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| 实验报告 | | | |
| 题目 | 专利数据库的建立与运用 | | |
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| 实验环境（计算机配置，操作系统，RDBMS版本等）  在Windows 64位操作系统，使用MySql软件建立数据库。 | | | |
| 实验内容（给出实验要求中的内容）  一、具体代码：  CREATE database if not exists patent\_2022;  use patent\_2022;  ##建表  CREATE table if not exists g\_patent(patent\_number varchar(20) PRIMARY KEY, d\_ipc int CHECK(d\_ipc = 0 or d\_ipc = 1), ipc\_section varchar(32), application\_number varchar(36));  CREATE table if not exists g\_inventor\_general(patent\_number varchar(20) PRIMARY KEY, team\_size int, inventors int, men\_inventors int, women\_inventors int, d\_inventor int CHECK(d\_inventor = 0 or d\_inventor = 1));  CREATE table if not exists g\_inventor\_detailed(patent\_number varchar(20) PRIMARY KEY, inventor\_id1 varchar(128), male\_flag1 int, inventor\_name1 varchar(128), inventor\_id2 varchar(128), male\_flag2 int, inventor\_name2 varchar(128), inventor\_id3 varchar(128), male\_flag3 int, inventor\_name3 varchar(128), inventor\_id4 varchar(128), male\_flag4 int, inventor\_name4 varchar(128), inventor\_id5 varchar(128), male\_flag5 int, inventor\_name5 varchar(128), inventor\_id6 varchar(128), male\_flag6 int, inventor\_name6 varchar(128), inventor\_id7 varchar(128), male\_flag7 int, inventor\_name7 varchar(128), inventor\_id8 varchar(128), male\_flag8 int, inventor\_name8 varchar(128), inventor\_id9 varchar(128), male\_flag9 int, inventor\_name9 varchar(128), inventors int);  CREATE table if not exists g\_application(application\_number varchar(20) PRIMARY KEY, application\_year int, patent\_number varchar(36) not null, grant\_year int, d\_application int CHECK(d\_application = 0 or d\_application = 1), KEY `K\_\_appli\_patent` (`patent\_number`), CONSTRAINT `FK\_\_appli\_patent` FOREIGN KEY (`patent\_number`) REFERENCES `g\_patent`(`patent\_number`));  CREATE table if not exists g\_assignee(patent\_number varchar(20) PRIMARY KEY, d\_assignee int, assignee varchar(160), assignee\_sequence int, assignee\_ind int);  CREATE table if not exists g\_location(patent\_number varchar(20) PRIMARY KEY, country varchar(36), city varchar(100), state varchar(36), county varchar(72), d\_location int CHECK(d\_location = 0 or d\_location = 1));  ##加入表级约束  ALTER table g\_inventor\_general add constraint inventor\_num  CHECK(inventors = men\_inventors + women\_inventors and  team\_size >= inventors);  ##建立跟踪表  #男女发明人数量差大于10  CREATE table if not exists inventor\_alert(patent\_number varchar(20) PRIMARY KEY, inventors int, men\_inventors int, women\_inventors int);  #从申请到确定相隔8年以上  CREATE table if not exists appli\_delay(application\_number varchar(20) PRIMARY KEY, patent\_number varchar(36) not null, application\_year int, grant\_year int);  #超大型非发明人团队（非发明人数量>10或有发明人时大于发明人数的五倍）  CREATE table if not exists beyond\_inventor(patent\_number varchar(20) PRIMARY KEY, not\_inventors int, inventors int);  ##分别创建触发器  delimiter //  CREATE trigger inventor\_warning  AFTER INSERT on g\_inventor\_general for each row  begin  if ((new.men\_inventors - new.women\_inventors > 10)  or (new.women\_inventors - new.men\_inventors > 10)) then  INSERT