第六章 德塔数据预测.

研发说明

数据预测引擎系统说明书说明书 V_1_0_5

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1. 起源动机

作者 2019 年设计 华瑞集 养疗大数据产品 发现其搜索打分算法不是很完善，需要一个预测算法集来做基础保 障。

作者在华瑞集智能相诊，声诊，大数据处理的研发中，发现有很多统计需求并用到了概率论等，觉得有必要实 现一个基础预测算法集。

作者设计华瑞集的智能相诊断，发现其卷积过滤过程有多种综合问题比如噪声，缺陷，轨迹等，需要一个正确 的观测算法来统计预测分析。 于是正式基于 git 研发。

2. 简介

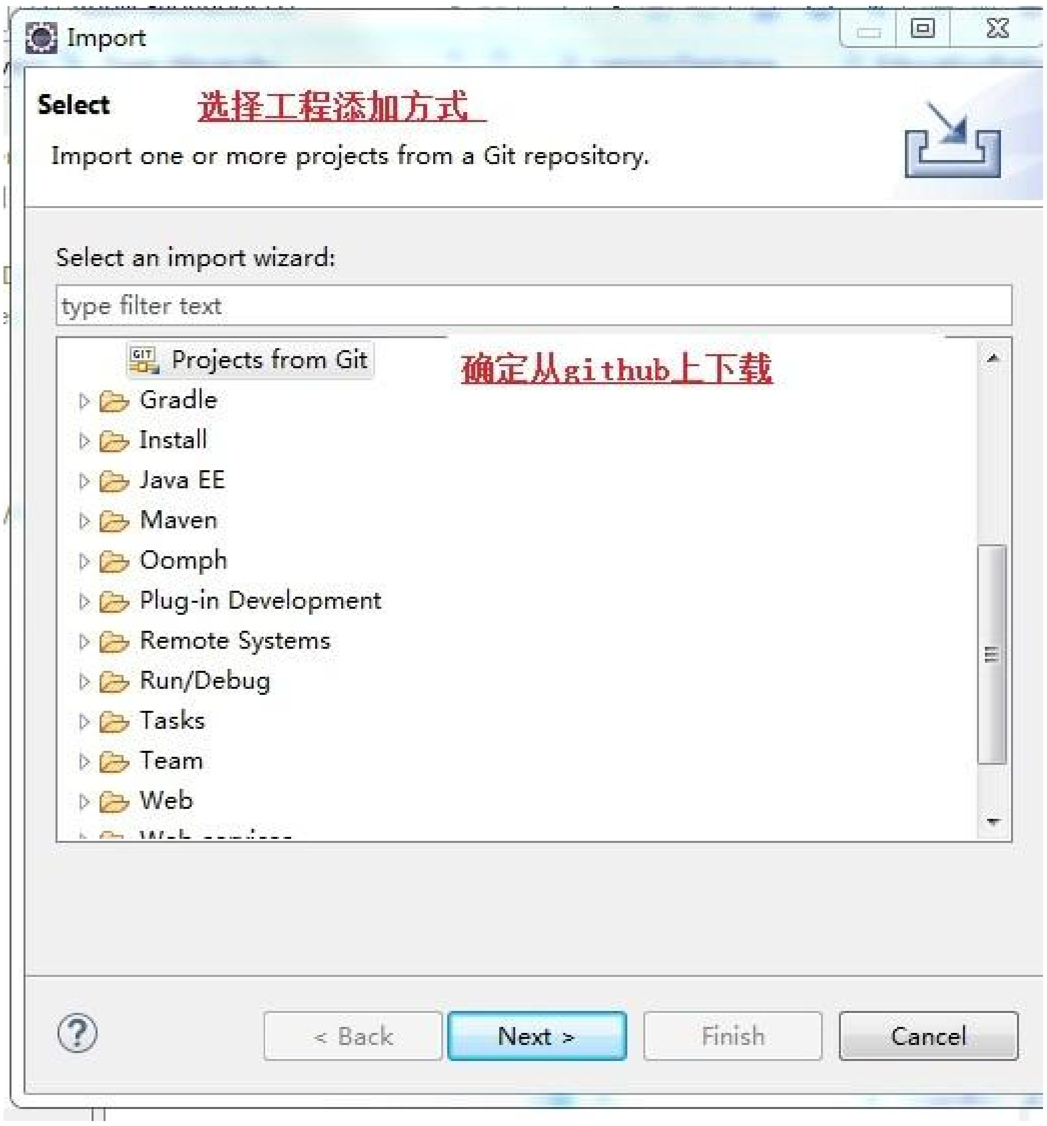
数据预测引擎系统作为 Deta 人工智能的核心组成部份主要任务就是极为快速做格式化数据的预测推断。主要用在快速轨迹坐标数据统计与概率论预测评估计算的社会工程领域。

当前版本已包含算法列表如下: 见 Read.Me
https://gitee.com/DetaChina/Data_Prediction

3 使用方法

3.1 下载 java 开发软件:
Eclipse: https://www.eclipse.org/
Intellij: https://www.jetbrains.com/idea/

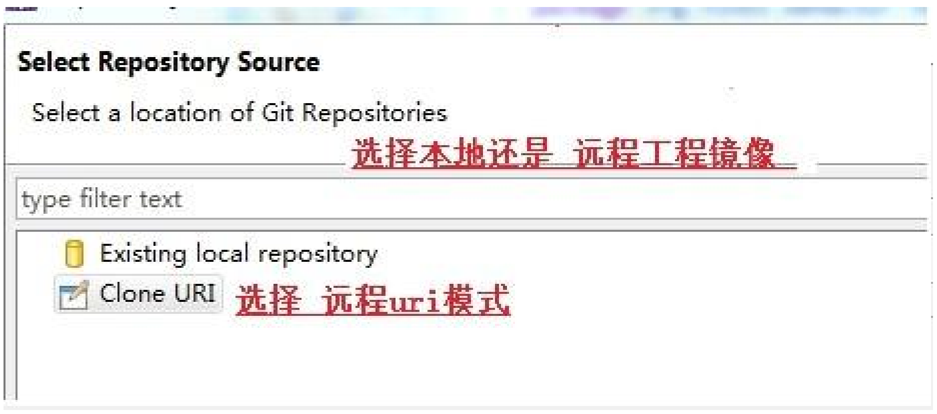
3.2 导入数据预测 api (API 是类库,接口 的意思, select 是选择 的意思)



Import one or more projects from a Git repository.

- Projects from Git
- Gradle
- Install
- Java EE
- Maven
- Oomph
- Plug-in Development
- Remote Systems
- Run/Debug
- Tasks
- Team
- Web

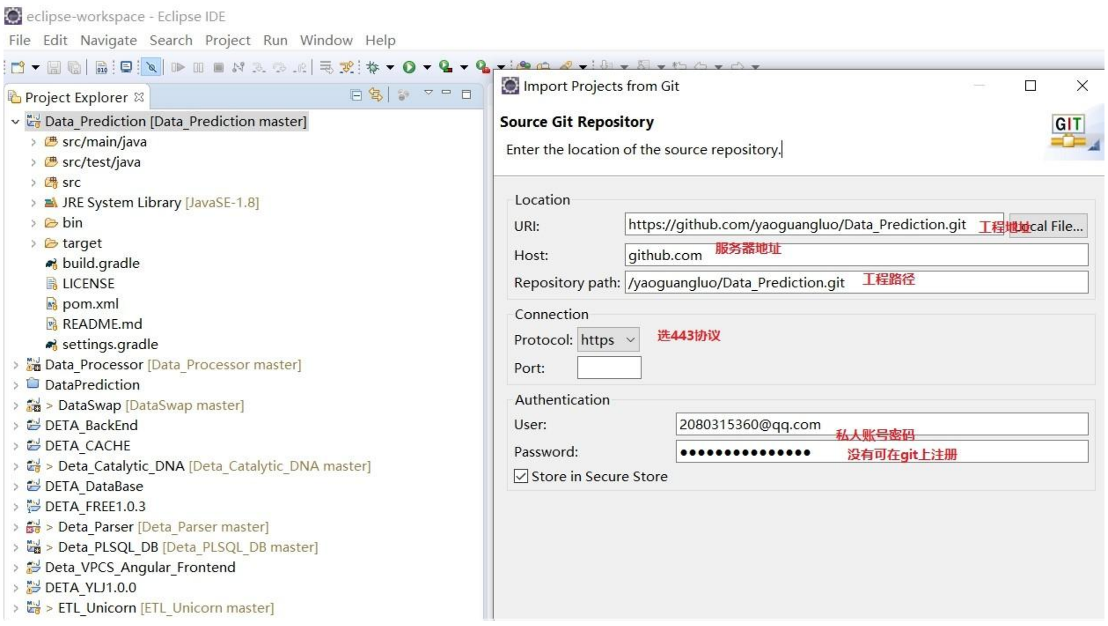
3.3 点URI (uri 是互联网传输的一种协议规范关键字)



Select a location of Git Repositories

- Existing local repository
- Clone URI

3.4 输入 Git 导入目标地址 (git 是版本持续化控制软件, repository 是 git 工程的下载标识, host 是远程 主机, repository path 是git 工程 在主机上下载链接, protocol 是是通信协议, port 是端口, authentication 是密钥, user 是帐户名, password 是密码, store in secure store 是记录保存)


eclipse-workspace - Eclipse IDE
File Edit Navigate Search Project Run Window Help
Project Explorer

```
Data_Prediction [Data_Prediction master]
  src/main/java
  src/test/java
  src
  JRE System Library [JavaSE-1.8]
  bin
  target
  build.gradle
  LICENSE
  pom.xml
  README.md
  settings.gradle
Data_Processor [Data_Processor master]
DataPrediction
> DataSwap [DataSwap master]
DETA_BackEnd
DETA_CACHE
> Deta_Catalytic_DNA [Deta_Catalytic_DNA master]
DETA_DataBase
DETA_FREE1.0.3
> Deta_Parser [Deta_Parser master]
> Deta_PLSQL_DB [Deta_PLSQL_DB master]
Deta_VPCS_Angular_Frontend
DETA_YLJ1.0.0
> ETL_Unicorn [ETL_Unicorn master]
```

