

DBMS Project

Taxi Management System

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Abstract

The rapid growth of urban populations has intensified the demand for efficient and reliable taxi services, necessitating advanced technological solutions for their management. This paper introduces a robust Database Management System (DBMS) tailored for Taxi Management Systems (TMS) to address the complexities associated with real-time data handling, fleet management, and user interactions.

Our proposed DBMS integrates seamlessly with TMS, offering a scalable and flexible architecture that accommodates the dynamic nature of taxi operations. The system focuses on optimizing key functionalities such as real-time location tracking, driver assignment, fare calculation, and customer interactions. By leveraging relational database principles, the DBMS ensures data integrity, consistency, and security throughout the system.

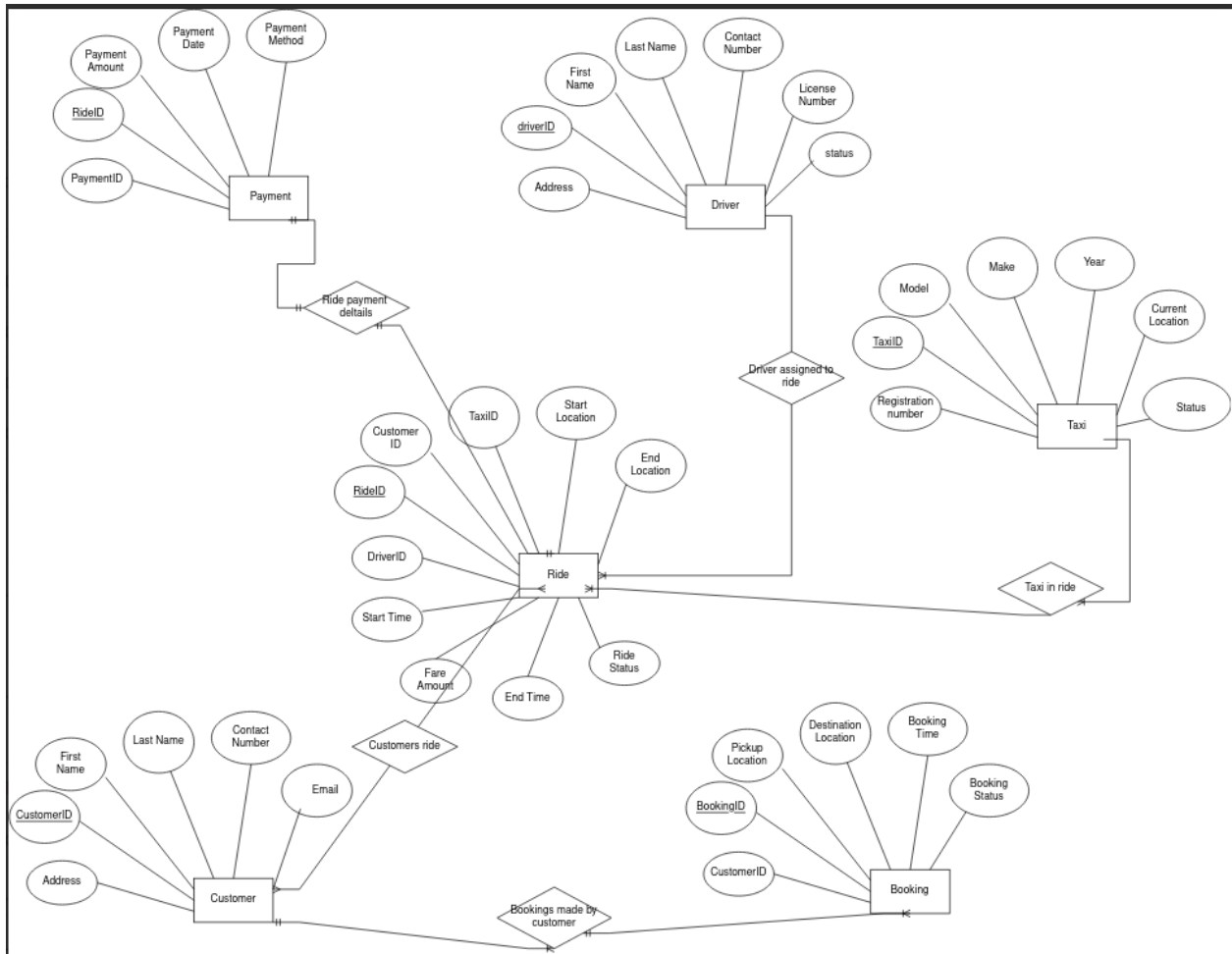
Key features of the DBMS include:

1. **Real-time Data Processing:** The system employs efficient algorithms for real-time data processing, allowing for instantaneous updates on taxi availability, location, and user requests.
2. **Fleet Optimization:** Advanced algorithms for dynamic fleet management enable intelligent driver dispatching, considering factors like proximity, traffic conditions, and driver availability to enhance overall service efficiency.

