

# MongoDB 的高级查询 aggregate 聚合管道

主讲教师：（大地）

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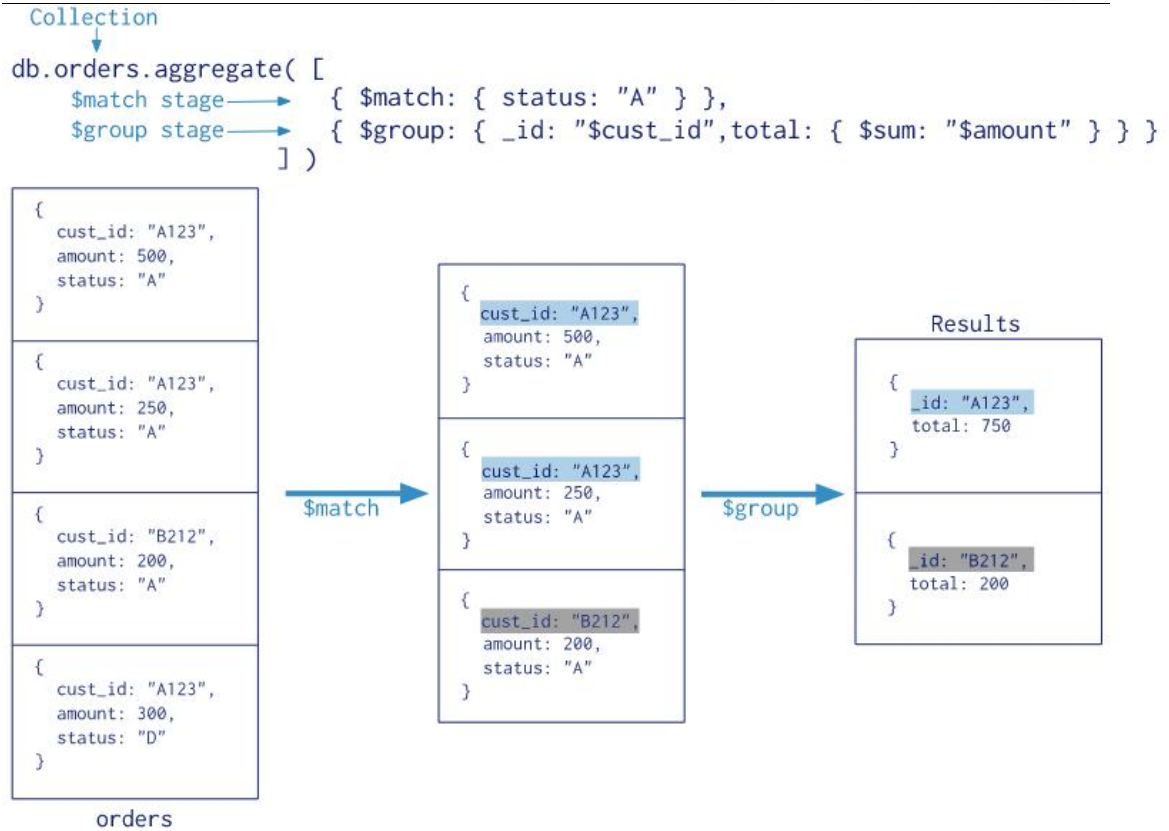
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## 一、MongoDB 聚合管道（Aggregation Pipeline）

使用聚合管道可以对集合中的文档进行变换和组合。

实际项目：表关联查询、数据的统计。

MongoDB 中使用 `db.COLLECTION_NAME.aggregate([{<stage>},...])` 方法来构建和使用聚合管道。先看下官网给的实例，感受一下聚合管道的用法。



## 二、MongoDB Aggregation 管道操作符与表达式

管道操作符	Description	
<b>\$project</b>	增加、删除、重命名字段	attributes (sequence) where
<b>\$match</b>	条件匹配。只满足条件的文档才能进入下一阶段	
<b>\$limit</b>	限制结果的数量	
<b>\$skip</b>	跳过文档的数量	
<b>\$sort</b>	条件排序。	
<b>\$group</b>	条件组合结果 统计	
<b>\$lookup</b>	<b>\$lookup</b> 操作符 用以引入其它集合的数据 (表关联查询)	

