MongoDB Geospatial Queries

mongodb.com

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Overview

- MongoDB supports geospatial queries on:
  - GeoJSON objects (spherical geometry)
  - Legacy coordinate pairs (planar geometry)
- Geospatial indexes enhance query performance
- Applications include location-based services, mapping, and spatial analysis

GeoJSON Format

- Represents geospatial data on an earth-like sphere
- Structure:

```
{
  "type": "Point",
  "coordinates": [-73.856077, 40.848447]
}
```

- Coordinates are in [longitude, latitude] order

Legacy Coordinate Pairs

- Represents geospatial data on a Euclidean plane
- Preferred format:

```
"location": [-73.856077, 40.848447]
```

- Also supports embedded documents:

```
"location": { "x": -73.856077, "y": 40.848447 }
```

- Use 2d indexes for planar geometry

Geospatial Indexes

- **2dsphere Index**:
  - Supports spherical geometry
  - Required for GeoJSON objects
  - Created with:

```
db.collection.createIndex({ location: "2dsphere" })
```

- **2d Index**:
  - Supports planar geometry
  - Suitable for legacy coordinate pairs
  - Created with:

```
db.collection.createIndex({ location: "2d" })
```

Geospatial Query Operators

- `$near`:
  - Finds documents close to a point
  - Requires a geospatial index
- `$geoWithin`:
  - Finds documents within a specified geometry
- `$geoIntersects`:
  - Finds documents that intersect with a geometry
- `$nearSphere`:
  - Similar to `$near` but calculates distances on a sphere

Example: $near Query

```
db.places.find({
  location: {
    $near: {
      $geometry: {
        type: "Point",
        coordinates: [-73.856077, 40.848447]
      },
      $maxDistance: 1000
    }
  }
})
```

- Finds places within 1 km of the specified point

Example: $geoWithin Query

```
1    db.places.find({
2        location: {
3            $geoWithin: {
4                $geometry: {
5                    type: "Polygon",
6                    coordinates: [[
7                        [-73.958, 40.800],
8                        [-73.949, 40.796],
9                        [-73.973, 40.764],
10                       [-73.981, 40.768],
11                       [-73.958, 40.800]
12                   ]]
13               }
14           }
15       }
16   })
```

- Finds places within the specified polygon

Summary

- MongoDB provides robust support for geospatial data
- Choose appropriate data formats and indexes based on your application's needs
- Utilize geospatial query operators to perform spatial searches

Resources

- Official Documentation: MongoDB Geospatial Queries
- GeoJSON Specification: geojson.org