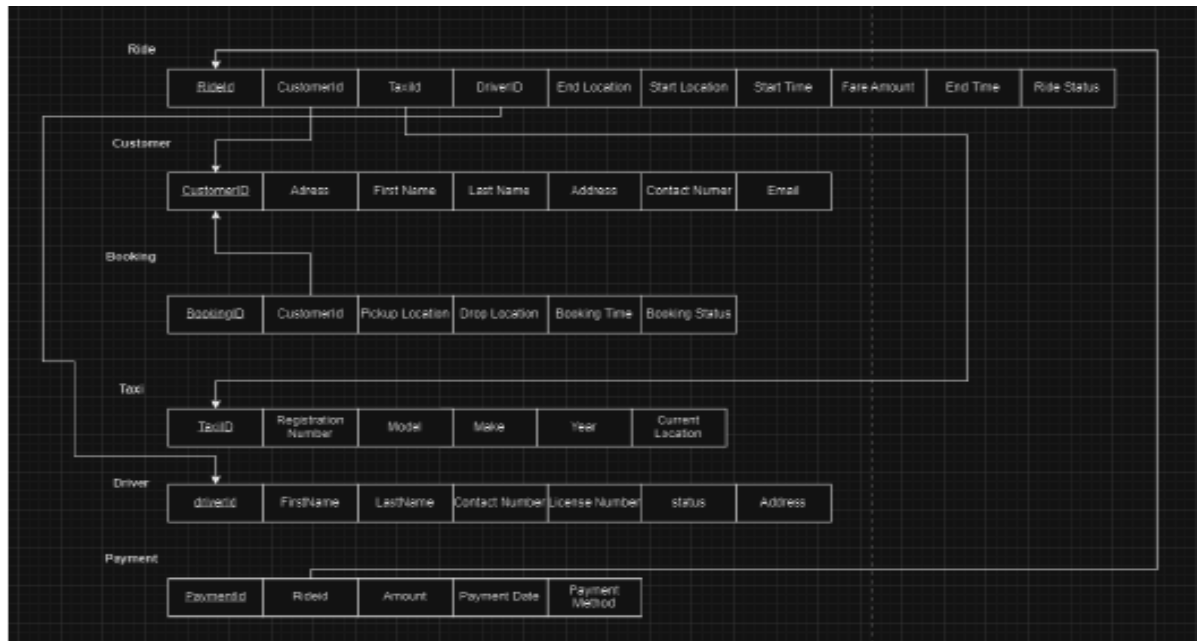
3. User Interaction and Feedback: The DBMS facilitates seamless interactions between users and the TMS through a user-friendly interface, enabling booking, payment, and feedback mechanisms for an enhanced customer experience.

4. Scalability and Performance: The system is designed to handle increasing data volumes as taxi services expand, ensuring optimal performance and responsiveness even under high demand scenarios.

Security and Data Integrity: Robust security measures are implemented to protect sensitive user information and ensure the integrity of the system's database,