## SQL 和 NOSQL 对比:

WHERE	\$match
GROUP BY	\$group
HAVING	\$match
SELECT	\$project
ORDER BY	\$sort
LIMIT	\$limit
SUM()	\$sum
COUNT()	\$sum
join	\$lookup

## 管道表达式:

管道操作符作为“键”,所对应的“值”叫做管道表达式。

例如{\$match:{status:"A"}}, \$match 称为管道操作符,而 status:"A"称为管道表达式,是管道操作符的操作数(Operand)。

每个管道表达式是一个文档结构,它是由字段名、字段值、和一些表达式操作符组成的。

常用表达式操作符	Description
\$addToSet	将文档指定字段的值去重
\$max	文档指定字段的最大值
\$min	文档指定字段的最小值
\$sum	文档指定字段求和
\$avg	文档指定字段求平均
\$gt	大于给定值
\$lt	小于给定值
\$eq	等于给定值

### 三、数据模拟

```
db.order.insert({"order_id":"1","uid":10,"trade_no":"111","all_price":100,"all_num":2})
db.order.insert({"order_id":"2","uid":7,"trade_no":"222","all_price":90,"all_num":2})
db.order.insert({"order_id":"3","uid":9,"trade_no":"333","all_price":20,"all_num":6})

db.order_item.insert({"order_id":"1","title":"商品鼠标 1","price":50,num:1})
db.order_item.insert({"order_id":"1","title":"商品键盘 2","price":50,num:1})
db.order_item.insert({"order_id":"1","title":"商品键盘 3","price":0,num:1})

db.order_item.insert({"order_id":"2","title":"牛奶","price":50,num:1})
db.order_item.insert({"order_id":"2","title":"酸奶","price":40,num:1})

db.order_item.insert({"order_id":"3","title":"矿泉水","price":2,num:5})
db.order_item.insert({"order_id":"3","title":"毛巾","price":10,num:1})
```

```
> db.order.find()
{ "_id" : ObjectId("5b743d8c2c327f8d1b360540"), "order_id" : "1", "uid" : 10, "trade_no" : "111", "all_price" : 100, "all_num" : 2 }
{ "_id" : ObjectId("5b743d902c327f8d1b360541"), "order_id" : "2", "uid" : 7, "trade_no" : "222", "all_price" : 90, "all_num" : 2 }
{ "_id" : ObjectId("5b743d962c327f8d1b360542"), "order_id" : "3", "uid" : 9, "trade_no" : "333", "all_price" : 20, "all_num" : 6 }
> db.order_item.find()
{ "_id" : ObjectId("5b743d9c2c327f8d1b360543"), "order_id" : "1", "title" : "商品鼠标1", "price" : 50, "num" : 1 }
{ "_id" : ObjectId("5b743da12c327f8d1b360544"), "order_id" : "1", "title" : "商品键盘2", "price" : 50, "num" : 1 }
{ "_id" : ObjectId("5b743da52c327f8d1b360545"), "order_id" : "1", "title" : "商品键盘3", "price" : 0, "num" : 1 }
{ "_id" : ObjectId("5b743da92c327f8d1b360546"), "order_id" : "2", "title" : "牛奶", "price" : 50, "num" : 1 }
{ "_id" : ObjectId("5b743dad2c327f8d1b360547"), "order_id" : "2", "title" : "酸奶", "price" : 40, "num" : 1 }
{ "_id" : ObjectId("5b743dad2c327f8d1b360547"), "order_id" : "3", "title" : "矿泉水", "price" : 2, "num" : 5 }
{ "_id" : ObjectId("5b743dff2c327f8d1b360548"), "order_id" : "3", "title" : "毛巾", "price" : 10, "num" : 1 }
```

