Санкт-Петербургский государственный университет

Факультет Прикладной математики - процессов управления

Курсовая работа по дисциплине
"Базы данных и сетевые технологии"
на тему:
"База данных нарушений ПДД"

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Введение

В данной курсовой работе описывается процесс создания базы данных нарушений ПДД.

Цель работы заключается в получении практических навыков создания базы данных с использованием среды PostgreSQL. К задачам курсовой работы относится следующее:

1. создание таблиц и формирование связей между ними;
2. написание запросов к созданной базе данных.

Актуальность темы обусловлена стремлением к повышению эффективности работы сотрудников ДПС, оптимизации хранения данных и работы с ними.

Описание базы данных нарушений ПДД

База данных состоит из 4 таблиц: Persons, Cars, Fines, Cops.

Объектная схема

Таблица Persons

1. id :: BIGINT
2. name :: VARCHAR(100)
3. birth_date :: DATE
4. country :: VARCHAR(100)
5. license_num :: INT

Таблица Cars

1. id :: BIGINT
2. number :: INT
3. brand :: VARCHAR(100)
4. power :: INT
5. owner_id :: INT

Таблица Fines

1. id :: BIGINT
2. person_id :: INT
3. car_id :: INT
4. violation :: VARCHAR(200)
5. price :: INT

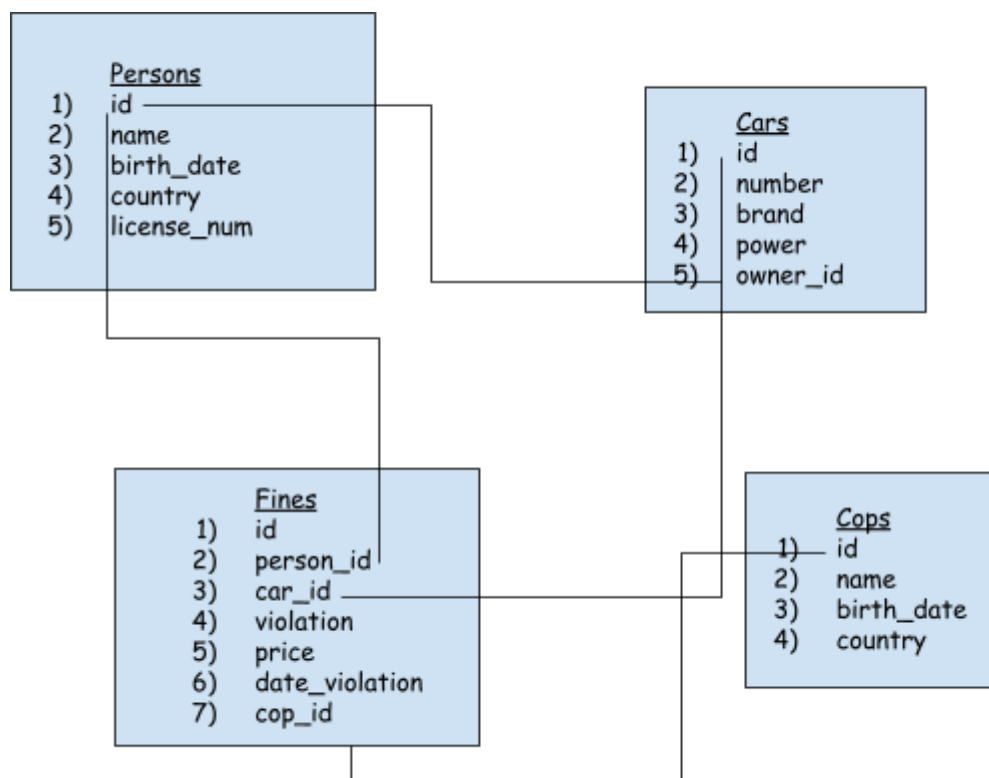6. date_violation :: DATE
7. cop_id :: INT

<u>Таблица Cops</u>
1. id :: BIGINT
2. name :: VARCHAR(100)
3. birth_date :: DATE
4. country :: VARCHAR(100)

Отношения между таблицами

1. Fines m:1 Persons
2. Persons 1:1 Cars
3. Fines m:1 Cars
4. Fines m:1 Cops

<u>Базы данных нарушений ПДД (sql дамп):</u> файл r.protsenko.sql

Схема базы данных

Запросы
Лёгкие запросы

Запрос 1.