Relational Schema



```

25 ● CREATE TABLE `cabs` (
26     `vehicle_number` int NOT NULL,
27     `registration_number` varchar(255) NOT NULL,
28     `seating_capacity` int NOT NULL,
29     `model` varchar(255) NOT NULL,
30     `type` varchar(255) NOT NULL,
31     `status` varchar(255) NOT NULL,
32     `driverID` int NOT NULL,
33     PRIMARY KEY (`vehicle_number`),
34     UNIQUE KEY `vehicle_number` (`vehicle_number`),
35     UNIQUE KEY `registration_number` (`registration_number`),
36     UNIQUE KEY `vehicle_number_2` (`vehicle_number`),
37     UNIQUE KEY `vehicle_number_3` (`vehicle_number`),
38     UNIQUE KEY `vehicle_number_4` (`vehicle_number`),
39     KEY `fk_cabs_drivers` (`driverID`),
40     CONSTRAINT `fk_cabs_drivers` FOREIGN KEY (`driverID`) REFERENCES `drivers` (`driver_id`)
41 ) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_0900_ai_ci;
42 ● /*!40101 SET character_set_client = @saved_cs_client */;
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DROP TABLE IF EXISTS `drivers`;
/*!40101 SET @saved_cs_client      = @@character_set_client */;
/*!50503 SET character_set_client = utf8mb4 */;
CREATE TABLE `drivers` (
  `driver_id` int NOT NULL AUTO_INCREMENT,
  `phone` varchar(255) NOT NULL,
  `name` varchar(255) NOT NULL,
  `address` varchar(255) NOT NULL,
  `dob` date NOT NULL,
  `license_number` varchar(255) NOT NULL,
  `rating_score` int NOT NULL,
  PRIMARY KEY (`driver_id`),
  UNIQUE KEY `license_number` (`license_number`),
  CONSTRAINT `check_phone_length` CHECK ((length(`phone`) <= 10)),
  CONSTRAINT `drivers_chk_1` CHECK (((`rating_score` >= 0) and (`rating_score` <= 5)))
) ENGINE=InnoDB AUTO_INCREMENT=999317053 DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_0900_ai_ci;
/*!40101 SET character_set_client = @saved_cs_client */;

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```

DROP TABLE IF EXISTS `locations`;
/*!40101 SET @saved_cs_client      = @@character_set_client */;
/*!50503 SET character_set_client = utf8mb4 */;
CREATE TABLE `locations` (
  `location_id` int NOT NULL AUTO_INCREMENT,
  `location_name` varchar(255) NOT NULL,
  `latitude` double NOT NULL,
  `longitude` double NOT NULL,
  PRIMARY KEY (`location_id`)
) ENGINE=InnoDB AUTO_INCREMENT=11 DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_0900_ai_ci;
/*!40101 SET character_set_client = @saved_cs_client */;

```

```

CREATE TABLE `payments` (
  `payment_id` int NOT NULL AUTO_INCREMENT,
  `payment_type` varchar(255) NOT NULL,
  `amount` decimal(10,2) NOT NULL,
  `customer_id` int NOT NULL,
  `driver_id` int NOT NULL,
  `booking_id` int DEFAULT NULL,
  PRIMARY KEY (`payment_id`),
  KEY `customer_id` (`customer_id`),
  KEY `driver_id` (`driver_id`),
  KEY `booking_id` (`booking_id`),
  CONSTRAINT `fk_payments_rides` FOREIGN KEY (`payment_id`) REFERENCES `rides` (`booking_id`),
  CONSTRAINT `payments_ibfk_1` FOREIGN KEY (`customer_id`) REFERENCES `customer` (`userID`),
  CONSTRAINT `payments_ibfk_2` FOREIGN KEY (`driver_id`) REFERENCES `drivers` (`driver_id`),
  CONSTRAINT `payments_ibfk_3` FOREIGN KEY (`booking_id`) REFERENCES `rides` (`booking_id`)
) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_0900_ai_ci;
/*!40101 SET character_set_client = @saved_cs_client */;

```

```

DROP TABLE IF EXISTS `rides`;
/*!40101 SET @saved_cs_client = @@character_set_client */;
/*!50503 SET character_set_client = utf8mb4 */;
CREATE TABLE `rides` (
  `booking_id` int NOT NULL AUTO_INCREMENT,
  `pickup_location` varchar(255) NOT NULL,
  `drop_location` varchar(255) NOT NULL,
  `start_time` datetime NOT NULL,
  `end_time` datetime NOT NULL,
  `rating` int NOT NULL,
  `distance` int NOT NULL,
  `customer_id` int NOT NULL,
  `driver_id` int NOT NULL,
  `status` enum('in transit','not in transit') NOT NULL DEFAULT 'not in transit',
  PRIMARY KEY (`booking_id`),
  KEY `fk_cabs_customers` (`customer_id`),
  KEY `fk_cabs_drivers` (`driver_id`),
  CONSTRAINT `fk_cabs_customers` FOREIGN KEY (`customer_id`) REFERENCES `customer` (`userID`),
  CONSTRAINT `fk_cabs_drivers` FOREIGN KEY (`driver_id`) REFERENCES `drivers` (`driver_id`),
  CONSTRAINT `drop_location` CHECK (('drop_location' in (_utf8mb4'Lalbagh Botanical Garden',_utf8mb4'Cubbon Park',_utf8mb4'Bangalore Palace',_utf8mb4'Vidhana Soudha)),
  CONSTRAINT `pickup_location` CHECK (('pickup_location' in (_utf8mb4'Lalbagh Botanical Garden',_utf8mb4'Cubbon Park',_utf8mb4'Bangalore Palace',_utf8mb4'Vidhana Soudha)),
  CONSTRAINT `valid_drop_location` CHECK (('drop_location' in (_utf8mb4'Lalbagh Botanical Garden',_utf8mb4'Cubbon Park',_utf8mb4'Bangalore Palace',_utf8mb4'Vidhana Soudha)),
  CONSTRAINT `valid_pickup_location` CHECK (('pickup_location' in (_utf8mb4'Lalbagh Botanical Garden',_utf8mb4'Cubbon Park',_utf8mb4'Bangalore Palace',_utf8mb4'Vidhana Soudha)),
) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_0900_ai_ci;
/*!40101 SET character set client = @saved_cs_client */;

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Function