### 四、\$project

修改文档的结构，可以用来重命名、增加或删除文档中的字段。

要求查找 order 只返回文档中 trade\_no 和 all\_price 字段

```
db.order.aggregate([
  {
    $project:{ trade_no:1, all_price:1 }
  }
])
```

```
> db.order.aggregate([
... {
...   $project:{ trade_no:1, all_price:1 }
... }
... ])
{ "_id" : ObjectId("5b743d8c2c327f8d1b360540"), "trade_no" : "111", "all_price" : 100 }
{ "_id" : ObjectId("5b743d902c327f8d1b360541"), "trade_no" : "222", "all_price" : 90 }
{ "_id" : ObjectId("5b743d962c327f8d1b360542"), "trade_no" : "333", "all_price" : 20 }
>
```

## 五、\$match

作用

用于过滤文档。用法类似于 find() 方法中的参数。

```
db.order.aggregate([
  {
    $project:{ trade_no:1, all_price:1 }
  },
  {
    $match:{"all_price":{$gte:90}}
  }
])
```

```
> db.order.aggregate([
... {
...   $project: { trade_no:1, all_price:1 }
... },
... {
...   $match: {"all_price": {$gte:90}}
... }
... ])
{ "_id" : ObjectId("5b743d8c2c327f8d1b360540"), "trade_no" : "111", "all_price" : 100 }
{ "_id" : ObjectId("5b743d902c327f8d1b360541"), "trade_no" : "222", "all_price" : 90 }
>
```

## 六、\$group

将集合中的文档进行分组，可用于统计结果。

统计每个订单的订单数量，按照订单号分组

```
db.order_item.aggregate(
[
  {
    $group: {_id: "$order_id", total: {$sum: "$num"}}
  }
])
```

```
> db.order_item.aggregate(
... [
...   {
...     $group: {_id: "$order_id", total: {$sum: 1}}
...   }
... ]
... )
{ "_id" : "3", "total" : 2 }
{ "_id" : "2", "total" : 2 }
{ "_id" : "1", "total" : 2 }
>
```

写错了是 {\$sum: "\$num"}  
不是1

## 七、\$sort

将集合中的文档进行排序。

```
db.order.aggregate([
  {
    $project:{ trade_no:1, all_price:1 }
  },
  {
    $match:{"all_price":{$gte:90}}
  },
  {
    $sort:{"all_price":-1}
  }
])
```

降序

```
> db.order.aggregate([
... {
...   $project:{ trade_no:1, all_price:1 }
... },
... {
...   $match:{"all_price":{$gte:90}}
... },
... {
...   $sort:{"all_price":1}
... }
... ])
{"_id" : ObjectId("5b743d902c327f8d1b360541"), "trade_no" : "222", "all_price" : 90 }
{"_id" : ObjectId("5b743d8c2c327f8d1b360540"), "trade_no" : "111", "all_price" : 100 }
```

```
> db.order.aggregate([
... {
...   $project:{ trade_no:1, all_price:1 }
... },
... {
...   $match:{"all_price":{$gte:90}}
... },
... {
...   $sort:{"all_price":-1}
... }
... ])
{"_id" : ObjectId("5b743d8c2c327f8d1b360540"), "trade_no" : "111", "all_price" : 100 }
{"_id" : ObjectId("5b743d902c327f8d1b360541"), "trade_no" : "222", "all_price" : 90 }
```

## 八、\$limit

```
db.order.aggregate([
  {
    $project:{ trade_no:1, all_price:1 }
  },
  {
    $match:{"all_price":{$gte:90}}
  },
  {
    $sort:{"all_price":-1}
  },
  {
    $limit:1
  }
])
```

```
> db.order.aggregate([
... {
...   $project:{ trade_no:1, all_price:1 }
... },
... {
...   $match:{"all_price":{$gte:90}}
... },
... {
...   $sort:{"all_price":-1}
... },
... {
...   $limit:1
... }
... ])
{ "_id" : ObjectId("5b743d8c2c327f8d1b360540"), "trade_no" : "111", "all_price" : 100 }
```