Import Projects from Git

Source Git Repository

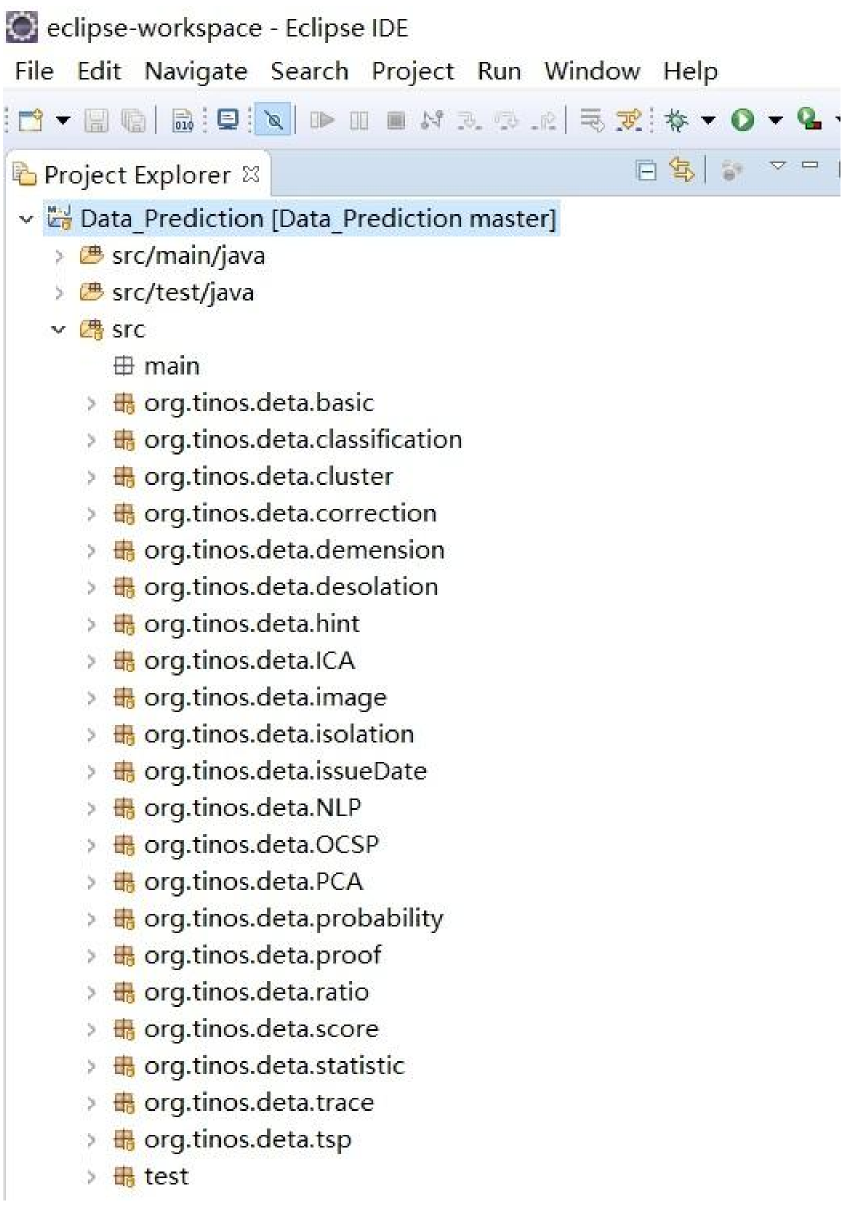
Enter the location of the source repository.

Location
URI: https://github.com/yaoguangluo/Data_Prediction.git 工程地址 Local File...
Host: github.com 服务器地址
Repository path: /yaoguangluo/Data_Prediction.git 工程路径

Connection
Protocol: https 选443协议
Port:

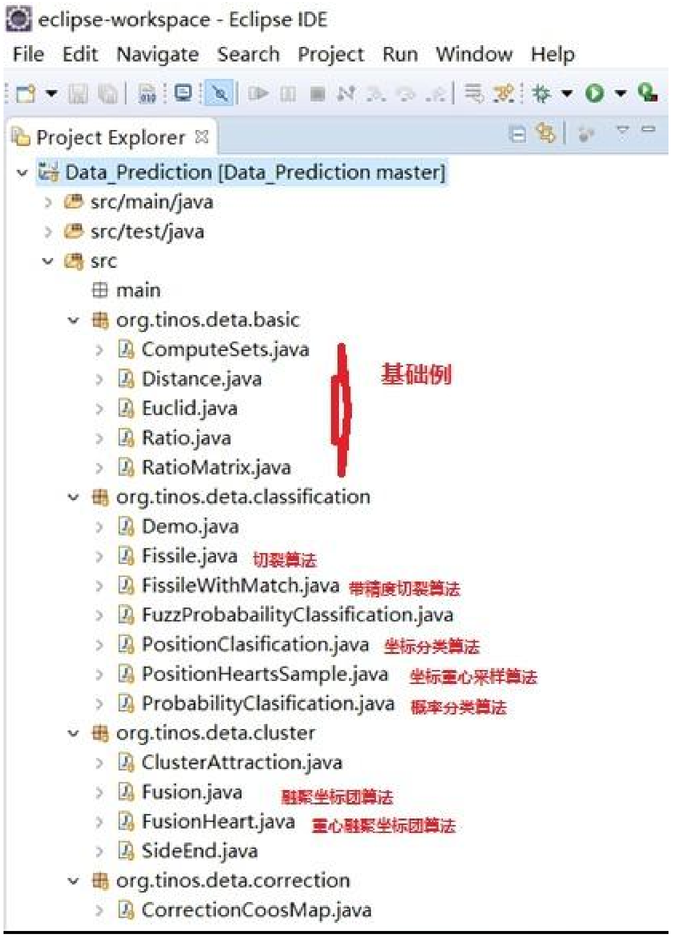
Authentication
User: 2080315360@qq.com 私人账号密码
Password: ●●●●●●●●●●●●●●●● 没有可在git上注册
☑ Store in Secure Store

3.5 生成 eclipse 工程 因为是无插件底层源码, 所以可以自由集成为pom, gradle, web,或者general 工程模式. (POM 是xml 形式的库标识 标识, gradle 是 模板形式, web 是web 2.0 动态java 工程, general 是普通java 工程)

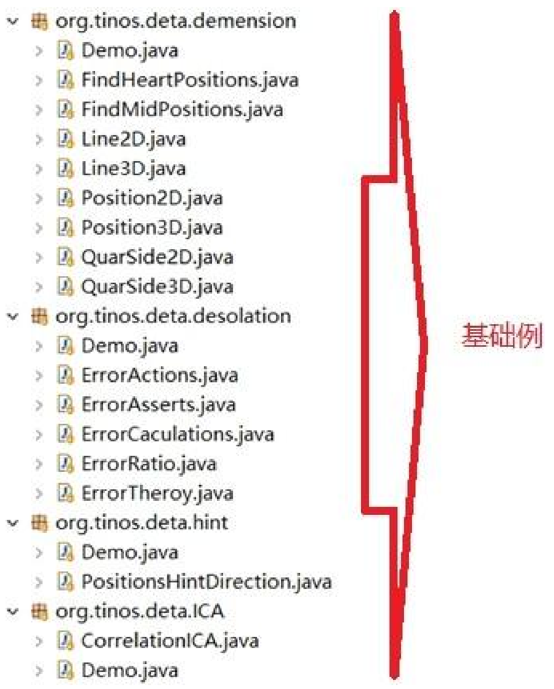

eclipse-workspace - Eclipse IDE
File Edit Navigate Search Project Run Window Help
Project Explorer

```
Data_Prediction [Data_Prediction master]
  src/main/java
  src/test/java
  src
    main
    org.tinos.deta.basic
    org.tinos.deta.classification
    org.tinos.deta.cluster
    org.tinos.deta.correction
    org.tinos.deta.demension
    org.tinos.deta.desolation
    org.tinos.deta.hint
    org.tinos.deta.ICA
    org.tinos.deta.image
    org.tinos.deta.isolation
    org.tinos.deta.issueDate
    org.tinos.deta.NLP
    org.tinos.deta.OCSP
    org.tinos.deta.PCA
    org.tinos.deta.probability
    org.tinos.deta.proof
    org.tinos.deta.ratio
    org.tinos.deta.score
    org.tinos.deta.statistic
    org.tinos.deta.trace
    org.tinos.deta.tsp
    test
```

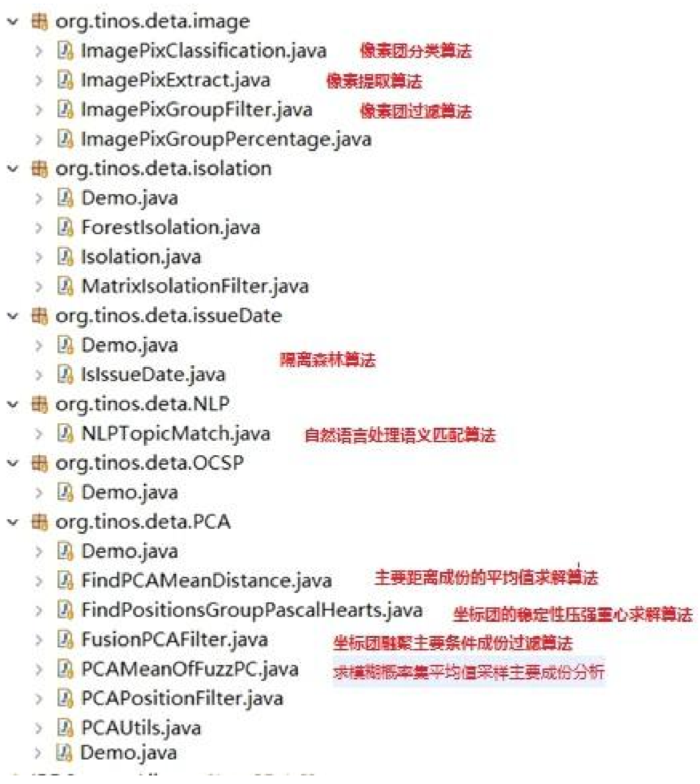
3.6 运行例子就可以了 所有 demo 和 test 都是 可运行实例 (demo 是例子的意思, test 是测试的意思 鼠标右键,点运行就可以了.)