```
DELIMITER ;;
CREATE DEFINER='root'@'localhost' FUNCTION `calculate_distance`(start_location_name VARCHAR(255), end_location_name VARCHAR(255)) RETURNS double
    DETERMINISTIC
BEGIN
    DECLARE start_lat DOUBLE;
    DECLARE start_lng DOUBLE;
    DECLARE end_lat DOUBLE;
    DECLARE end_lng DOUBLE;

    DECLARE earth_radius DOUBLE;
    DECLARE delta_lat DOUBLE;
    DECLARE delta_lng DOUBLE;
    DECLARE a DOUBLE;
    DECLARE c DOUBLE;
    DECLARE distance DOUBLE;

    SET earth_radius = 6371.0710;

    # Extract latitude and longitude values from start_location
    SELECT latitude, longitude
    INTO start_lat, start_lng
    FROM locations
    WHERE location_name = start_location_name;

    # Extract latitude and longitude values from end_location
    SELECT latitude, longitude
    INTO end_lat, end_lng
    FROM locations
    WHERE location_name = end_location_name;

    SET delta_lat = RADIANS(end_lat) - RADIANS(start_lat);
    SET delta_lng = RADIANS(end_lng) - RADIANS(start_lng);

    SET a = SIN(delta_lat / 2) * SIN(delta_lat / 2) +
        COS(RADIANS(start_lat)) * COS(RADIANS(end_lat)) *
        SIN(delta_lng / 2) * SIN(delta_lng / 2);
    SET c = 2 * ATAN2(SQRT(a), SQRT(1 - a));
    SET distance = earth_radius * c;

    RETURN distance;
END ::
```

taxi management

Enter the start location

Bangalore Palace

Enter the destination

Lalbagh Botanical Garden

5.372597439823163

Select the cab type

hatchback

Book Ride

```
DELIMITER ;;
CREATE DEFINER='root'@'localhost' FUNCTION `getRandomRegistrationNumber`(cabType VARCHAR(255)) RETURNS varchar(255) CHARSET utf8mb4
    DETERMINISTIC
BEGIN
    DECLARE random_reg_number VARCHAR(255);

    SELECT registration_number
    INTO random_reg_number
    FROM cabs
    WHERE type = cabType AND status = 'Available'
    ORDER BY RAND()
    LIMIT 1;

    RETURN random_reg_number;
END ;;
DELIMITER ;
```

taxi management

Enter the start location

Bangalore Palace

Enter the destination

Lalbagh Botanical Garden

5.372597439823163

Select the cab type

hatchback

Book Ride

Ride Booked Successfully!

this successfully allocates a cab of type 'hatchback' which is available ie not in another ride

Trigger

```
-----+-----+
update_avg_rating | UPDATE | rides | BEGIN
  DECLARE total_rating INT;
  DECLARE total_rides INT;
  SELECT SUM(rating), COUNT(*) INTO total_rating, total_rides
  FROM rides
  WHERE driver_id = NEW.driver_id AND rating IS NOT NULL;
  IF total_rides > 0 THEN
    UPDATE drivers
    SET avg_rating = total_rating / total_rides
    WHERE driver_id = NEW.driver_id;
  ELSE
    UPDATE drivers
    SET avg_rating = 0
    WHERE driver_id = NEW.driver_id;
  END IF;
END | AFTER | 2023-11-15 20:37:00.71 | ONLY_FULL_GROUP_BY,STRICT_TRANS_TABLES,NO_ZERO_IN_DATE,NO_ZERO_DATE,ERROR
FOR DIVISION BY ZERO,NO_ENGINE_SUBSTITUTION | root@localhost | cn850 | cn850-general-ci | utf8mb4_09
```

Procedure