## 九、\$skip

```
db.order.aggregate([
  {
    $project:{ trade_no:1, all_price:1 }
  },
  {
    $match:{"all_price":{$gte:90}}
  },
  {
    $sort:{"all_price":-1}
  },
  {
    $skip:1
  }
])
```



```
{
  $skip:1
}

])
```

```
> db.order.aggregate([
... {
...   $project:{ trade_no:1, all_price:1 }
... },
... {
...   $match:{"all_price":{"$gte:90}}
... },
... {
...   $sort:{"all_price":-1}
... },
... {
...   $skip:1
... }
... ])
{"_id" : ObjectId("5b743d902c327f8dlb360541"), "trade_no" : "222", "all_price" : 90 }
```

## 十、\$lookup 表关联

```
db.order.aggregate([
{
  $lookup:
  {
    from: "order_item",
    localField: "order_id",
    foreignField: "order_id",
    as: "items"
  }
}]
```

→ order 为主表

→ order 要关联 order\_item

→ 主表 字段

→ order\_item 的字段

将 order\_item 的结果放进这里



```
{
  "_id": ObjectId("5b743d8c2c327f8d1b360540"),
  "order_id": "1",
  "uid": 10,
  "trade_no": "111",
  "all_price": 100,
  "all_num": 2,
  "items": [{
    "_id": ObjectId("5b743d9c2c327f8d1b360543"),
    "order_id": "1",
    "title": "商品鼠标 1",
    "price": 50,
    "num": 1
  }, {
    "_id": ObjectId("5b743da12c327f8d1b360544"),
    "order_id": "1",
    "title": "商品键盘 2",
    "price": 50,
    "num": 1
  }, {
    "_id": ObjectId("5b74f457089f78dc8f0a4f3b"),
    "order_id": "1",
    "title": "商品键盘 3",
    "price": 0,
    "num": 1
  }
]}
{
  "_id": ObjectId("5b743d902c327f8d1b360541"),
  "order_id": "2",
  "uid": 7,
  "trade_no": "222",
  "all_price": 90,
  "all_num": 2,
  "items": [{
    "_id": ObjectId("5b743da52c327f8d1b360545"),
    "order_id": "2",
    "title": "牛奶",
    "price": 50,
    "num": 1
  }, {
    "_id": ObjectId("5b743da92c327f8d1b360546"),
    "order_id": "2",
```

```
        "title": "酸奶",
        "price": 40,
        "num": 1
    }}
  }{
    "_id": ObjectId("5b743d962c327f8d1b360542"),
    "order_id": "3",
    "uid": 9,
    "trade_no": "333",
    "all_price": 20,
    "all_num": 6,
    "items": [{
      "_id": ObjectId("5b743dad2c327f8d1b360547"),
      "order_id": "3",
      "title": "矿泉水",
      "price": 2,
      "num": 5
    }, {
      "_id": ObjectId("5b743dff2c327f8d1b360548"),
      "order_id": "3",
      "title": "毛巾",
      "price": 10,
      "num": 1
    }]
  }
}
```

```
db.order.aggregate([
  {
    $lookup:
```



```
{
  from: "order_item",
  localField: "order_id",
  foreignField: "order_id",
  as: "items"
},
{
  $match: {"all_price": {$gte: 90}}
}
])

{
  "_id": ObjectId("5b743d8c2c327f8d1b360540"),
  "order_id": "1",
  "uid": 10,
  "trade_no": "111",
  "all_price": 100,
  "all_num": 2,
  "items": [{
    "_id": ObjectId("5b743d9c2c327f8d1b360543"),
    "order_id": "1",
    "title": "商品鼠标 1",
    "price": 50,
    "num": 1
  }, {
    "_id": ObjectId("5b743da12c327f8d1b360544"),
    "order_id": "1",
    "title": "商品键盘 2",
    "price": 50,
    "num": 1
  }, {
    "_id": ObjectId("5b74f457089f78dc8f0a4f3b"),