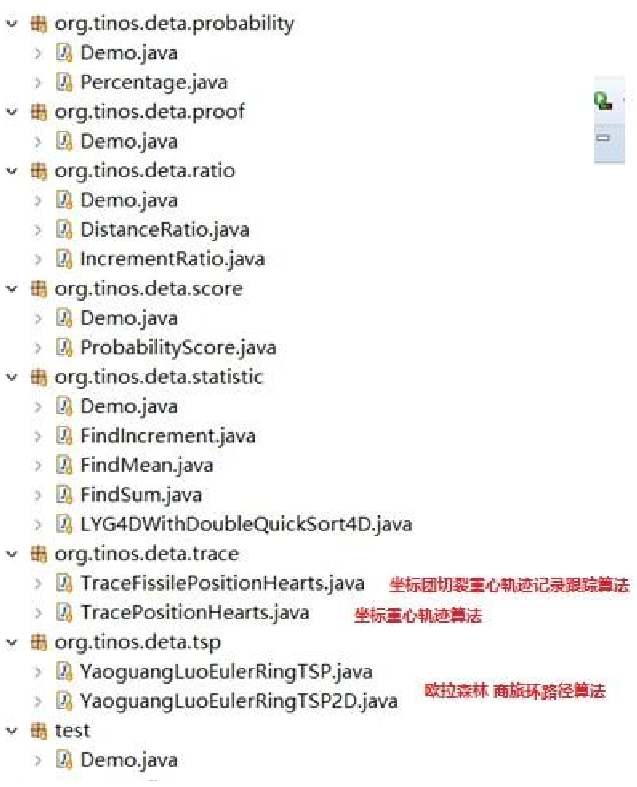
```
eclipse-workspace - Eclipse IDE
File  Edit  Navigate  Search  Project  Run  Window  Help
Project Explorer
v Data_Prediction [Data_Prediction master]
  > src/main/java
  > src/test/java
  v src
      main
    v org.tinos.deta.basic
      > ComputeSets.java
      > Distance.java            基础例
      > Euclid.java
      > Ratio.java
      > RatioMatrix.java
    v org.tinos.deta.classification
      > Demo.java
      > Fissile.java   切裂算法
      > FissileWithMatch.java  带精度切裂算法
      > FuzzProbabailityClassification.java
      > PositionClasification.java  坐标分类算法
      > PositionHeartsSample.java  坐标重心采样算法
      > ProbabilityClasification.java  概率分类算法
    v org.tinos.deta.cluster
      > ClusterAttraction.java
      > Fusion.java    融聚坐标团算法
      > FusionHeart.java  重心融聚坐标团算法
      > SideEnd.java
    v org.tinos.deta.correction
      > CorrectionCoosMap.java
```



```
v org.tinos.deta.demension
  > Demo.java
  > FindHeartPositions.java
  > FindMidPositions.java
  > Line2D.java
  > Line3D.java
  > Position2D.java
  > Position3D.java
  > QuarSide2D.java
  > QuarSide3D.java
v org.tinos.deta.desolation
  > Demo.java                          基础例
  > ErrorActions.java
  > ErrorAsserts.java
  > ErrorCaculations.java
  > ErrorRatio.java
  > ErrorTheroy.java
v org.tinos.deta.hint
  > Demo.java
  > PositionsHintDirection.java
v org.tinos.deta.ICA
  > CorrelationICA.java
  > Demo.java
```



```
v org.tinos.deta.image
  > ImagePixClassification.java   像素团分类算法
  > ImagePixExtract.java   像素提取算法
  > ImagePixGroupFilter.java   像素团过滤算法
  > ImagePixGroupPercentage.java
v org.tinos.deta.isolation
  > Demo.java
  > ForestIsolation.java
  > Isolation.java
  > MatrixIsolationFilter.java
v org.tinos.deta.issueDate
  > Demo.java
  > IsIssueDate.java    隔离森林算法
v org.tinos.deta.NLP
  > NLPTopicMatch.java   自然语言处理语义匹配算法
v org.tinos.deta.OCSP
  > Demo.java
v org.tinos.deta.PCA
  > Demo.java
  > FindPCAMeanDistance.java   主要距离成份的平均值求解算法
  > FindPositionsGroupPascalHearts.java   坐标团的稳定性压强重心求解算法
  > FusionPCAFilter.java   坐标团融聚主要条件成份过滤算法
  > PCAMeanOfFuzzPC.java   求模糊概率集平均值采样主要成份分析
  > PCAPositionFilter.java
  > PCAUtils.java
  > Demo.java
```

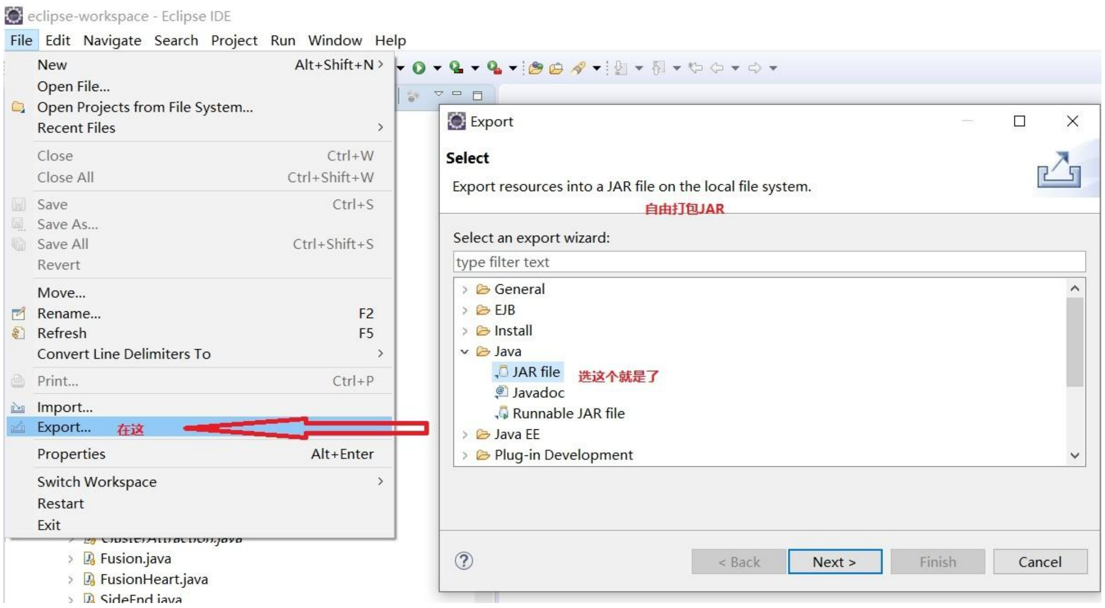


```
org.tinos.deta.probability
    Demo.java
    Percentage.java
org.tinos.deta.proof
    Demo.java
org.tinos.deta.ratio
    Demo.java
    DistanceRatio.java
    IncrementRatio.java
org.tinos.deta.score
    Demo.java
    ProbabilityScore.java
org.tinos.deta.statistic
    Demo.java
    FindIncrement.java
    FindMean.java
    FindSum.java
    LYG4DWithDoubleQuickSort4D.java
org.tinos.deta.trace
    TraceFissilePositionHearts.java   坐标团切裂重心轨迹记录跟踪算法
    TracePositionHearts.java   坐标重心轨迹算法
org.tinos.deta.tsp
    YaoguangLuoEulerRingTSP.java
    YaoguangLuoEulerRingTSP2D.java   欧拉森林 商旅环路径算法
test
    Demo.java
```

注：一些没有红色中文标注的函数属于基础类和非核心类略。

3.7 可下载的免费软件 例子:
https://github.com/yaoguangluo/Deta_Medicine 华瑞集的搜索打分, 3 维中药共生图与智能相诊 相关功能

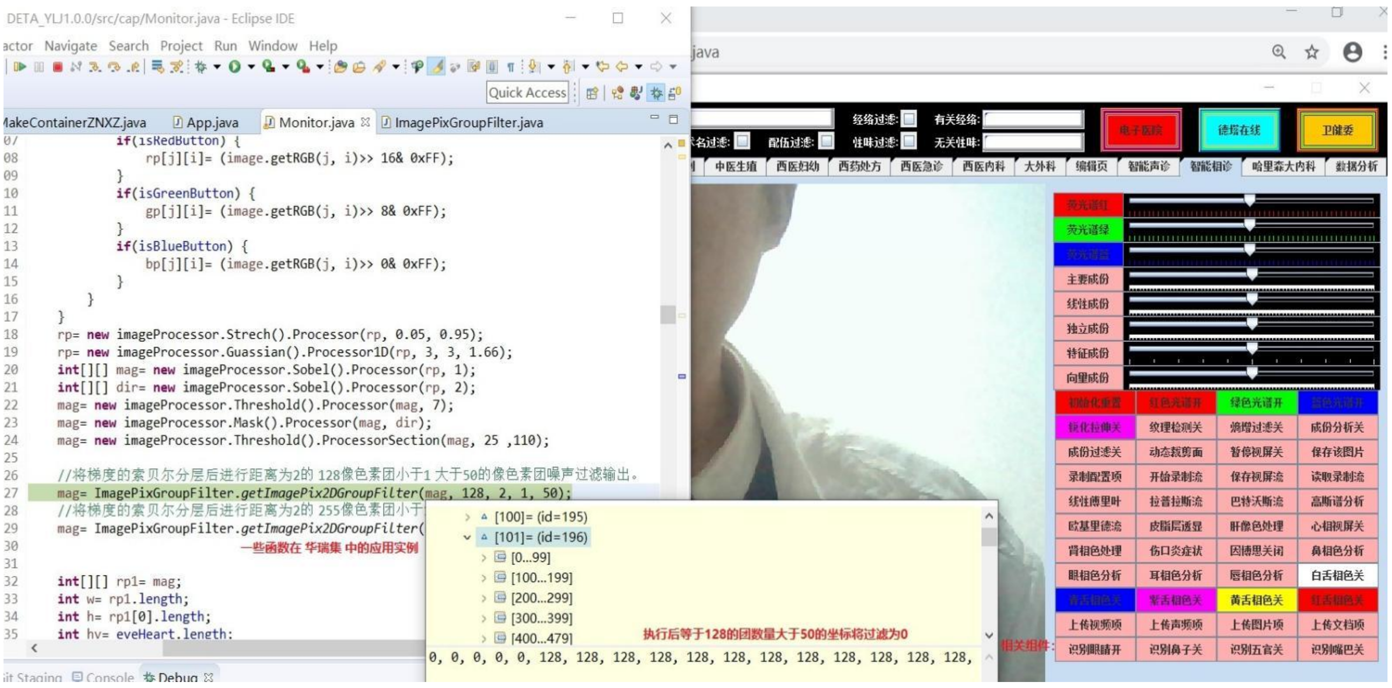
3.8 可以任意 打包 jar 作为商业 库销售和集成.(jar 是java 的库的意思, 可运行,可扩展, 可集成, export 是打包输出的意思)



Export resources into a JAR file on the local file system.

4 具体重要功能展示

4.1 档案管理功能



```
        if(isRedButton) {
            rp[j][i]= (image.getRGB(j, i)>> 16& 0xFF);
        }
        if(isGreenButton) {
            gp[j][i]= (image.getRGB(j, i)>> 8& 0xFF);
        }
        if(isBlueButton) {
            bp[j][i]= (image.getRGB(j, i)>> 0& 0xFF);
        }
    }
}
rp= new imageProcessor.Strech().Processor(rp, 0.05, 0.95);
rp= new imageProcessor.Guassian().Processor1D(rp, 3, 3, 1.66);
int[][] mag= new imageProcessor.Sobel().Processor(rp, 1);
int[][] dir= new imageProcessor.Sobel().Processor(rp, 2);
mag= new imageProcessor.Threshold().Processor(mag, 7);
mag= new imageProcessor.Mask().Processor(mag, dir);
mag= new imageProcessor.Threshold().ProcessorSection(mag, 25 ,110);

//将梯度的索贝尔分层后进行距离为2的 128像色素团小于1 大于50的像色素团噪声过滤输出。
mag= ImagePixGroupFilter.getImagePix2DGroupFilter(mag, 128, 2, 1, 50);
//将梯度的索贝尔分层后进行距离为2的 255像色素团小于
mag= ImagePixGroupFilter.getImagePix2DGroupFilter(


int[][] rp1= mag;
int w= rp1.length;
int h= rp1[0].length;
int hv= eveHeart.length;
```