Посчитать количество штрафов, совершенных людьми на своих машинах.

```
SELECT COUNT(id) FROM fines WHERE car_id = person_id;
```

```
 count
------
   179
(1 строка)
```

Запрос 2.

Вывести описание, цену и дату штрафов, совершенных в октябре 2021 года.

```
SELECT violation, price, date_violation FROM fines
WHERE date_violation BETWEEN '2021.10.1' AND '2021.10.31' ORDER BY date_violation;
```

```
                      violation                      | price | date_violation
-----------------------------------------------------+-------+----------------
 Parking in the wrong place                          |  3000 | 2021-10-01
 Over speed (from 60 to 80)                          |  2000 | 2021-10-01
 Over speed (from 80 to 100)                         |  5000 | 2021-10-01
 Over speed (from 60 to 80)                          |  2000 | 2021-10-02
 Over speed (from 40 to 60)                          |  1000 | 2021-10-03
 Over speed (from 20 to 40)                          |   500 | 2021-10-03
 Riding without insurance                            |   650 | 2021-10-05
 Riding without insurance                            |   650 | 2021-10-07
 Over speed (from 60 to 80)                          |  2000 | 2021-10-07
 Over speed (from 80 to 100)                         |  5000 | 2021-10-08
 Over speed (from 80 to 100)                         |  5000 | 2021-10-09
 Parking in the wrong place                          |  3000 | 2021-10-09
 Parking in the wrong place                          |  3000 | 2021-10-09
 Over speed (from 20 to 40)                          |   500 | 2021-10-09
 Over speed (from 60 to 80)                          |  2000 | 2021-10-10
 Attempt to bribe a police officer                   | 80000 | 2021-10-11
 Over speed (from 60 to 80)                          |  2000 | 2021-10-13
 Over speed (from 80 to 100)                         |  5000 | 2021-10-14
 Attempt to bribe a police officer                   | 80000 | 2021-10-15
 Crossing on inhibit signal                          |  1000 | 2021-10-16
 Crossing on inhibit signal                          |  1000 | 2021-10-16
 Parking in the wrong place                          |  3000 | 2021-10-16
 Riding without insurance                            |   650 | 2021-10-17
 Over speed (from 60 to 80)                          |  2000 | 2021-10-17
 Causing medium-gravity harm to the health of the victim | 10000 | 2021-10-17
 Parking in the wrong place                          |  3000 | 2021-10-17
 Parking in the wrong place                          |  3000 | 2021-10-18
 Causing minor harm to the health of the victim      |  2500 | 2021-10-19
 Riding without insurance                            |   650 | 2021-10-20
 Causing minor harm to the health of the victim      |  2500 | 2021-10-20
 Over speed (from 20 to 40)                          |   500 | 2021-10-21
 Over speed (from 60 to 80)                          |  2000 | 2021-10-22
 Over speed (from 60 to 80)                          |  2000 | 2021-10-22
 Attempt to bribe a police officer                   | 80000 | 2021-10-24
 Over speed (from 60 to 80)                          |  2000 | 2021-10-25
(35 строк)
```

Запрос 3.

Вывести имя, дату рождения и страну молодых людей до 21 включительно, имеющих права.

```
SELECT name, birth_date, country FROM persons
WHERE DATE_PART('year', AGE(birth_date)) <= 21;
```

```
     name       | birth_date |         country
-----------------+------------+------------------------
 Michael Johnson | 2001-11-09 | Guadeloupe
 Corey Harris    | 2000-06-18 | Bosnia and Herzegovina
(2 строки)
```

Запрос 4.

Вывести машины, марки которых начинаются на М и мощность больше 250.

```
SELECT brand, power FROM cars WHERE brand LIKE 'M%' AND power > 250
ORDER BY power DESC;
```

```
    brand      | power
---------------+-------
 McLaren       |   399
 Metrocab      |   358
 Mazda         |   330
 Mega          |   297
 Messerschmitt |   292
 Mitsubishi    |   286
(6 строк)
```

Запрос 5.

