

**ФЕДЕРАЛЬНОЕ ГОСУДАРСТВЕННОЕ АВТОНОМНОЕ ОБРАЗОВАТЕЛЬНОЕ
УЧРЕЖДЕНИЕ ВЫСШЕГО ОБРАЗОВАНИЯ
САНКТ-ПЕТЕРБУРГСКИЙ НАЦИОНАЛЬНЫЙ ИССЛЕДОВАТЕЛЬСКИЙ
УНИВЕРСИТЕТ
ИНФОРМАЦИОННЫХ ТЕХНОЛОГИЙ, МЕХАНИКИ И ОПТИКИ**

Факультет «Инфокоммуникационных технологий»
Направление подготовки «45.04.04 Интеллектуальные системы в гуманитарной среде»

О Т Ч Е Т

Лабораторная работа №6

Тема задания: Знакомство с MongoDB

Выполнил:

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К3243
номер группы

Проверил:

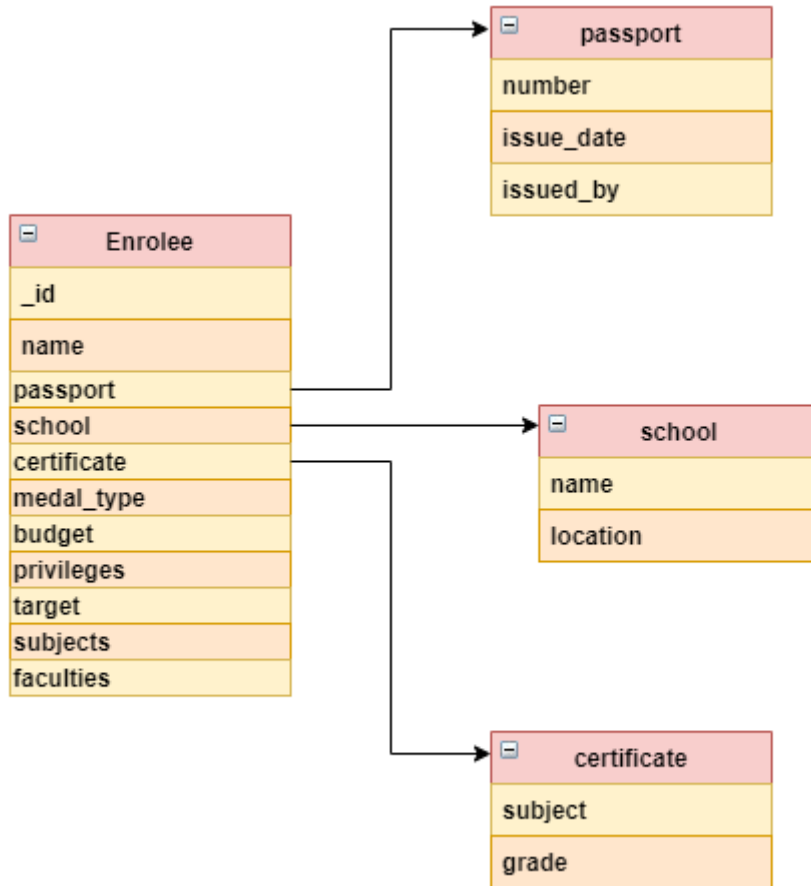
Преподаватель Говоров А.И.
(Фамилия И.О.)

**Санкт-Петербург
2020**

Цель работы: овладеть практическими навыками и умениями реализации баз данных в MongoDB.

Программное обеспечение: MongoDB server.

Модель данных была изменена в связи с особенностями реализации нереляционных БД:



Заполнение БД данными:

```
db.enrolee.insert({
  "name": "Ivanov Ivan Ivanovich",
  "passport": {
    "number": "4112123456",
    "issue_date": "2016-01-01",
    "issued_by": "MVD RF"
  },
  "school": {
    "name": "School #359",
    "location": "Moscow"
  },
  "certificate": {
    "math": "2",
    "english": "2",
    "history": "2"
  },
  "medal_type": "none",
```

```

"budget": "false",
"privileges": "true",
"target": "false",
"programs": ["Culturology"],
"faculties": ["Gender studies"]
})

```

```

db.enrolee.insert({
"name": "Dugin Alexander Gelevich",
"passport": {
"number": "4113654321",
"issue_date": "2016-01-01",
"issued_by": "MVD RF"
},
"school": {
"name": "School #123",
"location": "Moscow"
},
"certificate": {
"math": "5",
"english": "5",
"history": "5"
},
"medal_type": "golden",
"budget": "false",
"privileges": "true",
"target": "false",
"programs": ["Political science"],
"faculties": ["Faculty of law"]
})