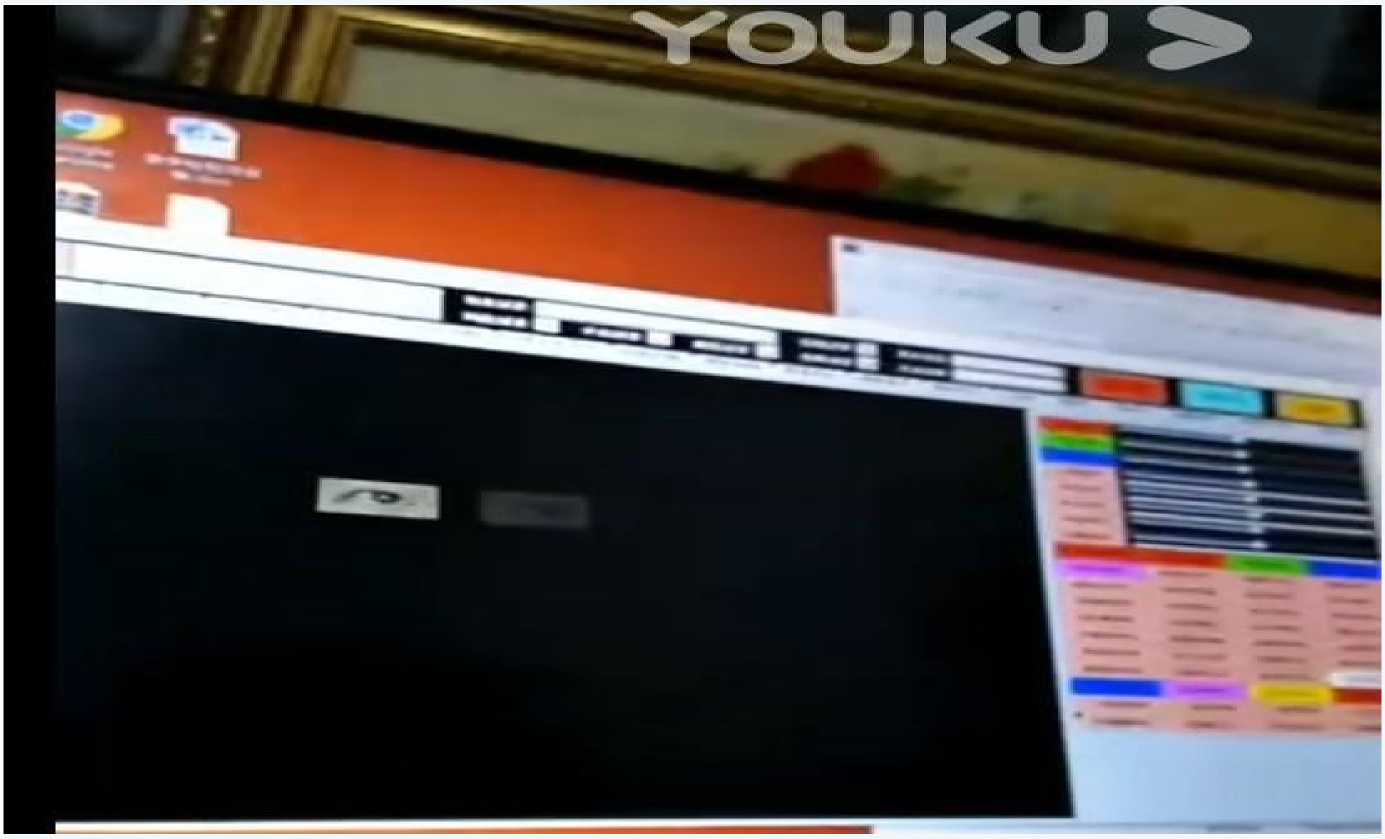
```
> [100]= (id=195)
v [101]= (id=196)
    > [0...99]
    > [100...199]
    > [200...299]
    > [300...399]
    > [400...479]
0, 0, 0, 0, 0, 128, 128, 128, 128, 128, 128, 128, 128, 128, 128, 128, 128,
```

一些函数在 华瑞集 中的应用实例

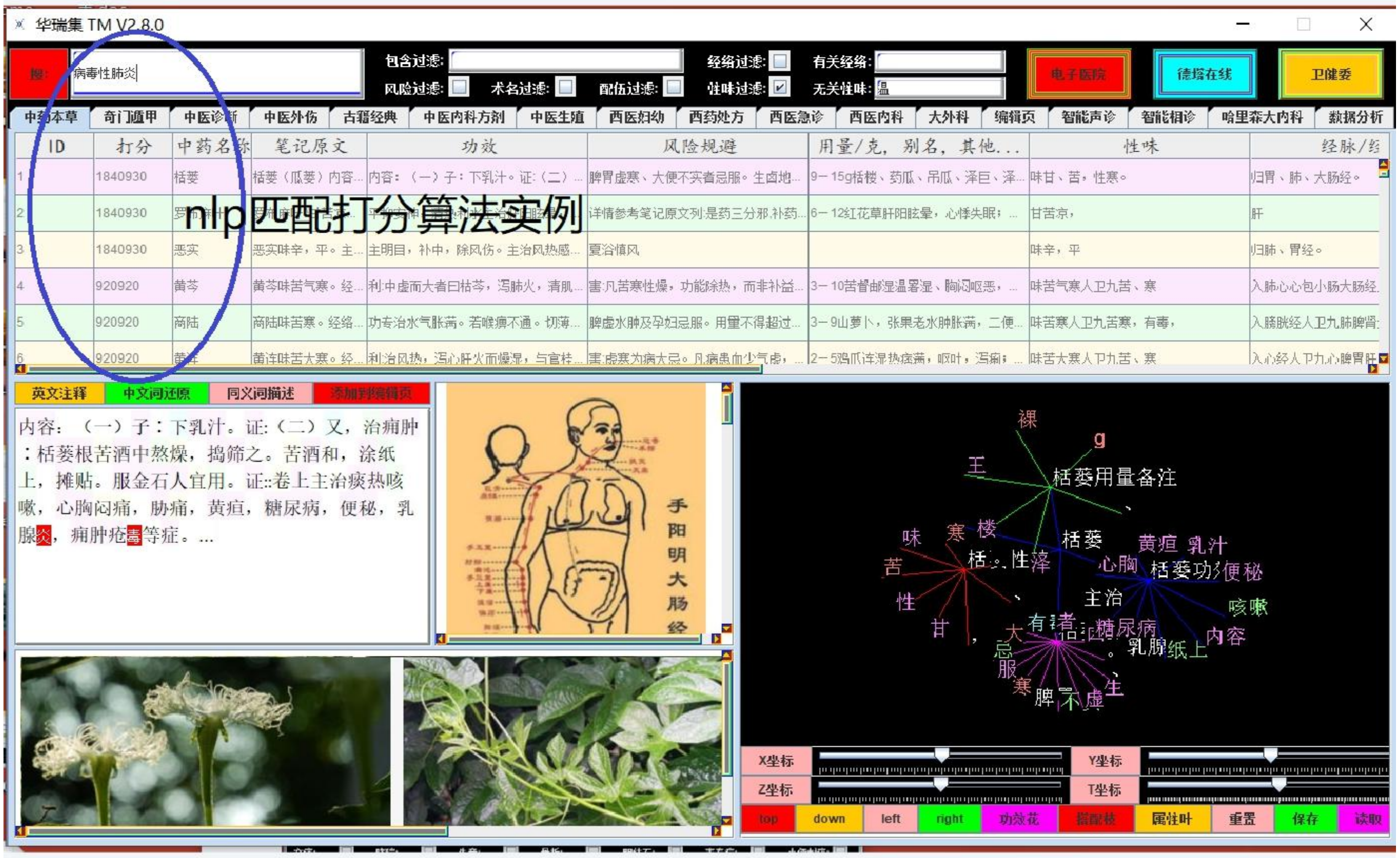
执行后等于128的团数量大于50的坐标将过滤为0

4.2 动态识别眼睛例子

https://v.youku.com/v_show/id_XNDYyMTA0Njg2NA==.html?spm=a2h0c.8166622.PhoneSokuUgc_1.dtitle



4.3 算法搜索的NLP匹配打分


华瑞集 TM V2.8.0

搜: 病毒性肺炎

包含过滤: 风险过滤: 术名过滤: 配伍过滤: 经络过滤: 性味过滤: ✓ 有关经络: 无关性味: 温

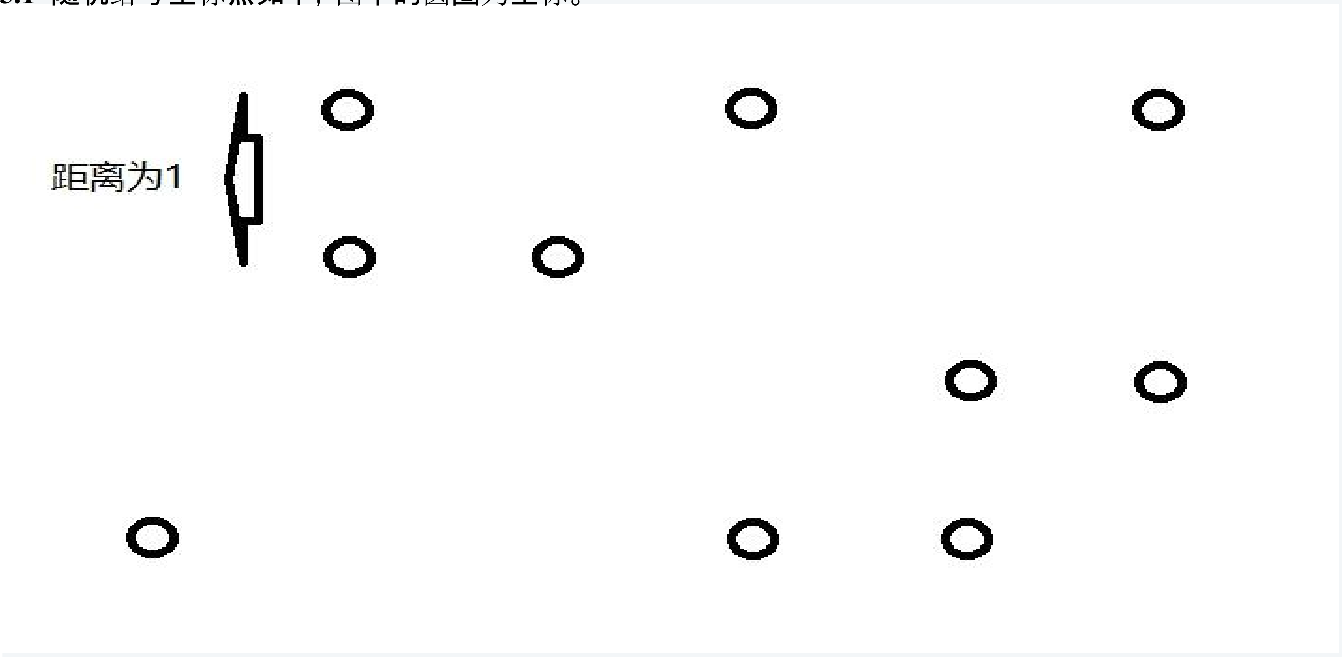
nlp匹配打分算法实例

ID	打分	中药名称	笔记原文	功效	风险规避	用量/克，别名，其他...	性味	经脉/经
1	1840930	栝蒌	栝蒌（瓜蒌）内容...	内容：（一）子：下乳汁。证:（二）...	脾胃虚寒、大便不实者忌服。生卤地...	9－15g栝楼、药瓜、吊瓜、泽巨、泽...	味甘、苦，性寒。	归胃、肺、大肠经。
2	1840930	罗布麻叶	[illegible]	[illegible]	详情参考笔记原文列:是药三分邪,补药...	6－12红花草肝阳眩晕，心悸失眠；...	甘苦凉，	肝
3	1840930	恶实	恶实味辛，平。主...	主明目，补中，除风伤。主治风热感...	夏浴慎风		味辛，平	归肺、胃经。
4	920920	黄芩	黄芩味苦气寒。经...	利:中虚而大者曰枯芩，泻肺火，清肌...	害:凡苦寒性燥，功能除热，而非补益...	3－10苦督邮湿温暑湿、胸闷呕恶，...	味苦气寒人卫九苦、寒	入肺心心包小肠大肠经.
5	920920	商陆	商陆味苦寒。经络...	功专治水气胀满。若喉痹不通。切薄...	脾虚水肿及孕妇忌服。用量不得超过...	3－9山萝卜，张果老水肿胀满，二便...	味苦寒人卫九苦寒，有毒，	入膀胱经人卫九肺脾肾
6	920920	黄连	黄连味苦大寒。经...	利:治风热，泻心肝火而燥湿，与官桂...	害:虚寒为病大忌。凡病患血少气虚，...	2－5鸡爪连湿热痞满，呕吐，泻痢；...	味苦大寒人卫九苦、寒	入心经人卫九心脾胃肝