Найти гаишника из Украины.

```
SELECT name, birth_date, country FROM cops
WHERE country LIKE 'Ukraine';
```

```
     name      | birth_date | country
---------------+------------+---------
 Frank McGuire | 1976-06-24 | Ukraine
(1 строка)
```

Средние запросы

Запрос 1.

Найти имена людей, их страну и описание штрафов, оформленных гаишником из Украины.

```
SELECT persons.name, persons.country, fines.violation FROM persons
JOIN fines ON fines.person_id = persons.id JOIN cops ON fines.cop_id = cops.id
WHERE cops.country LIKE 'Ukraine';
```

name	country	violation
Paul Allen	Mauritius	Riding without insurance
Russell Elliott	Kenya	Causing medium-gravity harm to the health of the victim
Don Johnson	Guatemala	Riding without insurance
Tony Evans	Czech Republic	Crossing on inhibit signal
Ronald Taylor	Vietnam	Over speed (from 60 to 80)
Carl Clark	Swaziland	Causing medium-gravity harm to the health of the victim
Lawrence Hoffman	Slovakia	Over speed (from 20 to 40)
Paul Johnson	Bahrain	Riding without insurance
Paul Johnson	Bahrain	Riding without insurance
Jonathan Howell	Armenia	Causing medium-gravity harm to the health of the victim
Edgar Smith	Andorra	Parking in the wrong place
Miguel Johnson	Italy	Parking in the wrong place
Sam Austin	Honduras	Over speed (from 40 to 60)
James Mitchell	Iraq	Over speed (from 60 to 80)
Jeremy Ward	Cayman Islands	Riding without insurance
James Cummings	Angola	Causing minor harm to the health of the victim
Thomas Padilla	South Africa	Crossing on inhibit signal
Thomas Dawson	Namibia	Over speed (from 40 to 60)
Robert Clayton	Cyprus	Over speed (from 60 to 80)
John Lopez	Italy	Attempt to bribe a police officer
Leonard Oliver	United States	Over speed (from 80 to 100)
Mark Smith	Guatemala	Causing minor harm to the health of the victim
Willie Morales	Nepal	Attempt to bribe a police officer
William Dean	Guatemala	Over speed (from 60 to 80)
Fred Ward	Egypt	Over speed (from 60 to 80)
Chad Lopez	Hungary	Over speed (from 80 to 100)
David Neal	Latvia	Parking in the wrong place
Jacob Owen	Namibia	Crossing on inhibit signal
Raymond Russell	U.S. Virgin Islands	Over speed (from 20 to 40)
Tony Jones	Cayman Islands	Over speed (from 40 to 60)
James Cummings	Angola	Causing medium-gravity harm to the health of the victim
Fred Ward	Egypt	Over speed (from 40 to 60)
Charlie Miller	Kuwait	Riding without insurance
David Neal	Latvia	Riding without insurance
Adam Kennedy	Belize	Over speed (from 40 to 60)

(35 строк)

Запрос 2.

Найти для каждого описания штрафа, совершенного на Maserati, его количество.

```
SELECT violation, COUNT(person_id) FROM fines
JOIN cars ON fines.car_id = cars.id
WHERE cars.brand LIKE 'Maserati' GROUP BY violation;
```

```
                      violation                      | count
-----------------------------------------------------+-------
 Attempt to bribe a police officer                   |     2
 Causing medium-gravity harm to the health of the victim |  2
 Causing minor harm to the health of the victim      |     1
 Over speed (from 40 to 60)                          |     1
 Over speed (from 60 to 80)                          |     2
 Over speed (from 80 to 100)                         |     1
 Parking in the wrong place                          |     2
 Riding without insurance                            |     2
(8 строк)
```

Запрос 3.

