CRUD Operations

(Create, Read, Update, and Delete) are the basic set of operations that allow users to interact with the MongoDB server.

As we know, to use MongoDB we need to interact with the MongoDB server to perform certain operations like entering new data into the application, updating data into the application, deleting data from the application, and reading the application data.

In this article, we will learn all **4 major operations**– **CREATE**, **READ**, **UPDATE**, and **DELETE** that form the CRUD operations in MongoDB.

Perform CRUD Operations in MongoDB

Now that we know the components of the CRUD operation, let's learn about each individual operation in MongoDB. We will know what each operation does, and the methods to perform these operations in MongoDB.

1. Create Operations

The **create or insert operations** are used to insert or add new documents in the collection. If a collection does not exist, then it will create a new collection in the database.

You can perform, create operations using the following methods provided by the MongoDB:

Method	Description
db.collection.insertOne()	It is used to insert a single document in the collection.
db.collection.insertMany()	It is used to insert multiple documents in the collection.
db.createCollection()	It is used to create an empty collection.

2. Read Operations

The Read operations are used to retrieve documents from the collection, or in other words, read operations are used to query a collection for a document.

You can perform read operation using the following method provided by the MongoDB:

Method	Description
db.collection.find()	It is used to retrieve documents from the collection.

```
Note: pretty() method is used to decorate the result such that it is easy to read.
```

3. Update Operations

The update operations are used to update or modify the existing document in the collection. You can perform update operations using the following methods provided by the MongoDB:

Method	Description
db.collection.updateOne()	It is used to update a single document in the collection that satisfy the given criteria.
db.collection.updateMany()	It is used to update multiple documents in the collection that satisfy the given criteria.
db.collection.replaceOne()	It is used to replace single document in the collection that satisfy the given criteria.

4. Delete Operations

The delete operation are used to delete or remove the documents from a collection. You can perform delete operations using the following methods provided by the MongoDB:

Method	Description
db.collection.deleteOne()	It is used to delete a single document from the collection that satisfy the given criteria.
db.collection.deleteMany()	It is used to delete multiple documents from the collection that satisfy the given criteria.

Conclusion

CRUD operations are the fundamentals of MongoDB. MongoDB CRUD operations let user interact with the MongoDB server. They provide operations to create, read, update and delete documents from the collection in database.

In this article, we have explained the purpose and use of CRUD operations in MongoDB. We have also discussed each CRUD operation with examples to provide better understanding of the concept.

EXPERIMENT 01

a. Illustration of Where Clause, AND,OR operations in MongoDB.

b. Execute the Commands of MongoDB and operations in MongoDB : Insert, Query, Update, Delete and Projection.

Where Clause, AND,OR

WHERE:

In MongoDB, the where clause is not used as in traditional SQL queries. Instead, MongoDB uses the $where operator, which allows for the execution of JavaScript functions to perform complex queries. However, the use of $where is discouraged due to performance implications, as it can be slower than traditional query methods and may not leverage indexes efficiently.