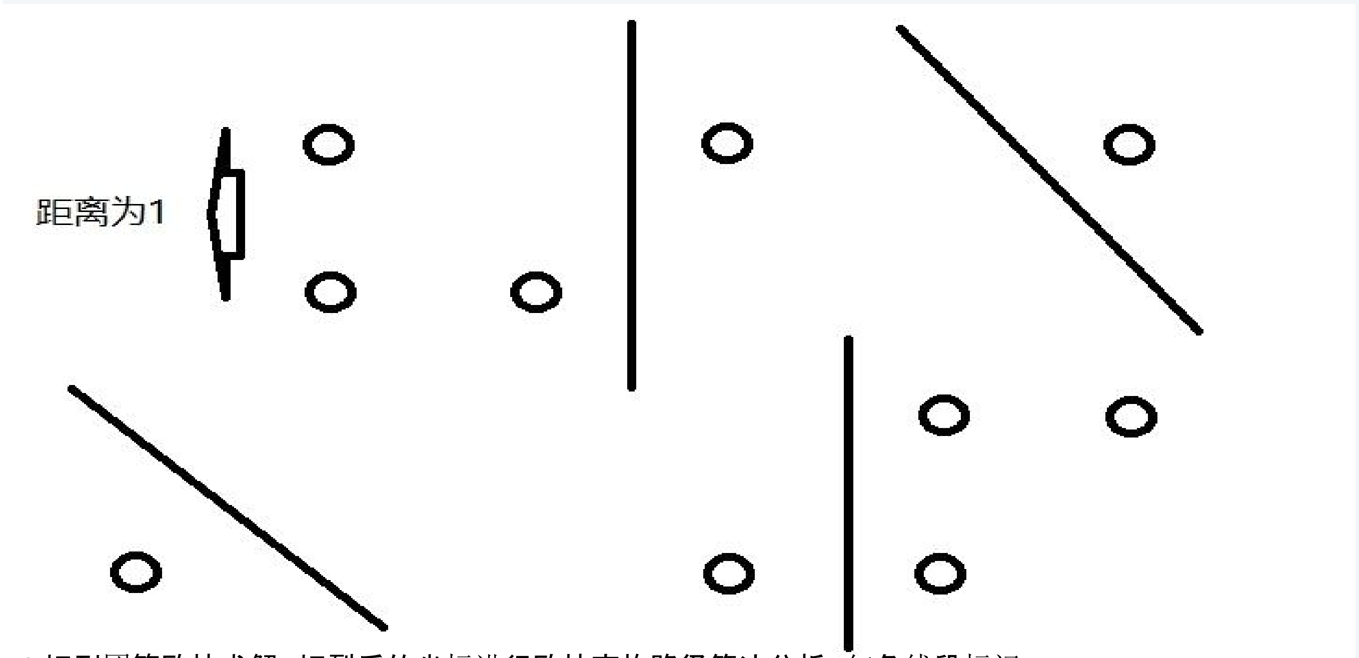
内容：（一）子：下乳汁。证:（二）又，治痈肿：栝蒌根苦酒中熬燥，捣筛之。苦酒和，涂纸上，摊贴。服金石人宜用。证::卷上主治痰热咳嗽，心胸闷痛，胁痛，黄疸，糖尿病，便秘，乳腺炎，痈肿疮毒等症。...

