

《数据库原理与设计》实验报告

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实验题目	实验 7 索引			
实验时间	2024. 10. 22	实验地点	DS1501	
实验成绩		实验性质	<input checked="" type="checkbox"/> 验证性 <input type="checkbox"/> 设计性 <input type="checkbox"/> 综合性	
教师评价： <input type="checkbox"/> 算法/实验过程正确; <input type="checkbox"/> 源程序/实验内容提交 <input type="checkbox"/> 程序结构/实验步骤合理; <input type="checkbox"/> 实验结果正确; <input type="checkbox"/> 语法、语义正确; <input type="checkbox"/> 报告规范; 其他: 评价教师签名:				
一、实验目的 [1] 理解索引的定义及优点; [2] 掌握创建索引的方法; [3] 掌握管理索引的方法。				
二、实验项目内容 针对数据库 Library 进行下面的实验： 1. 使用图形界面工具对 reader 表的读者编号 rno 列创建主键索引; 2. 使用图形界面工具对 book 表的 btitle 列创建全文索引 btix; 3. 使用 SQL 在 book 表中的 bno 创建一个唯一性索引 bnox; 4. 使用图形界面工具将索引 btix 重命名为 title_index; 5. 使用图形界面工具查看索引 title_index; 6. 使用图形界面工具删除索引 title_index; 7. 使用 SQL 删除索引 bnox; 8. 仿照实验 7.2，设计一个检测索引功能的实验。				
三、实验过程或算法（源程序） 3. create unique index bnox on book(bno); 7.				

报告创建时间:

```
drop index bnx on book;
```

8 先创建了一个随着时间 year 的增长等级增长的表，没一万级增长则变换等级，等级依次为 EDCBA，这样，在 tech_level 表中一共有五万条记录

```
delimiter $
```

```
create procedure insert1()
begin
declare i int default 1;
while (i<=10000)do
insert into tech_level values(i,concat('E',i));
set i=i+1;
end while;
END$
```

```
create procedure insert2()
begin
declare i int default 1;
while (i<=10000)do
insert into tech_level values(i,concat('D',i));
set i=i+1;
end while;
END$
```

```
create procedure insert3()
begin
declare i int default 1;
while (i<=10000)do
insert into tech_level values(i,concat('C',i));
set i=i+1;
end while;
END$
```

```
create procedure insert4()
begin
declare i int default 1;
while (i<=10000)do
insert into tech_level values(i,concat('B',i));
set i=i+1;
end while;
END$
```

```
create procedure insert5()
begin
declare i int default 1;
```

```

while (i<=10000)do
insert into tech_level values(i,concat('A',i));
set i=i+1;
end while;
END$
```

```

delimiter ;

call insert1();
call insert2();
call insert3();
call insert4();
call insert5();
```

然后比较有索引和无索引的查找速度

```

select * from tech_level where level='A1';
Explain select * from tech_level where level='A1';
```

```

create index level_index on tech_level(level);
select * from tech_level where level='A1';
Explain select * from tech_level where level='A1';
```

四、实验结果及分析和（或）源程序调试过程

1. 创建主键，系统将自动生成主键索引

The screenshot shows the MySQL Workbench interface for creating a primary key and index. The main table lists columns: rno (CHAR(10), PK, NN, AI), rname (VARCHAR(20), NN), rsex (VARCHAR(2)), rage (TINYINT), and reduction (VARCHAR(10)). Below the table, a new column 'rno' is being defined with type CHAR(10), storage as Virtual, and primary key checked. The 'Index Columns' section shows 'rno' as the only column in the index, ordered ASC. Index options include storage type as InnoDB, key block size as 0, and parser as Standard.

Column Name	Datatype	PK	NN	UQ	B	UN	ZF	AI	G	Default/Expression
rno	CHAR(10)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>						
rname	VARCHAR(20)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>						
rsex	VARCHAR(2)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	NULL
rage	TINYINT	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	NULL
reduction	VARCHAR(10)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	NULL

Column Name: rno
Data Type: CHAR(10)
Default:
Storage: Virtual Primary Key Not Null Unique
Binary Unsigned Zero
Auto Increment Generated

Comments:

Index Name	Type
PRIMARY	PRIMARY

Index Columns

Column	#	Order	Length
rno	1	ASC	
rname		ASC	
rsex		ASC	
rage		ASC	
reduction		ASC	

Index Options

- Storage Type:
- Key Block Size: 0
- Parser:
- Visible:

Index Comment:

2. 创建

Comments:

Index Name	Type
PRIMARY	PRIMARY
bno	UNIQUE
btix	FULLTEXT

Index Columns

Column	#	Order	Length
bno		ASC	
<input checked="" type="checkbox"/> btitle	1	ASC	
bauthor		ASC	
bprice		ASC	

Index Options

- Storage Type:
- Key Block Size: 0
- Parser:
- Visible:

Index Comment:

Columns Indexes ForeignKeys Triggers Partitioning Options

Apply Revert

创建成功

The navigation tree shows the following structure:

- library
 - Tables
 - book
 - Columns
 - Indexes
 - PRIMARY
 - bno
 - btix** (highlighted)

Index: **btix**

Definition:

Type	FULLTEXT
Unique	No
Visible	Yes
Columns	btitle

3.