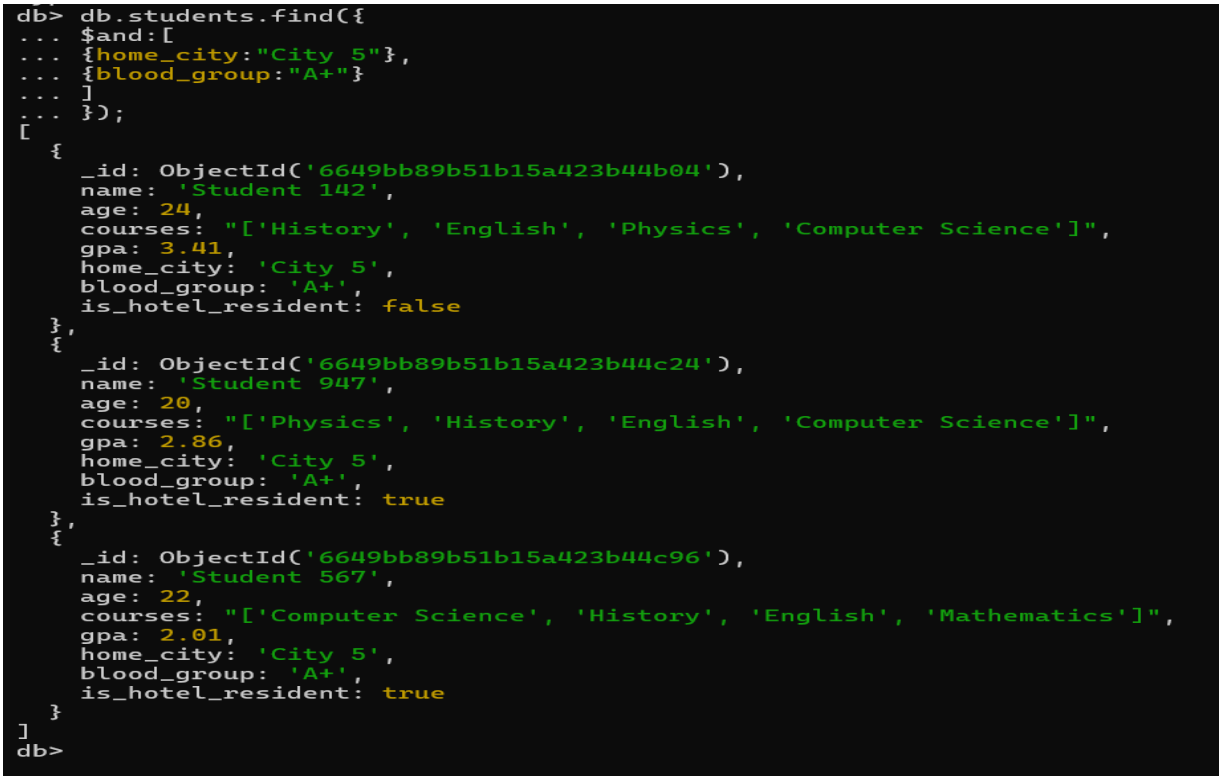
```
db> db.students.find({gpa:{$gt:3.5}});
[
  {
    _id: ObjectId('6649bb89b51b15a423b44ad1'),
    name: 'Student 930',
    age: 25,
    courses: "['English', 'Computer Science', 'Mathematics', 'History']",
    gpa: 3.63,
    home_city: 'City 3',
    blood_group: 'A-',
    is_hotel_resident: true
  },
  {
    _id: ObjectId('6649bb89b51b15a423b44ad3'),
    name: 'Student 268',
    age: 21,
    courses: "['Mathematics', 'History', 'Physics']",
    gpa: 3.98,
    blood_group: 'A+',
    is_hotel_resident: false
  },
  {
    _id: ObjectId('6649bb89b51b15a423b44add'),
    name: 'Student 368',
    age: 20,
    courses: "['English', 'History', 'Physics', 'Computer Science']",
    gpa: 3.91,
    home_city: 'City 9',
    blood_group: 'O-',
    is_hotel_resident: false
  },
  {
    _id: ObjectId('6649bb89b51b15a423b44ae4'),
    name: 'Student 468',
    age: 21,
    courses: "['Computer Science', 'Physics', 'Mathematics', 'History']",
    gpa: 3.97,
    blood_group: 'A-',
    is_hotel_resident: true
  },
```

The MongoDB query `db.students.find({gpa:{$gt:3.5}});` is used to retrieve documents from the `students` collection where the `gpa` field is greater than 3.5. The query returns four documents that match this criteria. Each document represents a student and includes fields such as `_id` (the unique identifier), `name`, `age`, `courses`, `gpa`, `home_city`, `blood_group`, and `is_hotel_resident`. These fields provide information about the students' personal details, academic performance, and other attributes. For example, one student has a GPA of 3.63, is from City 3, has blood type A-, and is a hotel resident, while another student has a GPA of 3.98, is not a hotel resident, and has blood type A+.

AND:

In MongoDB, the `$and` operator is used to combine multiple conditions in a query, requiring that all conditions must be met for a document to be returned. It is often used when you need to specify several criteria for selecting documents from a collection.

For example,
`db.collection.find({ $and: [ { field1: value1 }, { field2: value2 } ] })` will return documents where `field1` is equal to `value1` and `field2` is equal to `value2`.



```
db> db.students.find({
... $and:[
... {home_city:"City 5"},
... {blood_group:"A+"}
... ]
... });
[
  {
    _id: ObjectId('6649bb89b51b15a423b44b04'),
    name: 'Student 142',
    age: 24,
    courses: "['History', 'English', 'Physics', 'Computer Science']",
    gpa: 3.41,
    home_city: 'City 5',
    blood_group: 'A+',
    is_hotel_resident: false
  },
  {
    _id: ObjectId('6649bb89b51b15a423b44c24'),
    name: 'Student 947',
    age: 20,
    courses: "['Physics', 'History', 'English', 'Computer Science']",
    gpa: 2.86,
    home_city: 'City 5',
    blood_group: 'A+',
    is_hotel_resident: true
  },
  {
    _id: ObjectId('6649bb89b51b15a423b44c96'),
    name: 'Student 567',
    age: 22,
    courses: "['Computer Science', 'History', 'English', 'Mathematics']",
    gpa: 2.01,
    home_city: 'City 5',
    blood_group: 'A+',
    is_hotel_resident: true
  }
]
db>
```

The MongoDB query `db.students.find({ $and:[{ home_city: "City 5" }, { blood_group: "A+" }]})` is used to retrieve documents from the `students` collection where both the`home_city` field is "City 5" and the `blood_group` field is "A+". The query returns three documents that match these criteria. Each document represents a student and includes fields such as `_id` (the unique identifier), `name`, `age`, `courses`, `gpa`, `home_city`,

`blood_group`, and `is_hotel_resident`. These fields provide information about the students' personal details, academic performance, and other attributes. For example, one student from City 5 with blood type A+ has a GPA of 3.41 and is not a hotel resident, while another student with the same blood type and city is a hotel resident with a lower GPA.