5.关于核心算法欧拉森林商旅路径思想解析：

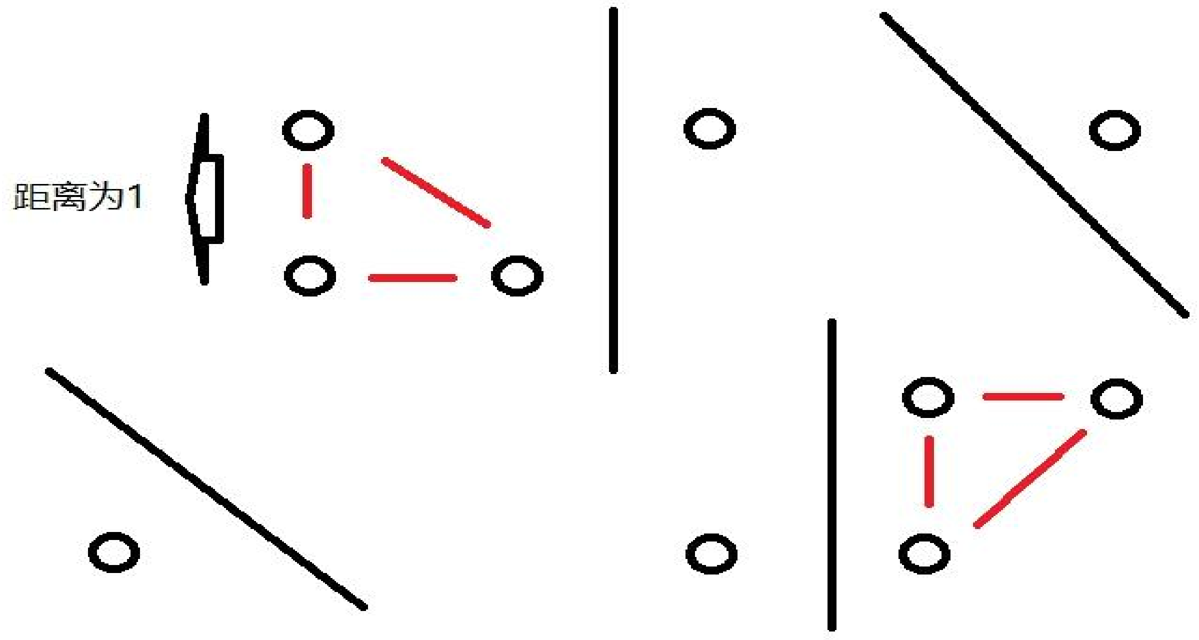
5.1 随机给与坐标点如下，图中的圆圈为坐标。



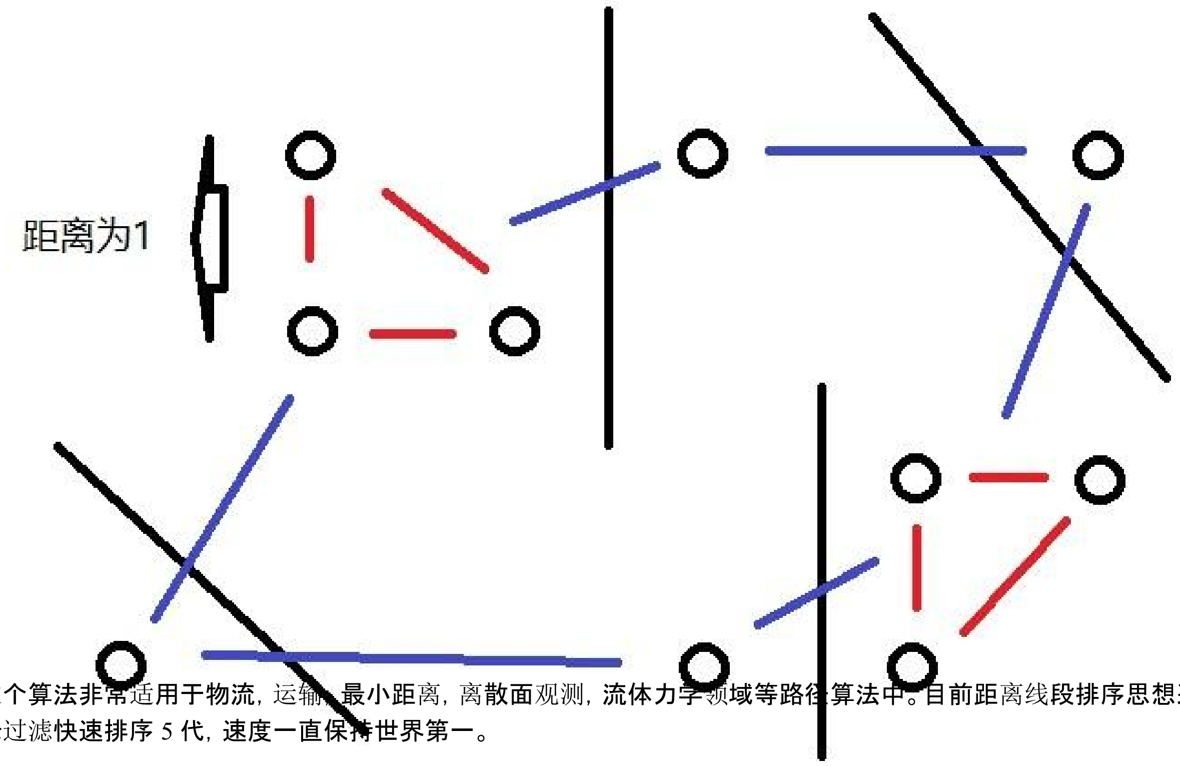
5.2 坐标点距离精度 2 切裂，黑色的线为切裂的观测。



5.3 切列团簇欧拉求解，切裂后的坐标进行欧拉商旅路径算法分析。红色线段标记



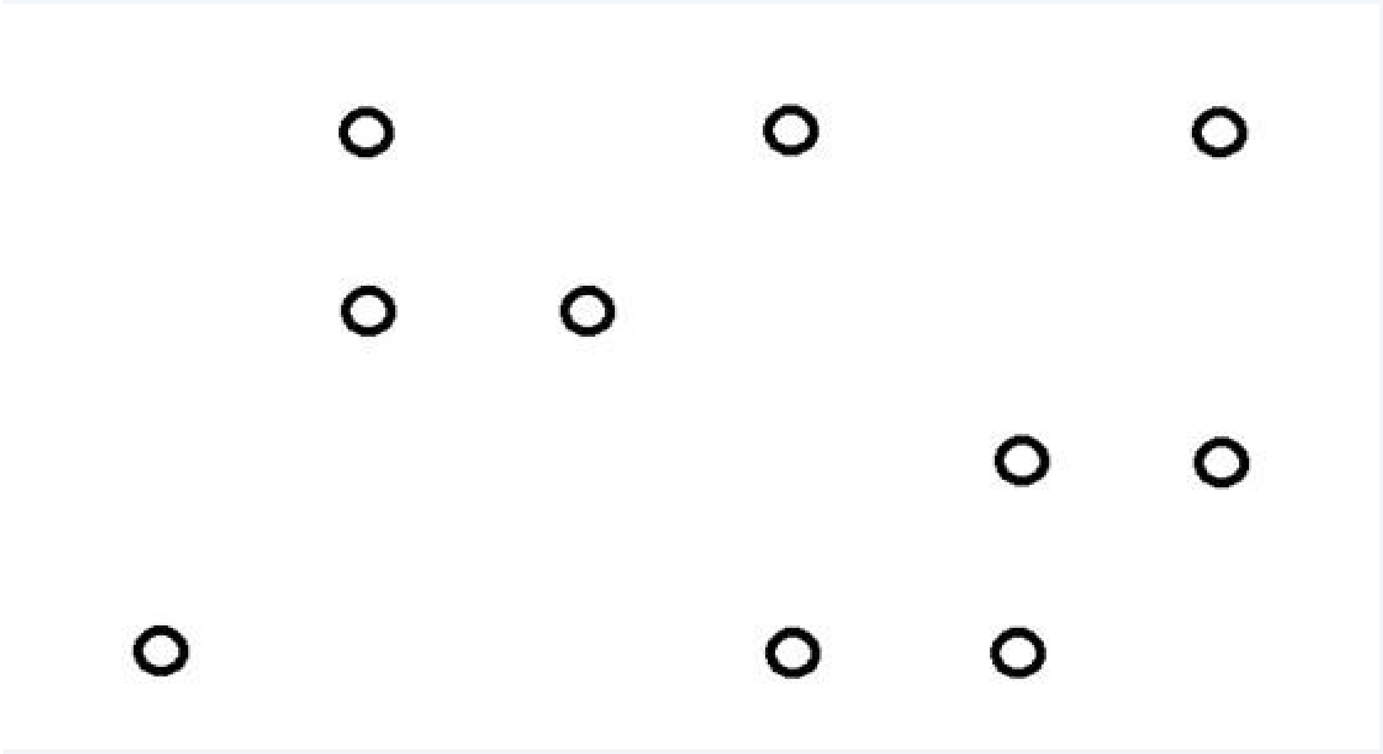
5.4 离散融聚路径，标记后进行整个商旅路径整合。



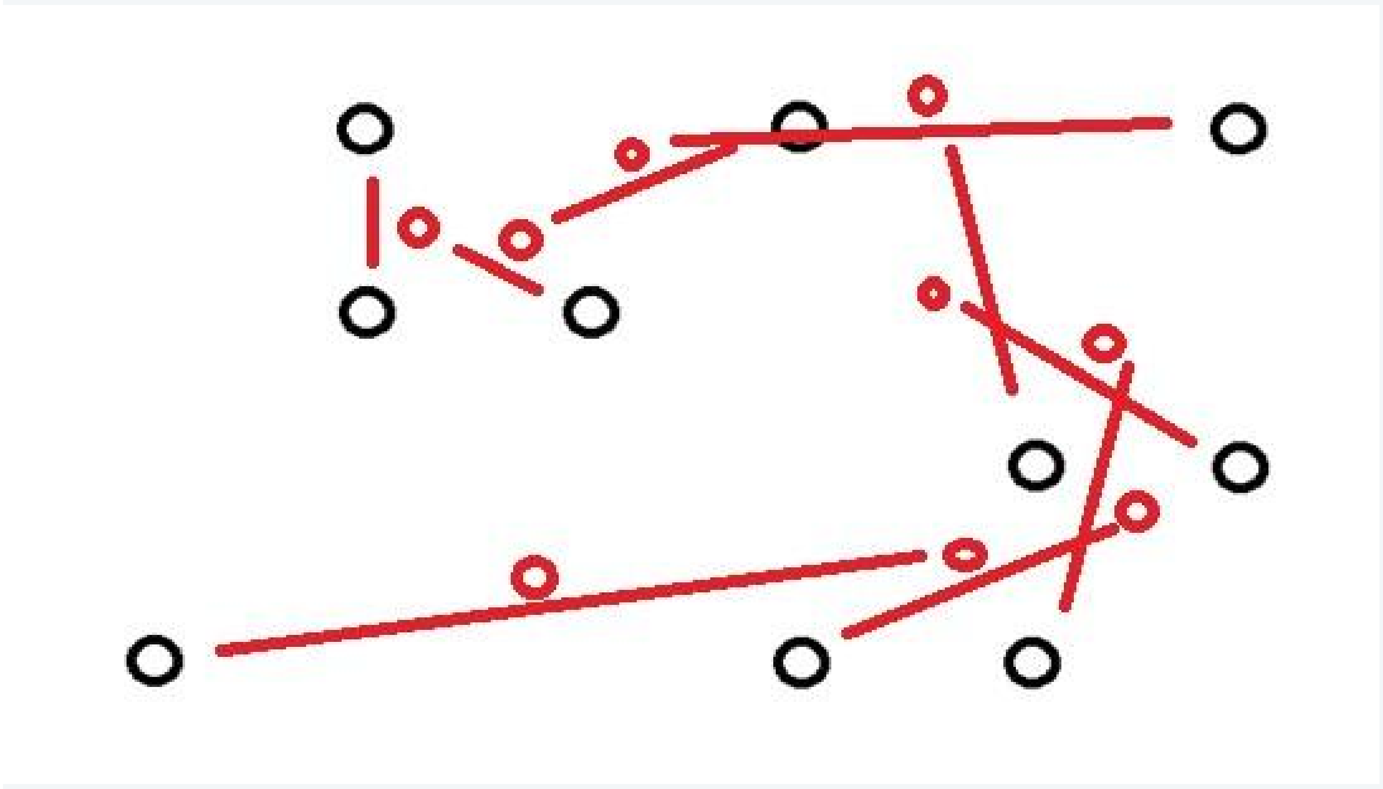
这个算法非常适用于物流，运输，最小距离，离散面观测，流体力学领域等路径算法中。目前距离线段排序思想采用罗瑶光小高峰过滤快速排序 5 代，速度一直保持世界第一。