Вывести фамилию, номер машины и нарушение только для тех водителей, которые на одной машине нарушили одно и то же правило два и более раз, отсортировав по имени, номеру машины и описанию штрафа в алфавитном порядке.

```
SELECT persons.name, cars.number, fines.violation
FROM fines JOIN persons ON fines.person_id = persons.id
JOIN cars ON fines.car_id = cars.id
GROUP BY persons.name, cars.number, fines.violation
HAVING COUNT(name) >= 2
ORDER BY persons.name, cars.number, fines.violation;
```

```
      name        | number |                      violation
------------------+--------+------------------------------------------------------
 Adam Kennedy     |    539 | Drunk driving
 Carl Clark       |    617 | Over speed (from 80 to 100)
 Christopher French |  412 | Causing minor harm to the health of the victim
 Clarence Moore   |    610 | Over speed (from 40 to 60)
 Craig Williams   |    157 | Over speed (from 20 to 40)
 Earl Williams    |    384 | Over speed (from 20 to 40)
 Gabriel Anderson |    434 | Attempt to bribe a police officer
 Joshua Larson    |    455 | Over speed (from 20 to 40)
 Melvin Johnson   |    575 | Drunk driving
 Michael Johnson  |    143 | Causing minor harm to the health of the victim
 Michael Johnson  |    143 | Over speed (from 80 to 100)
 Paul Allen       |    342 | Riding without insurance
 Richard Phillips |     77 | Drunk driving
 Ronald Taylor    |    349 | Causing medium-gravity harm to the health of the victim
 Theodore Gardner |    420 | Parking in the wrong place
 Thomas Padilla   |    701 | Over speed (from 20 to 40)
(16 строк)
```

Сложные запросы

Запрос 1.

Найти человека с максимальным количеством штрафов.

```
SELECT persons.name, COUNT(violation) FROM persons
JOIN fines on persons.id = fines.person_id GROUP BY persons.name
HAVING COUNT(violation) =
(SELECT COUNT(violation) FROM persons
JOIN fines ON persons.id = fines.person_id
GROUP BY persons.name ORDER BY COUNT(violation) DESC LIMIT 1);
```

```
       name       | count
------------------+-------
 Gabriel Anderson |    17
(1 строка)
```

Запрос 2.

Найти машины, у которых минимальное количество штрафов размером больше 5000.

```
SELECT brand, power FROM cars WHERE id IN
(SELECT cars.id FROM cars JOIN fines ON cars.id = fines.car_id
WHERE fines.price > 5000 GROUP BY cars.id HAVING COUNT(price) =
(SELECT COUNT(price) FROM fines WHERE price > 5000 GROUP BY car_id
ORDER BY COUNT(price) LIMIT 1)) ORDER BY brand;
```

```
    brand      | power
---------------+-------
 Alpine        |   389
 Aurus         |   195
 Bitter        |   228
 Cupra         |   176
 Geo           |   154
 GMC           |   298
 Liebao Motor  |   174
 Lucid         |   456
 Pontiac       |   204
 Porsche       |   262
 SEAT          |   204
 Suzuki        |   145
 TATA          |   338
 Tianma        |   276
(14 строк)
```

Запрос 3.

Найти гаишников, которые за 2020 год имели сумму штрафа больше средней.

```
SELECT name, birth_date, country FROM cops WHERE id IN
(SELECT cop_id FROM fines
WHERE date_violation BETWEEN '2020.01.01' AND '2020.12.31'
GROUP BY cop_id HAVING SUM(price) >
(SELECT AVG(totals.sums) FROM
(SELECT SUM(price) AS sums  FROM fines
WHERE date_violation BETWEEN '2020.01.01' AND '2020.12.31'
GROUP BY cop_id) AS totals));
```

name	birth_date	country
Richard Johnston	1990-10-24	Latvia
Joe Henderson	1955-08-11	Portugal
Eugene Robertson	1958-05-04	Iceland
Phillip Barrett	1970-05-19	Iraq
Wade Powers	1985-07-21	Andorra
Jeffrey Williams	1996-01-27	Algeria
Adam Jones	1994-05-22	Estonia
Jorge Daniels	1956-02-18	Slovakia
Robert Foster	1997-05-25	Guinea
Joshua Graham	1989-09-02	Guadeloupe
Howard Jones	1957-03-27	New Caledonia
David West	2000-02-07	Bangladesh

(12 строк)