OR:

In MongoDB, the `$or` operator performs a logical OR operation between multiple expressions in a query, matching documents that satisfy at least one of the specified conditions. This allows for the construction of queries where documents can meet any of the criteria specified within the `$or` array. For example, `db.collection.find({ $or: [{ field1: value1 }, { field2: value2
}] })` will return documents where `field1` is equal to `value1` or `field2` is equal to `value2`.

```
db> db.students.find({
... $or:[
... {is_hotel_resident:true},
... {gpa:{$lt:3.0}}
... ]
... });
[
  {
    _id: ObjectId('6649bb89b51b15a423b44acd'),
    name: 'Student 948',
    age: 19,
    courses: "['English', 'Computer Science', 'Physics', 'Mathematics']",
    gpa: 3.44,
    home_city: 'City 2',
    blood_group: 'O+',
    is_hotel_resident: true
  },
  {
    _id: ObjectId('6649bb89b51b15a423b44ace'),
    name: 'Student 157',
    age: 20,
    courses: "['Physics', 'English']",
    gpa: 2.27,
    home_city: 'City 4',
    blood_group: 'O-',
    is_hotel_resident: true
  },
  {
    _id: ObjectId('6649bb89b51b15a423b44acf'),
    name: 'Student 316',
    age: 20,
    courses: "['Physics', 'Computer Science', 'Mathematics', 'History']",
    gpa: 2.32,
    blood_group: 'B+',
    is_hotel_resident: true
  },
```

The MongoDB query `db.students.find({ $or: [ { is_hotel_resident: true }, { gpa: { $lt: 3.0 } } ] })` is used to retrieve documents from the `students` collection where either the `is_hotel_resident` field is true or the `gpa` field is less than 3.0. The query returns

multiple documents that match these criteria. Each document represents a student and includes fields such as `_id` (the unique identifier), `name`, `age`, `courses`, `gpa`, `home_city`,
`blood_group`, and `is_hotel_resident`. These fields provide information about the students' personal details, academic performance, and other attributes. For example, one student is a hotel resident with a GPA of 3.44, while another student has a GPA of 2.27 and is also a hotel resident.

INSERTONE:

In MongoDB, the `insertOne` method is used to insert a single document into a collection. It takes a single parameter, which is an object representing the document to be inserted. Upon successful insertion, it returns an object with an `acknowledged` field set to true and an
`insertedId` field containing the unique identifier (`ObjectId`) assigned to the newly inserted document. This method is useful for adding individual documents to a collection in MongoDB.

```
db> const studentData={
... "name":"Alice Smith",
... "age":22,
... "courses":["Mathematics","Computer Science","English"],
... "gpa":3.8,
... "home_city":"New York",
... "blood_group":"A+",
... "is_hotel_resident":false
... };

db> db.students.insertOne(studentData);
{
  acknowledged: true,
  insertedId: ObjectId('6661da38b0d232162dcdcdf6')
}
db>
```

JavaScript object `studentData` contains information about a student, including their name, age, courses, GPA, home city, blood group, and hotel residency status. Using the
`insertOne` method in MongoDB, this data is inserted into the `students` collection as a single document. The `insertedId` field in the returned object confirms that the document was successfully inserted and includes the unique identifier (`ObjectId`) assigned to the newly inserted document. This identifier can be used to uniquely identify and retrieve the inserted

document from the collection.

UPDATEONE:

In MongoDB, the `updateOne` method is used to update a single document that matches a specified filter. It takes two parameters: a filter object to identify the document to update, and an update object containing the modifications to apply. Only the first document that matches the filter is updated. The method returns an object indicating whether the update operation was acknowledged and the number of documents modified.

```
db> db.students.insertOne(studentData);
{
  acknowledged: true,
  insertedId: ObjectId('6661da38b0d232162dcdcdf6')
}
db>  db.students.updateOne({name:"Alice Smith"},{$set:{gpa:3.8}});
{
  acknowledged: true,
  insertedId: null,
  matchedCount: 1,
  modifiedCount: 0,
  upsertedCount: 0
}
db>
```

The first MongoDB operation inserts a new document into the `students` collection using `insertOne`, which is acknowledged with `acknowledged: true` and provides the

`insertedId` of the new document. The second operation uses `updateOne` to find a document with the name "Alice Smith" and update its `gpa` field to 3.8. This update operation is also acknowledged with `acknowledged: true`, and it indicates that one document was matched (`matchedCount: 1`), but no actual modifications were made (`modifiedCount: 0`) because the existing `gpa` value was already 3.8.