```

```

db.enrolee.insert({
"name": "Sorokin Vladimir Georgievich",
"passport": {
"number": "4114098765",
"issue_date": "2016-01-01",
"issued_by": "MVD RF"
},
"school": {
"name": "School #222",
"location": "Moscow"
},
"certificate": {
"math": "4",
"english": "5",
"history": "4"
},
"medal_type": "silver",
"budget": "false",
"privileges": "true",
"target": "false",
"programs": ["Literature"],
"faculties": ["Faculty of norms"]
})

```

```

db.enrolee.insert({
"name": "Limonov Eduard Veniaminovich",
"passport": {
"number": "4115228359",
"issue_date": "2016-01-01",

```

```

"issued_by": "MVD RF"
},
"school": {
"name": "School #222",
"location": "Omsk"
},
"certificate": {
"math": "3",
"english": "4",
"history": "5"
},
"medal_type": "silver",
"budget": "false",
"privileges": "true",
"target": "false",
"programs": ["Literature"],
"faculties": ["Faculty of norms"]
})

db.enrolee.insert({
"name": "Bayan Pervitinovich Shiryanov",
"passport": {
"number": "4116114488",
"issue_date": "2016-01-01",
"issued_by": "MVD RF"
},
"school": {
"name": "School #321",
"location": "Perm"
},
"certificate": {
"math": "3",
"english": "4",
"history": "4"
},
"medal_type": "golden",
"budget": "false",
"privileges": "true",
"target": "false",
"programs": ["Literature"],
"faculties": ["Faculty of norms"]
})

```

```

    _id: ObjectId("5f03488fd3b7579b3b701c5e")
    name: "Dugin Alexander Gelevich"
  }
  passport: Object
    number: "4113654321"
    issue_date: "2016-01-01"
    issued_by: "MVD RF"
  }
  school: Object
    name: "School #123"
    location: "Moscow"
  }
  certificate: Object
    math: "5"
    english: "5"
    history: "5"
    medal_type: "golden"
    budget: "false"
    privileges: "true"
    target: "false"
  }
  programs: Array
    0: "Political science"
  }
  faculties: Array
    0: "Faculty of law"
  }
}

```

```

    _id: ObjectId("5f047da9d3b7579b3b701c5f")
    name: "Ivanov Ivan Ivanovich"
  }
  passport: Object
  }
  school: Object
  }
  certificate: Object
    medal_type: "none"
    budget: "false"
    privileges: "true"
    target: "false"
  }
  programs: Array
  }
  faculties: Array
  }
}

```

Запросы:

Вывод ФИО, паспортных данных и информации о школе всех абитуриентов:

```

> db.enrolee.find({}, {name: 1, passport: 1, school: 1}).sort({"passport.number": -1})
{ "_id" : ObjectId("5f0480fd3b7579b3b701c62"), "name" : "Bayan Pervitinovich Shiryayev", "passport" : { "number" : "4116114488", "issue_date" : "2016-01-01", "issued_by" : "MVD RF" }, "school" : { "name" : "School #321", "location" : "Perm" } }
{ "_id" : ObjectId("5f0480ebd3b7579b3b701c61"), "name" : "Limonov Eduard Veniaminovich", "passport" : { "number" : "4115228359", "issue_date" : "2016-01-01", "issued_by" : "MVD RF" }, "school" : { "name" : "School #222", "location" : "Moscow" } }
{ "_id" : ObjectId("5f047da9d3b7579b3b701c5f"), "name" : "Sorokin Vladimir Georgievich", "passport" : { "number" : "4114098765", "issue_date" : "2016-01-01", "issued_by" : "MVD RF" }, "school" : { "name" : "School #222", "location" : "Moscow" } }
{ "_id" : ObjectId("5f03488fd3b7579b3b701c5e"), "name" : "Dugin Alexander Gelevich", "passport" : { "number" : "4113654321", "issue_date" : "2016-01-01", "issued_by" : "MVD RF" }, "school" : { "name" : "School #123", "location" : "Moscow" } }
{ "_id" : ObjectId("5f047da9d3b7579b3b701c5f"), "name" : "Ivanov Ivan Ivanovich", "passport" : { "number" : "4112123456", "issue_date" : "2016-01-01", "issued_by" : "MVD RF" }, "school" : { "name" : "School #359", "location" : "Moscow" } }