into inventor\_alert  values(new.patent\_number, new.inventors, new.men\_inventors, new.women\_inventors);  end if;  end;//  CREATE trigger application\_long  AFTER INSERT on g\_application for each row  begin  if(new.grant\_year - new.application\_year >8) then  INSERT into appli\_delay  values(new.application\_number, new.patent\_number, new.application\_year, new.grant\_year);  end if;  end;//  CREATE trigger big\_assistants  AFTER INSERT on g\_inventor\_general for each row  begin  if((new.team\_size - new.inventors >10) or  ((new.team\_size > 6\*new.inventors) and (new.inventors > 0))) then  INSERT into beyond\_inventor  values(new.patent\_number, new.team\_size - new.inventors, new.inventors);  end if;  end;//  delimiter ;  ##导入数据，查看触发器执行情况  LOAD data infile 'C:/ProgramData/MySQL/MySQL Server 8.1/UpLOADs/g\_patent.csv'  into table g\_patent fields terminated by ','  IGNORE 1 LINES;  LOAD data infile 'C:/ProgramData/MySQL/MySQL Server 8.1/UpLOADs/g\_inventor\_general.csv'  into table g\_inventor\_general fields terminated by ','  IGNORE 1 LINES;  LOAD data infile 'C:/ProgramData/MySQL/MySQL Server 8.1/UpLOADs/g\_inventor\_detailed.csv'  into table g\_inventor\_detailed fields terminated by ','  IGNORE 1 LINES  (`patent\_number`,`inventor\_id1`,@`male\_flag1`,`inventor\_name1`,  `inventor\_id2`,@`male\_flag2`,`inventor\_name2`,`inventor\_id3`,@`male\_flag3`,`inventor\_name3`,  `inventor\_id4`,@`male\_flag4`,`inventor\_name4`,`inventor\_id5`,@`male\_flag5`,`inventor\_name5`,  `inventor\_id6`,@`male\_flag6`,`inventor\_name6`,`inventor\_id7`,@`male\_flag7`,`inventor\_name7`,  `inventor\_id8`,@`male\_flag8`,`inventor\_name8`,`inventor\_id9`,@`male\_flag9`,`inventor\_name9`,  `inventors`)  set `male\_flag1` = nullif(@male\_flag1,''),  `male\_flag2` = nullif(@male\_flag2,''),  `male\_flag3` = nullif(@male\_flag3,''),  `male\_flag4` = nullif(@male\_flag4,''),  `male\_flag5` = nullif(@male\_flag5,''),  `male\_flag6` = nullif(@male\_flag6,''),  `male\_flag7` = nullif(@male\_flag7,''),  `male\_flag8` = nullif(@male\_flag8,''),  `male\_flag9` = nullif(@male\_flag9,'');  LOAD data infile 'C:/ProgramData/MySQL/MySQL Server 8.1/UpLOADs/g\_application.csv'  into table g\_application fields terminated by ','  IGNORE 1 LINES;  LOAD data infile 'C:/ProgramData/MySQL/MySQL Server 8.1/UpLOADs/g\_assignee.csv'  into table g\_assignee fields terminated by ','  IGNORE 1 LINES  (`patent\_number`,`d\_assignee`,`assignee`,@`assignee\_sequence`,`assignee\_ind`)  set `assignee\_sequence` = nullif(@assignee\_sequence,'');  LOAD data infile 'C:/ProgramData/MySQL/MySQL Server 8.1/UpLOADs/g\_location.csv'  into table g\_location fields terminated by ','  IGNORE 1 LINES;  SELECT \* from inventor\_alert;  SELECT \* from appli\_delay  order by patent\_number;  SELECT \* from beyond\_inventor;  二、实验结果：  异常追踪表最终结果如下列图所示：    从左到右，分别为男女发明人数量差大于10，从申请到确定相隔8年以上，超大型非发明人团队（非发明人数量>10或有发明人时大于发明人数的五倍）三种异常业务的追踪表。可以看到，触发器成功触发，追踪表记录下符合触发条件的元组。 | | | |
| 实验总结  1.在设计触发器时，须考虑数据量与触发条件的关系，比如数据量大时，触发器可能多次触发，导致异常追踪表中元组较多，“异常”不再那么“异常”，我们可以考虑收紧触发条件等方法  2.在异常追踪表的建立过程中，外键非常重要，这需要我们在设计基本表时，合理设计约束完整性，从而使异常追踪表更加合理  3.在创建触发器时，须注意语法结构与C语言类似，注意MySql与其的区别（delimiter） | | | |