1 • create unique index bnx on book(bno);
2

Index: bnx

Definition:

Type	BTREE
Unique	Yes
Visible	Yes
Columns	bno

Action Output

#	Time	Action
11	21:12:16	SELECT * FROM library.borrow LIMIT 0, 1000
12	21:12:25	SELECT * FROM library.book_count LIMIT 0, 1000
13	21:13:47	insert into book_count(bno,borrowtimes) values('13','b02')
14	21:15:05	insert into book_count(bno,borrowtimes) values('13','b02')
15	21:16:01	insert into borrow(borrownum,bno) values('13','b02')
16	21:16:07	SELECT * FROM library.book_count LIMIT 0, 1000
17	21:25:36	Apply changes to book
18	21:29:01	Apply changes to book
19	21:30:07	create unique index bnx on book(bno)

4、5

1 ALTER TABLE 'library', 'book'
2 ;
3 ALTER TABLE 'library', 'book' RENAME INDEX 'btix' TO 'title_index';
4 ALTER TABLE 'library', 'book' ALTER INDEX 'title_index' VISIBLE;
5

Action Output

#	Time	Action
12	21:12:25	SELECT * FROM library.borrow LIMIT 0, 1000
13	21:13:47	insert into book_count(bno,borrowtimes) values('13','b02')
14	21:15:05	insert into book_count(bno,borrowtimes) values('13','b02')
15	21:16:01	insert into borrow(borrownum,bno) values('13','b02')
16	21:16:07	SELECT * FROM library.book_count LIMIT 0, 1000

Navigator

SCHEMAS

Filter objects

library

- Tables
 - book
 - Columns
 - Indexes
 - PRIMARY
 - bnox
 - title_index**
 - Foreign Keys
 - Triggers
 - book_count
 - bookcopy
 - borrow
 - readcopy
 - reader
 - test1
 - test2
 - Views
 - Stored Procedures
 - Functions

library_2

Administration Schemas

Information

Index: title_index

Definition:

Type	FULLTEXT
Unique	No
Visible	Yes
Columns	btitle

6.

Index Name	Type
PRIMARY	PRIMARY
bnox	UNIQUE

Delete Selected

Index Columns

Column	#	Order	Length
<input checked="" type="checkbox"/> bno	1	ASC	
<input type="checkbox"/> btitle		ASC	
<input type="checkbox"/> bauthor		ASC	

7.

File Database Refresh Find Go Back Home Help

```
1 • drop index bnox on book;
2
```

8.先创建表和批量插入数据

#	Time	Action	Message
1	22:58:22	call insert1()	1 row(s) affected
2	22:58:38	call insert2()	1 row(s) affected
3	22:58:54	call insert3()	1 row(s) affected
4	22:59:11	call insert4()	1 row(s) affected
5	22:59:27	call insert5()	1 row(s) affected
6	23:00:05	SELECT * FROM library.tech_level	50000 row(s) returned

先用一般查询，可以看到时间 0.032sec

year	level
1	A1

Output

#	Time	Action	Message	Duration / Fetch
1	23:15:00	SELECT * FROM library.tech_level	50000 row(s) returned	0.000 sec / 0.015 sec
2	23:15:33	select * from tech_level where level='A1'	1 row(s) returned	0.032 sec / 0.000 sec

Explain Output

id	select_type	table	partitions	type	possible_keys	key	key_len	ref	rows	filtered	Extra
1	SIMPLE	tech_level	HULL	ALL	HULL	HULL	HULL	HULL	50163	10.00	Using where

然后在 level 上创建索引，时间变快了

```

1 •  create index level_index on tech_level(level);
2 •  select * from tech_level where level='A1';
3

```

Automatic context help disabled. Use the toolbar manually get help for the current caret position or toggle automatic help

Result Grid | Filter Rows: _____ | Export: | Wrap Cell Content: |

year	level
1	A1

tech_level 3 ×

Output

Action Output

#	Time	Action	Message	Duration / Fetch
1	23:15:00	SELECT * FROM library.tech_level	50000 row(s) returned	0.000 sec / 0.015 s
2	23:15:33	select * from tech_level where level='A1'	1 row(s) returned	0.032 sec / 0.000 s
3	23:18:43	explain select * from tech_level where level='A1'	1 row(s) returned	0.015 sec / 0.000 s
4	23:21:01	create index level_index on tech_level(level)	0 row(s) affected Records: 0 Duplicates: 0 Warnings: 0	0.250 sec
5	23:21:01	select * from tech_level where level='A1'	1 row(s) returned	0.000 sec / 0.000 s

Read Only Context Help Snippets

用 explain 也可以看到，确实用了创建的索引 level_index

```

1
2 •  explain select * from tech_level where level='A1';
3

```

Result Grid | Filter Rows: _____ | Export: | Wrap Cell Content: |

ID	select_type	table	partitions	type	possible_keys	key	key_len	ref	rows	filtered	Extra
1	SIMPLE	tech_level	NULL	ref	level_index	level_index	83	const	1	100.00	NULL