluru-Mysuru Highway Toll Plaza	7
8	tollgateA	6
9	A	3
10	hydrebad-kurnool express way	8
11	hydrebad-kurnool express way	8
12	hydrebad-kurnool express way	8
13	hydrebad-kurnool express way	8
14	hydrebad-kurnool express way	8
15	toll	2
16	vi	1

Procedure-4:

```
DELIMITER ;;
CREATE DEFINER=`root`@`localhost` PROCEDURE `AddTollHistory` (
  IN p_vehicle_id VARCHAR(255),
  IN p_vehicle_type VARCHAR(255),
  IN p_tollgate_id INT,
  IN p_fare DECIMAL(10,2)
)
BEGIN
  DECLARE p_date DATE;
  DECLARE p_entry_time TIME;
  DECLARE p_exit_time TIME;

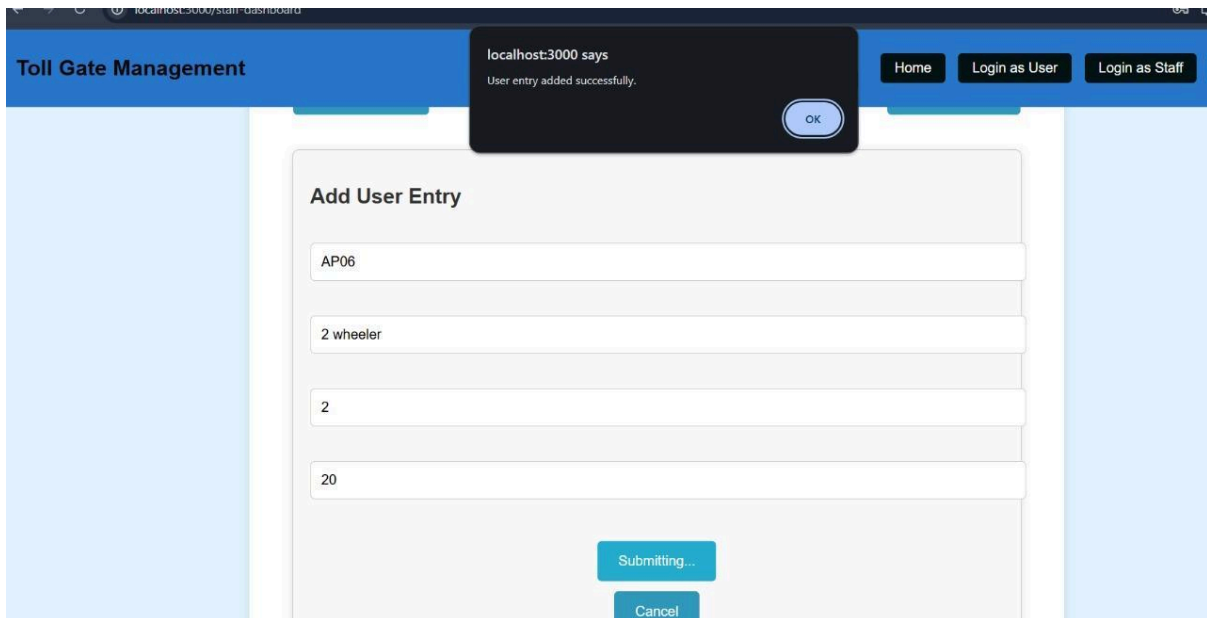
  SET p_date = CURDATE();
  SET p_entry_time = CURTIME();

  SET p_exit_time = ADDTIME(p_entry_time, '00:03:00');

  INSERT INTO toll_history (vehicle_id, vehicle_type, tollgate_id, fare, date, entry_time, exit_time)
  VALUES (p_vehicle_id, p_vehicle_type, p_tollgate_id, p_fare, p_date, p_entry_time, p_exit_time);

END ;;
```

Procedure-4 Usage:



1	WB13	2-wheeler	20.00	2022-01-02	15:00:00	15:15:00
2	AP06	2 wheeler	20.00	2024-11-19	19:08:43	19:11:43
2	AP07	heavy vehicle	100.00	2022-01-01	14:00:00	14:30:00
2	DL02	4-wheeler	50.00	2022-01-01	09:00:00	09:20:00
2	GJ06	4-wheeler	50.00	2022-01-02	16:00:00	16:20:00
2	KA11	heavy vehicle	100.00	2022-01-02	21:00:00	21:30:00
2	MH09	2-wheeler	20.00	2022-01-02	11:00:00	11:15:00
2	TN12	2-wheeler	20.00	2022-01-01	10:00:00	10:10:00

Procedure 5 / Nested query /aggregate function:

```
CREATE DEFINER=`root`@`localhost` PROCEDURE `GetTollFareData`(  
    IN tollgateId INT,  
    IN selectedDate DATE  
)  
BEGIN  
  
    SELECT  
        vehicle_id,  
        vehicle_type,  
        entry_time,  
        fare,  
        (SELECT SUM(fare)  
         FROM toll_history  
         WHERE tollgate_id = tollgateId  
         AND date = selectedDate) AS total_fare  
    FROM toll_history  
    WHERE tollgate_id = tollgateId  
        AND date = selectedDate;  
END ;;  
DELIMITER ;
```

Procedure 5 / Nested query /aggregate function usage:

[Add User Entry](#) [View Toll History](#) [Toll Records](#) [View Schedule](#)

Check Fare

[Check](#)
[Cancel](#)

Total Fare Collected: 100.00

tollgate_id	vehicle_id	vehicle_type	fare	date	entry_time	exit_time
1	AP07	heavy vehicle	100.00	2022-01-03	09:00:00	09:30:00
1	DL10	4-wheelers	50.00	2022-01-03	20:00:00	20:20:00