    "order_id": "1",
    "title": "商品键盘 3",
    "price": 0,
    "num": 1
  }
}]
```

```
{
  "_id": ObjectId("5b743d902c327f8d1b360541"),
  "order_id": "2",
  "uid": 7,
  "trade_no": "222",
  "all_price": 90,
  "all_num": 2,
  "items": [{
    "_id": ObjectId("5b743da52c327f8d1b360545"),
    "order_id": "2",
    "title": "牛奶",
    "price": 50,
    "num": 1
  }, {
    "_id": ObjectId("5b743da92c327f8d1b360546"),
    "order_id": "2",
    "title": "酸奶",
    "price": 40,
    "num": 1
  }]
}
```

```
db.order.aggregate([
  {
    $lookup:
    {
      from: "order_item",
      localField: "order_id",
      foreignField: "order_id",
      as: "items"
    }
  },
  {
    $project: { trade_no:1, all_price:1,items:1 }
  },
  {
    $match: {"all_price":{$gte:90}}
  },
  {
    $sort: {"all_price":-1}
  }
])
```



```
    },  
  ])  
  
  {  
    "_id": ObjectId("5b743d8c2c327f8d1b360540"),  
    "trade_no": "111",  
    "all_price": 100,  
    "items": [{  
      "_id": ObjectId("5b743d9c2c327f8d1b360543"),  
      "order_id": "1",  
      "title": "商品鼠标 1",  
      "price": 50,  
      "num": 1  
    }, {  
      "_id": ObjectId("5b743da12c327f8d1b360544"),  
      "order_id": "1",  
      "title": "商品键盘 2",  
      "price": 50,  
      "num": 1  
    }, {  
      "_id": ObjectId("5b74f457089f78dc8f0a4f3b"),  
      "order_id": "1",  
      "title": "商 品键盘 3",  
      "price": 0,  
      "num": 1  
    }  
  ]  
} {  
  "_id": ObjectId("5b743d902c327f8d1b360541"),  
  "trade_no": "222",  
  "all_price": 90,  
  "items": [{  
    "_id": ObjectId("5b743da52c327f8d1b360545"),  
    "order_id": "2",  
    "title": "牛奶",  
    "price": 50,  
    "num": 1  
  }, {  
    "_id": ObjectId("5b743da92c327f8d1b360546"),  
    "order_id": "2",  
    "title": "酸奶",  
    "price": 40,  
    "num": 1  
  }  
}
```

```
}]  
}
```

```
> db.order.aggregate([  
.. {  
..   $lookup:  
..   {  
..     from: "order_item",  
..     localField: "order_id",  
..     foreignField: "order_id",  
..     as: "items"  
..   }  
.. },  
.. {  
..   $project: { trade_no:1, all_price:1, items:1 }  
.. },  
.. {  
..   $match: {"all_price": {$gte:90}}  
.. },  
.. {  
..   $sort: {"all_price":-1}  
.. },  
.. ]]  
{ "_id" : ObjectId("5b743d8c2c327f8d1b360540"), "trade_no" : "111", "all_price" : 100, "items" : [ { "_id" : ObjectId("5b743d9c2c327f8d1b360541"), "order_id" : "1", "title" : "商品鼠标1", "price" : 50, "num" : 1 }, { "_id" : ObjectId("5b743da12c327f8d1b360544"), "order_id" : "1", "title" : "商品键盘2", "price" : 50, "num" : 1 }, { "_id" : ObjectId("5b743d902c327f8d1b360541"), "trade_no" : "222", "all_price" : 90, "items" : [ { "_id" : ObjectId("5b743da52c327f8d1b360546"), "order_id" : "2", "title" : "酸奶", "price" : 40, "num" : 1 }, { "_id" : ObjectId("5b743da92c327f8d1b360546"), "order_id" : "2", "title" : "酸奶", "price" : 40, "num" : 1 } ] } ]
```