```

Вывод ФИО и паспортных данных абитуриентов, сортировка по ФИО в алфавитном порядке:

```

> db.enrolee.find({}, {name: 1, passport: 1}).sort({"name": 1})
{ "_id" : ObjectId("5f0480fd3b7579b3b701c62"), "name" : "Bayan Pervitinovich Shiryayev", "passport" : { "number" : "4116114488", "issue_date" : "2016-01-01", "issued_by" : "MVD RF" } }
{ "_id" : ObjectId("5f03488fd3b7579b3b701c5e"), "name" : "Dugin Alexander Gelevich", "passport" : { "number" : "4113654321", "issue_date" : "2016-01-01", "issued_by" : "MVD RF" } }
{ "_id" : ObjectId("5f047da9d3b7579b3b701c5f"), "name" : "Ivanov Ivan Ivanovich", "passport" : { "number" : "4112123456", "issue_date" : "2016-01-01", "issued_by" : "MVD RF" } }
{ "_id" : ObjectId("5f0480ebd3b7579b3b701c61"), "name" : "Limonov Eduard Veniaminovich", "passport" : { "number" : "4115228359", "issue_date" : "2016-01-01", "issued_by" : "MVD RF" } }
{ "_id" : ObjectId("5f047da9d3b7579b3b701c5f"), "name" : "Sorokin Vladimir Georgievich", "passport" : { "number" : "4114098765", "issue_date" : "2016-01-01", "issued_by" : "MVD RF" } }

```

Вывод абитуриентов, имеющих медаль, их номера паспорта и вида медали:

```

> db.enrolee.find({medal_type: {$ne: "none"}}, {name: 1, passport.number: 1})
{ "_id" : ObjectId("5f03488fd3b7579b3b701c5e"), "name" : "Dugin Alexander Gelevich", "passport" : { "number" : "4113654321", "issue_date" : "2016-01-01", "issued_by" : "MVD RF" } }
{ "_id" : ObjectId("5f047da9d3b7579b3b701c60"), "name" : "Sorokin Vladimir Georgievich", "passport" : { "number" : "4114098765", "issue_date" : "2016-01-01", "issued_by" : "MVD RF" } }
{ "_id" : ObjectId("5f0480ebd3b7579b3b701c61"), "name" : "Limonov Eduard Veniaminovich", "passport" : { "number" : "4115228359", "issue_date" : "2016-01-01", "issued_by" : "MVD RF" } }
{ "_id" : ObjectId("5f0480fd3b7579b3b701c62"), "name" : "Bayan Pervitinovich Shiryayev", "passport" : { "number" : "4116114488", "issue_date" : "2016-01-01", "issued_by" : "MVD RF" } }

```

Сумма заявок, поданных на каждый факультет:

```

> db.enrolee.aggregate([{$unwind: "$faculties"}, {$group: {_id: "$faculties", count: {$sum: 1}}}])
{ "_id" : "Faculty of norms", "count" : 3 }
{ "_id" : "Faculty of law", "count" : 1 }
{ "_id" : "Gender studies", "count" : 1 }

```

MapReduce:

Код:

```
> var map_function = function(){
... emit(this.school.name, this.certificate.math);
... };
> var reduce_function = function(name, math){
... return Array.sum(math);
... };
```

Использование запроса:

```
> db.enrolee.mapReduce(map_function, reduce_function, {out:"MapReduceRes"})
{
  "result" : "MapReduceRes",
  "timeMillis" : 178,
  "counts" : {
    "input" : 5,
    "emit" : 5,
    "reduce" : 1,
    "output" : 4
  },
  "ok" : 1
}
> db.enrolee.mapReduce(map_function, reduce_function, {out:"MapReduceRes"})
{
  "result" : "MapReduceRes",
  "timeMillis" : 67,
  "counts" : {
    "input" : 5,
    "emit" : 5,
    "reduce" : 1,
    "output" : 4
  },
  "ok" : 1
}
> db.MapReduceRes.find({})
{ "_id" : "School #123", "value" : "5" }
{ "_id" : "School #222", "value" : "43" }
{ "_id" : "School #321", "value" : "3" }
{ "_id" : "School #359", "value" : "2" }
```

Вывод: В ходе работы были получены базовые навыки проектирования и реализации нереляционных баз данных.