DELETEONE

. Only the first document that matches the filter is updated. The method returns an object indicating whether the update operation was acknowledged and the number of documents modified.

```
db> db.students.insertOne(studentData);
{
  acknowledged: true,
  insertedId: ObjectId('6661da38b0d232162dcdcdf6')
}
db>  db.students.updateOne({name:"Alice Smith"},{$set:{gpa:3.8}});
{
  acknowledged: true,
  insertedId: null,
  matchedCount: 1,
  modifiedCount: 0,
  upsertedCount: 0
}
db>
```

The first MongoDB operation inserts a new document into the `students` collection using `insertOne`, which is acknowledged with `acknowledged: true` and provides the
`insertedId` of the new document. The second operation uses `updateOne` to find a document with the name "Alice Smith" and update its `gpa` field to 3.8. This update operation is also acknowledged with `acknowledged: true`, and it indicates that one document was matched (`matchedCount: 1`), but no actual modifications were made (`modifiedCount: 0`) because the existing `gpa` value was already 3.8.

UPDATEMANY:

In MongoDB, the `updateMany` method is used to update multiple documents that match a specified filter. It takes two parameters: a filter object to identify the documents to update, and an update object containing the modifications to apply. All documents that match the filter will be updated. The method returns an object indicating whether the update operation was acknowledged and the number of documents modified.

```
db> db.students.updateMany({gpa:{$lt:3.0}},{$inc:{gpa:0.5}});
{
  acknowledged: true,
  insertedId: null,
  matchedCount: 261,
  modifiedCount: 261,
  upsertedCount: 0
}
```

The MongoDB operation `updateMany` is used to update multiple documents in the `students` collection where the `gpa` is less than 3.0. The update increments the `gpa` field by 0.5 for each matched document. The operation is acknowledged with `acknowledged: true` and indicates that 261 documents were matched (`matchedCount: 261`) and modified (`modifiedCount: 261`). This means that all documents with a `gpa` less than 3.0 were successfully updated to increase their `gpa` by 0.5.

DELETEMANY:

In MongoDB, the `deleteMany` method is used to delete multiple documents that match specified filter. It takes a filter object to identify the documents to delete, and removes all documents that match the filter. The method returns an object indicating whether the delete operation was acknowledged and the number of documents deleted.

```
db> db.students.deleteMany({is_hotel_resident:false});
{ acknowledged: true, deletedCount: 255 }
db>
```

MongoDB operation `deleteMany` is used to delete multiple documents from the `students` collection where the `is_hotel_resident` field is `false`. The operation is acknowledged with `acknowledged: true` and indicates that 255 documents were deleted (`deletedCount: 255`). This means that all documents in the collection where `is_hotel_resident` is `false` were successfully removed.

One More example for experiment 1(a):

```
//To create the new database as well as switch the database if not existing
use ProgrammingBooks
```

```
//To create the collection inside the database
db.createCollection("BookDetails")
```

```
//To insert the single value or document
db.BookDetails.insertOne({
  _id: 1,
  title: "Clean Code",
  author: "Robert C. Martin",
  category: "Software Development",
  year: 2008
})
```

Note: Insert multiples values or document in collection command...

```
//To insert the multiple values or documents
db.BookDetails.insertMany([
{_id: 1, title: "Clean Code", author: "Robert C. Martin", category: "Software Development", year: 2008 },
{_id: 2,  title: "JavaScript: The Good Parts", author: "Douglas Crockford", category: "JavaScript", year: 2008 },
{_id: 3,  title: "Design Patterns", author: "Erich Gamma", category: "Software Design", year: 1994 },
{_id: 4,  title: "Introduction to Algorithms", author: "Thomas H. Cormen", category: "Algorithms", year: 2009 },
{_id: 5,  title: "Python Crash Course", author: "Eric Matthes", category: "Python", year: 2015 }
]);
```

```
//Condition statement for where operator
db.BookDetails.find({ year: 2008 }).pretty()
```

OUTPUT:

```
[
  {
    _id: 1,
    title: 'Clean Code',
    author: 'Robert C. Martin',
    category: 'Software Development',
    year: 2008
  },
  {
    _id: 2,
    title: 'JavaScript: The Good Parts',
    author: 'Douglas Crockford',
    category: 'JavaScript',
    year: 2008
  }
]
```