6. 关于核心算法坐标团重心轨迹算法思想图解：

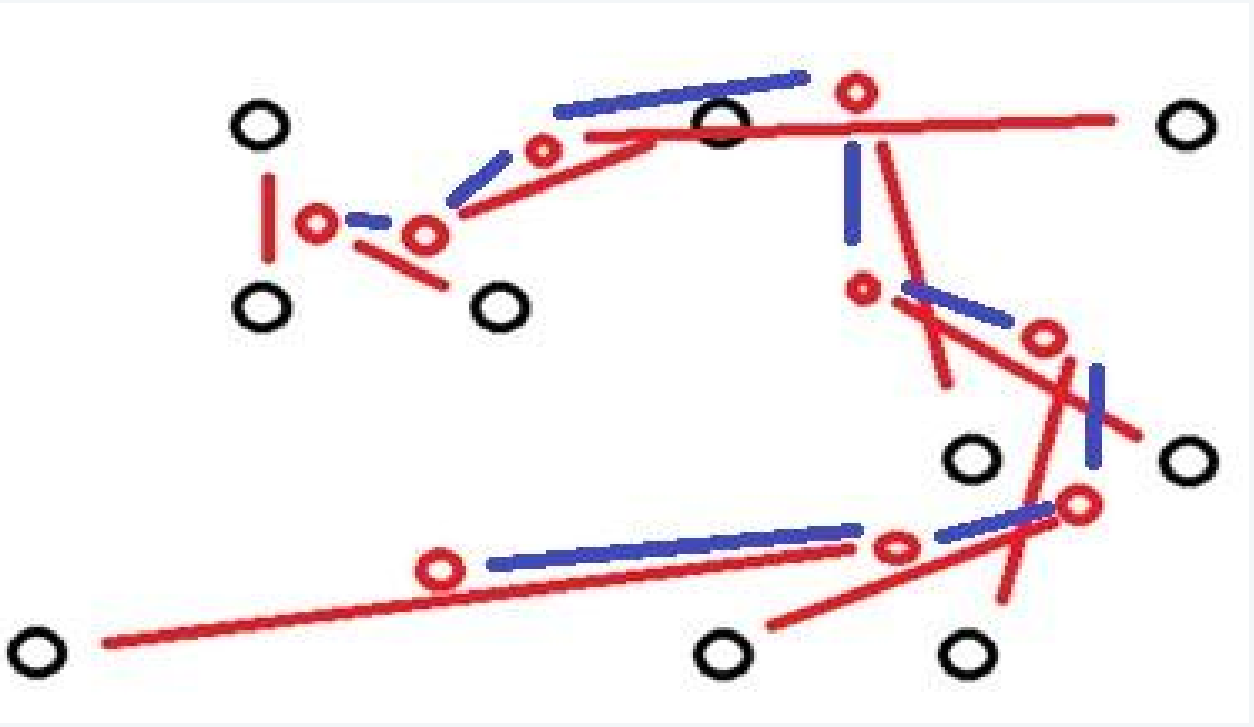
6.1 随机坐标团



6.2 坐标欧基里德轨迹添加，红色线段为欧基里德熵增。

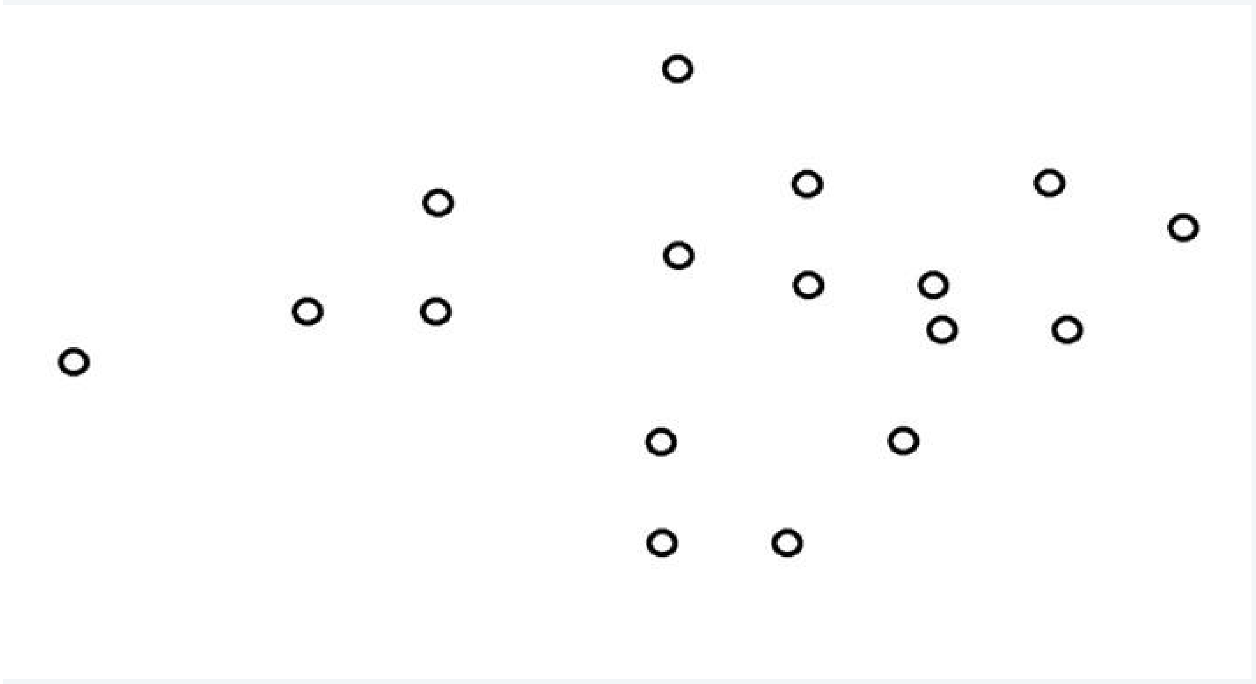


6.3 坐标轨迹观测 蓝色线段为轨迹。

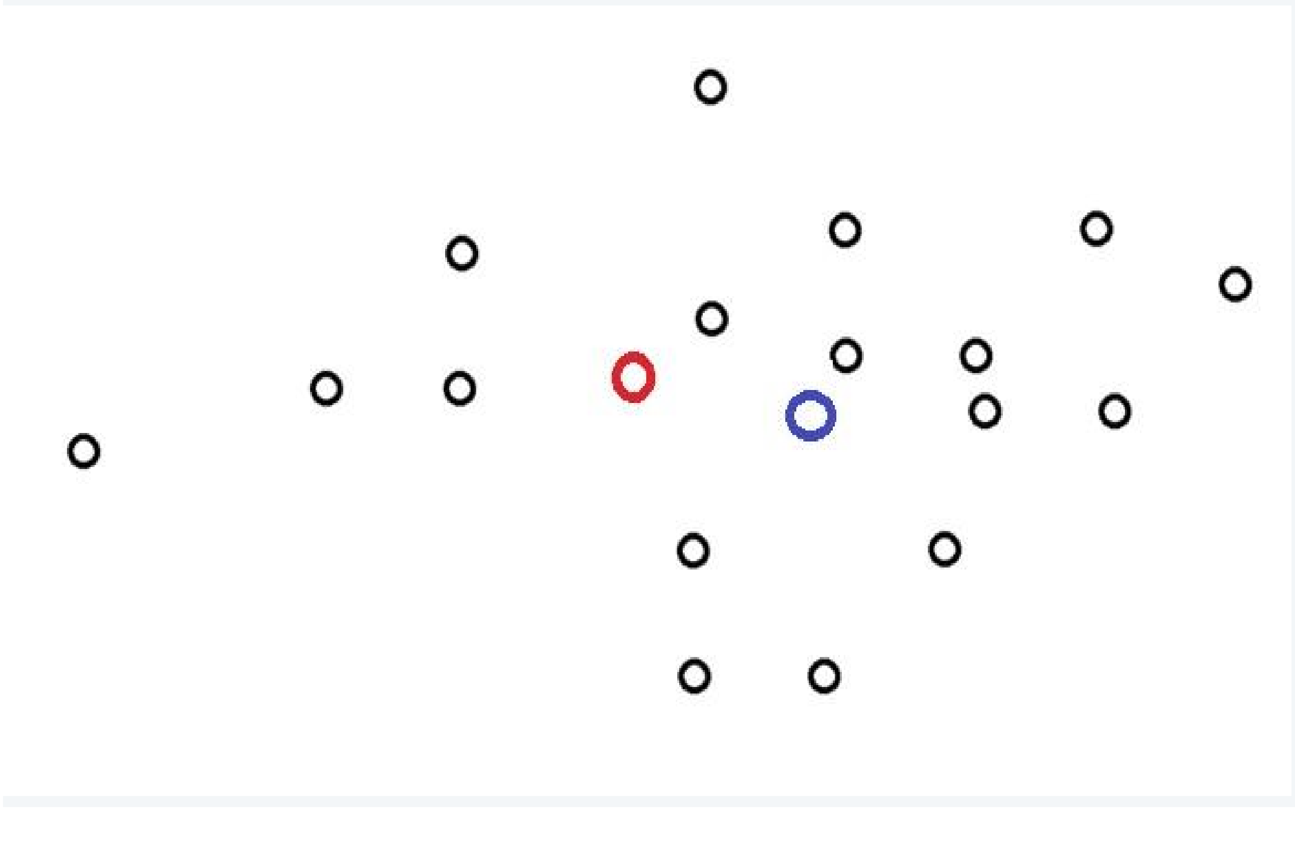


7. 关于核心算法压强斥力和运动轨迹思想

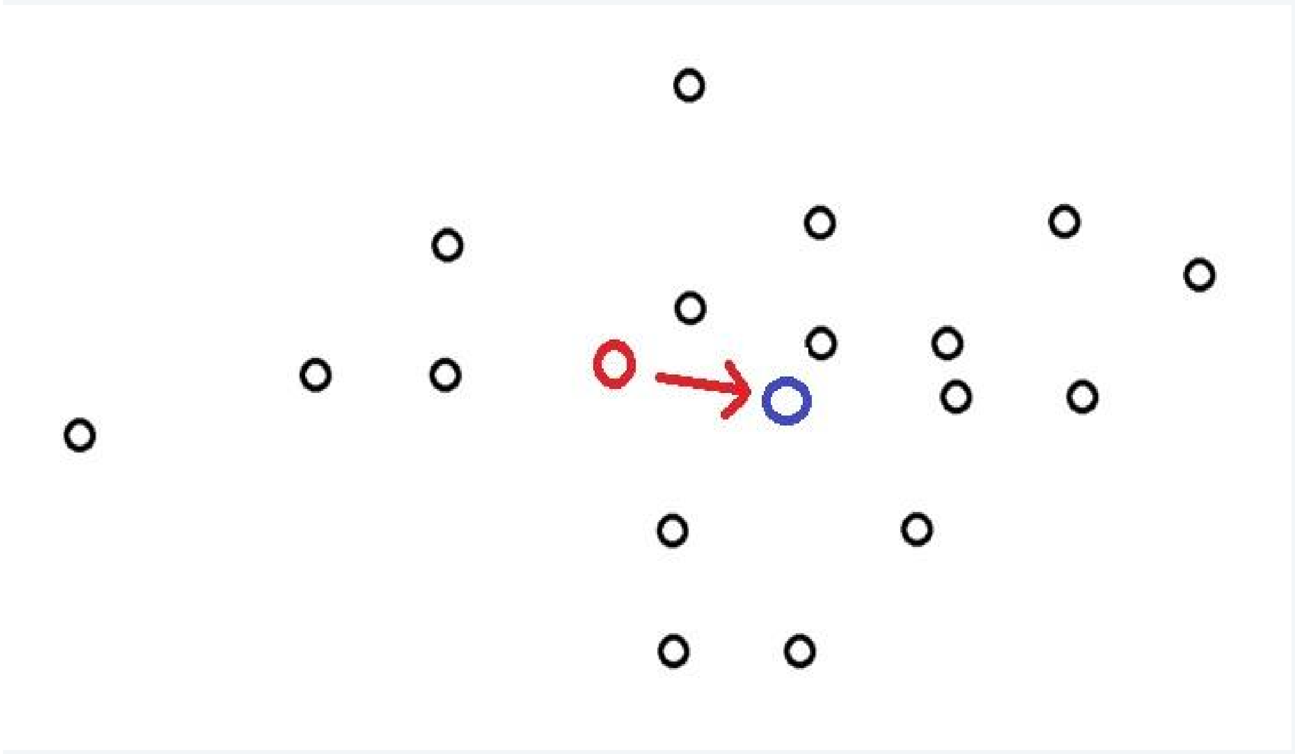
7.1 随机坐标团



7.2 团重心和团中心 蓝色为重心，红色为中心

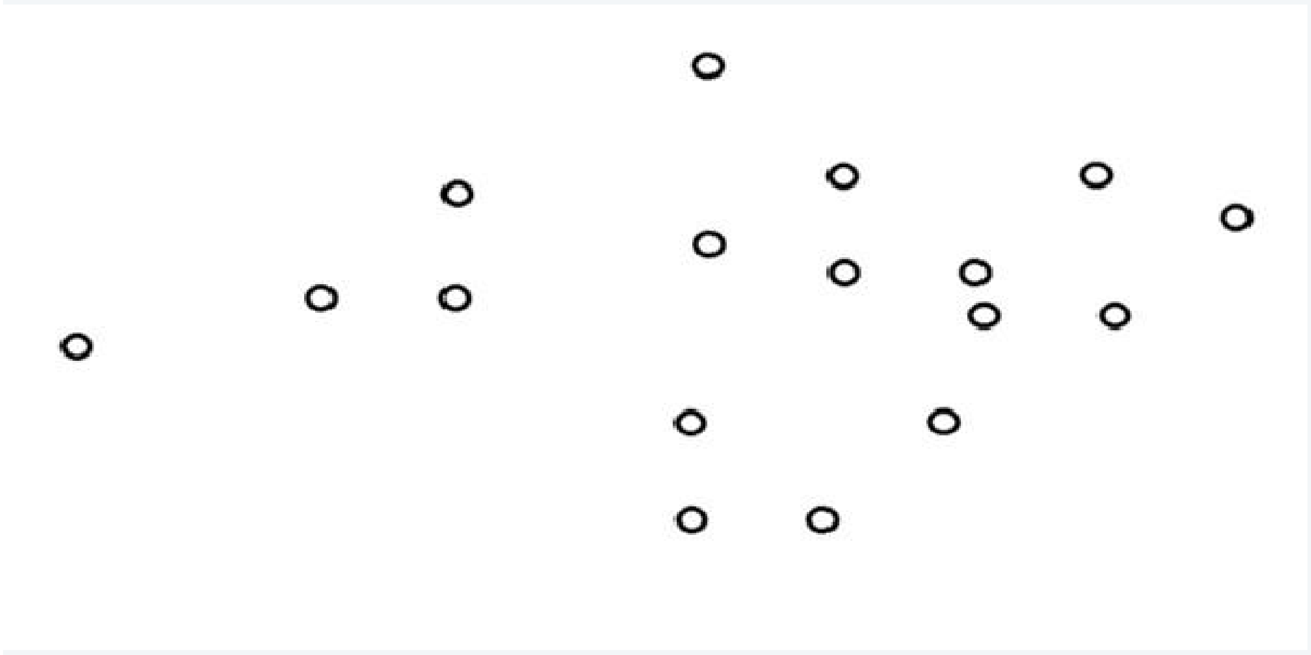


