

Module 5

2d indexes

Suppose we have following collection in our database, and we have a “2d” index on “loc” field:

```
> db.places.insert<<"name" : "A4", "location" : "hotel", "loc" : [20,40]>>
WriteResult<< "nInserted" : 1 >>
> db.places.insert<<"name" : "A4", "location" : "hotel", "loc" : [120,40]>>
WriteResult<< "nInserted" : 1 >>
> db.places.insert<<"name" : "A1", "location" : "palace", "loc" : [40,60]>>
WriteResult<< "nInserted" : 1 >>
>
> db.places.insert<<"name" : "A2", "location" : "mall", "loc" : [49,60]>>
WriteResult<< "nInserted" : 1 >>
>
> db.places.ensureIndex<<"loc" : "2d", "type" : 1>>
{
  "createdCollectionAutomatically" : false,
  "numIndexesBefore" : 1,
  "numIndexesAfter" : 2,
  "ok" : 1
}
```

This query finds the documents near [40,50].

```
> db.places.find<<"loc" : {$near : [40,50]}>>
{ "_id" : ObjectId<"54c9c72cc5d362f04a552fc8">, "name" : "A1", "location" : "palace", "loc" : [ 40, 60 ] }
{ "_id" : ObjectId<"54c9c747c5d362f04a552fc9">, "name" : "A2", "location" : "mall", "loc" : [ 49, 60 ] }
{ "_id" : ObjectId<"54c9c70ac5d362f04a552fc6">, "name" : "A4", "location" : "hotel", "loc" : [ 20, 40 ] }
{ "_id" : ObjectId<"54c9c712c5d362f04a552fc7">, "name" : "A4", "location" : "hotel", "loc" : [ 120, 40 ] }
>
```

The following queries for documents within a rectangle defined by [0 ,0] at the bottom left corner and by [100 , 100] at the top right corner.

```
> db.places.find<<loc : {$geoWithin : { $box : [[60,60], [100,100]] }}>>
>
> db.places.find<<loc : {$geoWithin : { $box : [[0,0], [100,100]] }}>>
{ "_id" : ObjectId<"54c9c747c5d362f04a552fc9">, "name" : "A2", "location" : "mall", "loc" : [ 49, 60 ] }
{ "_id" : ObjectId<"54c9c70ac5d362f04a552fc6">, "name" : "A4", "location" : "hotel", "loc" : [ 20, 40 ] }
{ "_id" : ObjectId<"54c9c72cc5d362f04a552fc8">, "name" : "A1", "location" : "palace", "loc" : [ 40, 60 ] }
>
> _
```

The following queries for documents that are within the circle centred on [100 , 100] and with a radius of 40: this shows no results, as there are no such documents that are within the circle centred on [100 , 100] and with a radius of 40 .

Then queries for documents that are within the circle centred on [40,50] and with a radius of 10: one results.

```
> db.places.find(<loc : <$geoWithin : < $center : [[100,100], 40] >>>>
>
> db.places.find(<loc : <$geoWithin : < $center : [[40,50], 10] >>>>
< "_id" : ObjectId("54c9c72cc5d362f04a552fc8"), "name" : "A1", "location" : "palace", "loc" : [ 40, 60 ] >
>
>
> db.places.find(<loc : <$geoWithin : < $center : [[40,50], 30] >>>>
< "_id" : ObjectId("54c9c72cc5d362f04a552fc8"), "name" : "A1", "location" : "palace", "loc" : [ 40, 60 ] >
< "_id" : ObjectId("54c9c747c5d362f04a552fc9"), "name" : "A2", "location" : "mall", "loc" : [ 49, 60 ] >
< "_id" : ObjectId("54c9c70ac5d362f04a552fc6"), "name" : "A4", "location" : "hotel", "loc" : [ 20, 40 ] >
>
```

The following example query returns all documents within a 10-mile radius of longitude 40 W and latitude 50 N. The example converts distance to radians by dividing distance by the approximate radius of the earth, 39 miles:

```
> db.places.find(<loc : <$geoWithin : < $centerSphere : [[40,50], 10/3958] >>>>
>
> db.places.find(<loc : <$geoWithin : < $centerSphere : [[40,50], 10/39] >>>>
< "_id" : ObjectId("54c9c72cc5d362f04a552fc8"), "name" : "A1", "location" : "palace", "loc" : [ 40, 60 ] >
< "_id" : ObjectId("54c9c747c5d362f04a552fc9"), "name" : "A2", "location" : "mall", "loc" : [ 49, 60 ] >
>
```

More information using near command:

Returns documents in order of proximity to a specified point, from the nearest to farthest.

```
> db.runCommand(<<geoNear : 'places' , near : [40,50]>>)
{
  "results" : [
    {
      "dis" : 10,
      "obj" : {
        "_id" : ObjectId("54c9c72cc5d362f04a552fc8"),
        "name" : "A1",
        "location" : "palace",
        "loc" : [
          40,
          60
        ]
      }
    },
    {
      "dis" : 13.45362404707371,
      "obj" : {
        "_id" : ObjectId("54c9c747c5d362f04a552fc9"),
        "name" : "A2",
        "location" : "mall",
        "loc" : [
          49,
          60
        ]
      }
    },
    {
      "dis" : 22.360679774997898,
      "obj" : {
        "_id" : ObjectId("54c9c70ac5d362f04a552fc6"),
        "name" : "A4",
        "location" : "hotel",
        "loc" : [
          20,
          40
        ]
      }
    },
    {
      "dis" : 80.62257748298549,
      "obj" : {
        "_id" : ObjectId("54c9c712c5d362f04a552fc7"),
        "name" : "A4",
        "location" : "hotel",
        "loc" : [
          120,
          40
        ]
      }
    }
  ],
  "stats" : {
    "nscanned" : NumberLong(4),
    "objectsLoaded" : NumberLong(4),
    "avgDistance" : 31.609220326264275,
    "maxDistance" : 80.62257748298549,
    "time" : 0
  },
  "ok" : 1
}
```

```

    {
      "dis" : 80.62257748298549,
      "obj" : {
        "_id" : ObjectId("54c9c712c5d362f04a552fc7"),
        "name" : "A4",
        "location" : "hotel",
        "loc" : [
          120,
          40
        ]
      }
    }
  ],
  "stats" : {
    "nscanned" : NumberLong(4),
    "objectsLoaded" : NumberLong(4),
    "avgDistance" : 31.609220326264275,
    "maxDistance" : 80.62257748298549,
    "time" : 0
  },
  "ok" : 1
}
-
```