```

CREATE DEFINER='root'@'localhost' PROCEDURE `ProcessRidePayment`(
  IN p_booking_id INT
)
BEGIN
  DECLARE p_distance FLOAT;
  DECLARE p_base_fare FLOAT DEFAULT 20;
  DECLARE p_rate_per_km FLOAT DEFAULT 5;
  DECLARE p_additional_charges FLOAT DEFAULT 5;
  DECLARE p_payment_type VARCHAR(255) DEFAULT 'UPI';
  DECLARE p_customer_id INT;
  DECLARE p_driver_id INT;
  DECLARE p_total_bill FLOAT;

  SELECT
    distance,
    customer_id,
    driver_id

  SELECT
    distance,
    customer_id,
    driver_id
  INTO
    p_distance,
    p_customer_id,
    p_driver_id
  FROM rides
  WHERE booking_id = p_booking_id;

  SET p_total_bill = p_base_fare + (p_distance * p_rate_per_km) + p_additional_charges;

  INSERT INTO payments (booking_id, payment_type, amount, customer_id, driver_id)
  VALUES (p_booking_id, p_payment_type, p_total_bill, p_customer_id, p_driver_id);
END

```

Output

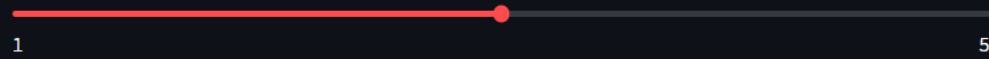
Cab Management System

Enter Ride ID

43.00

- +

Rate the ride (1-5)



Complete Ride

The total amount for this ride is \$75.00

Join Operation

```
query = """
SELECT
    rides.pickup_location,
    rides.drop_location,
    rides.distance,
    customer.name as customer_name,
    rides.rating,
    payments.amount as payment_amount
FROM
    rides
    LEFT JOIN drivers ON rides.driver_ID = drivers.driver_id
    LEFT JOIN customer ON rides.customer_Id = customer.userID
    LEFT JOIN payments ON rides.driver_ID = payments.driver_id
WHERE
    rides.driver_id = %s
"""
```

Output

Enter Driver ID

762332143.00

	Pickup Location	Drop Location	Distance	Customer Name	Rating	Payment Amount
0	ISKCON Temple Bangalore	Cubbon Park	6	srini	5	40
1	ISKCON Temple Bangalore	Cubbon Park	6	srini	5	55
2	ISKCON Temple Bangalore	Cubbon Park	6	srini	5	55
3	ISKCON Temple Bangalore	Cubbon Park	6	srini	5	55
4	Lalbagh Botanical Garden	Cubbon Park	3	srini	3	40
5	Lalbagh Botanical Garden	Cubbon Park	3	srini	3	55
6	Lalbagh Botanical Garden	Cubbon Park	3	srini	3	55
7	Lalbagh Botanical Garden	Cubbon Park	3	srini	3	55
8	Bangalore Palace	Lalbagh Botanical Garden	5	srini	1	40
9	Bangalore Palace	Lalbagh Botanical Garden	5	srini	1	55
10	Bangalore Palace	Lalbagh Botanical Garden	5	srini	1	55
11	Bangalore Palace	Lalbagh Botanical Garden	5	srini	1	55

TRIGGER

```
calculate_avg_rating | INSERT | rides | BEGIN
```

```
DECLARE total_rating INT;
```

```
DECLARE total_rides INT;
```

```
SELECT SUM(rating), COUNT(*) INTO total_rating, total_rides  
FROM rides  
WHERE driver_id = NEW.driver_id AND rating IS NOT NULL;
```

```
IF total_rides > 0 THEN
```

```
    UPDATE drivers
```

```
    SET avg_rating = total_rating / total_rides
```

```
    WHERE driver_id = NEW.driver_id;
```

```
ELSE
```

```
    UPDATE drivers
```

```
    SET avg_rating = 0
```

```
    WHERE driver_id = NEW.driver_id;
```

```
END IF;
```