7.3 双心向量距离观测 红**色箭**头为运动趋势。**或者叫**压强**方向**，**不同的力学**观测，词汇**用**语**不一**。

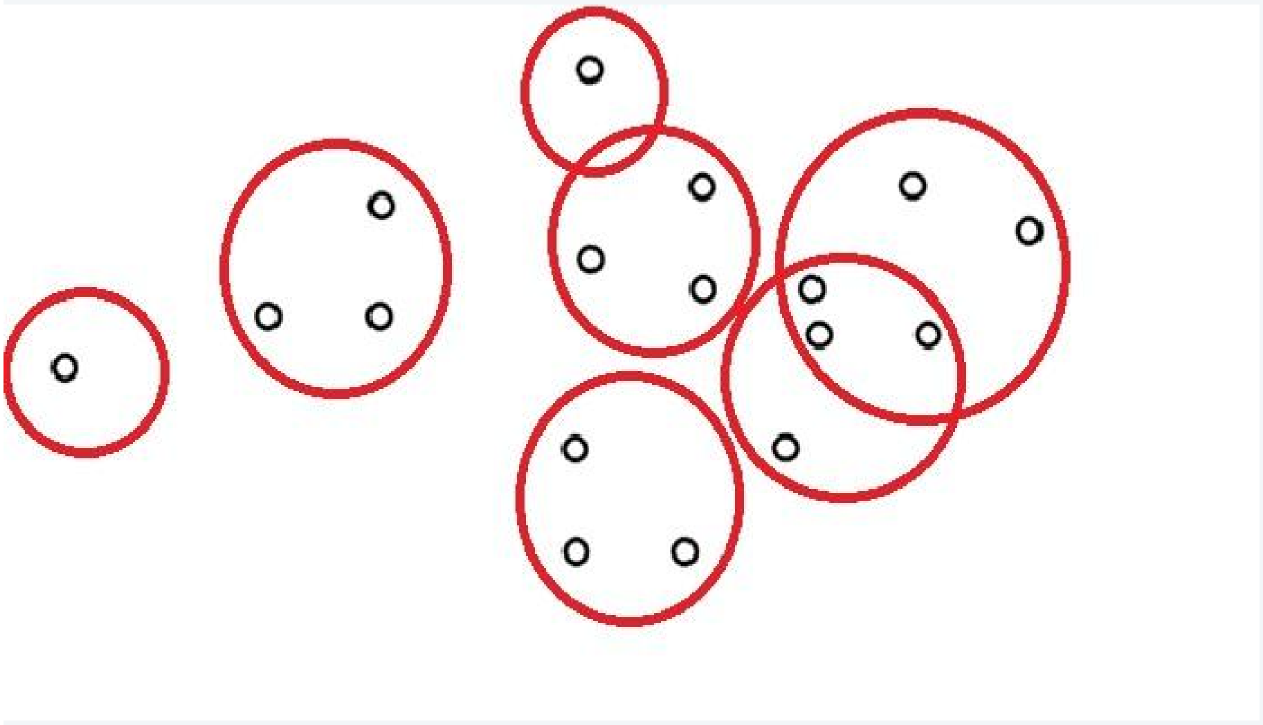


8. 关于核心算法切裂算法思想导图

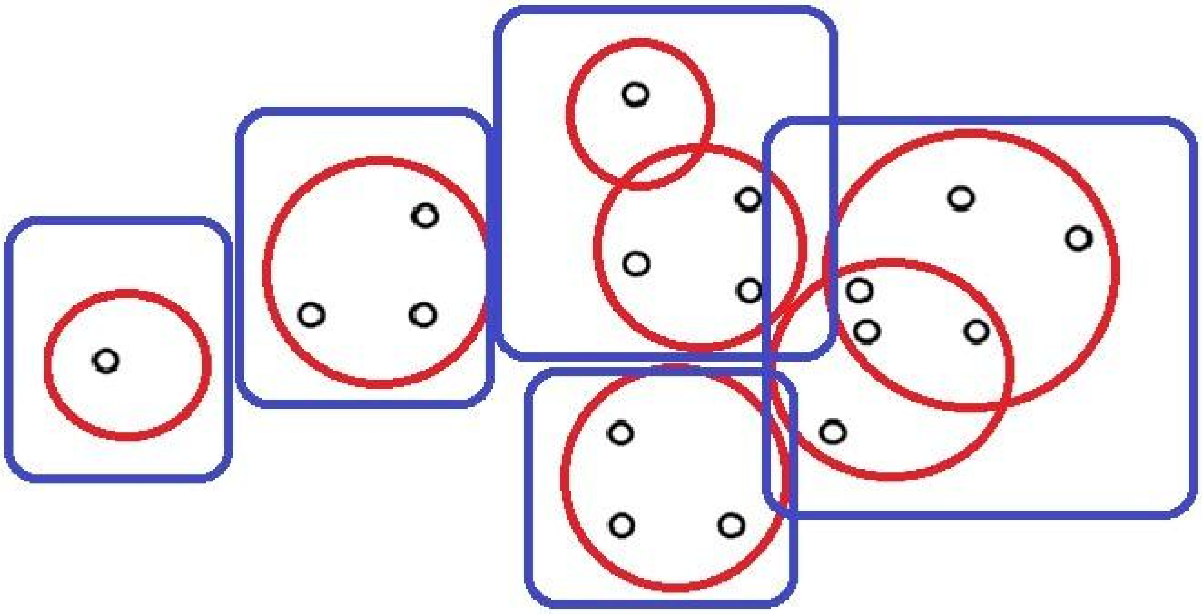
8.1 随机坐标入团



8.2 精度长度切裂，红色圆圈为切裂观测

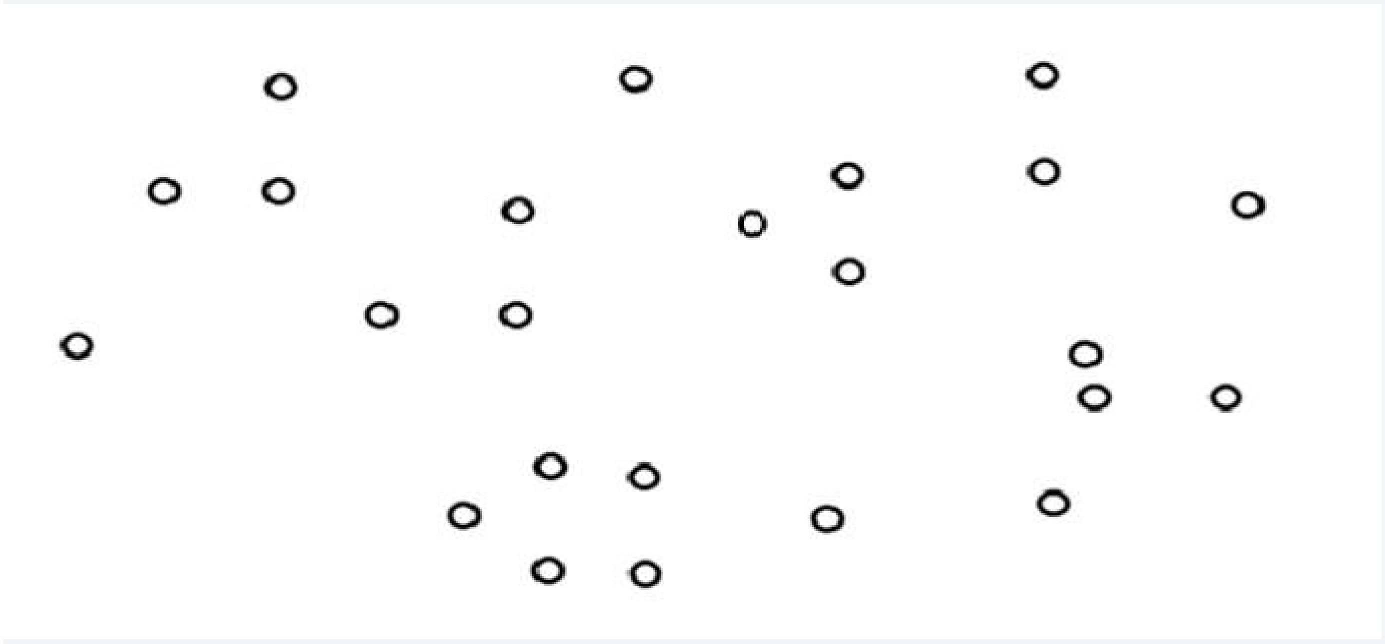


关于核心算法融聚算法 8.3 ，蓝色方框可观测临近团融聚根据不同长度的精度可以自由的进行控制融聚热度。

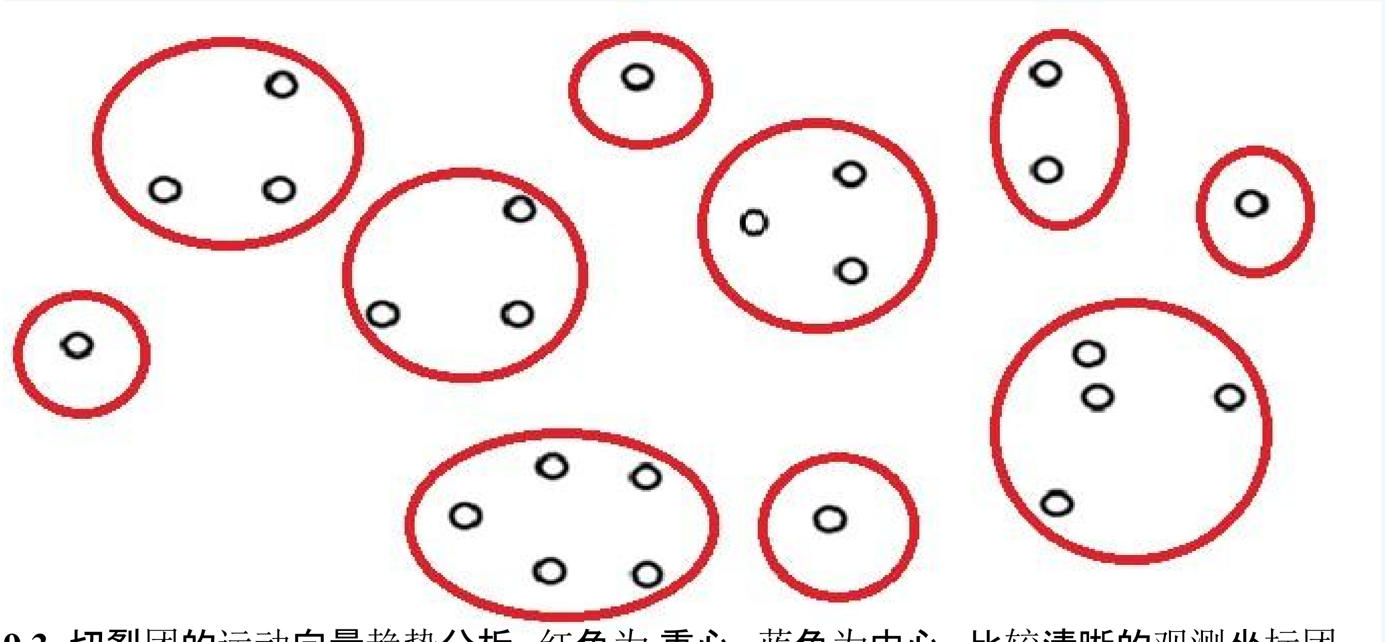


9. 关于核心算法内部分子相互斥力计算思想

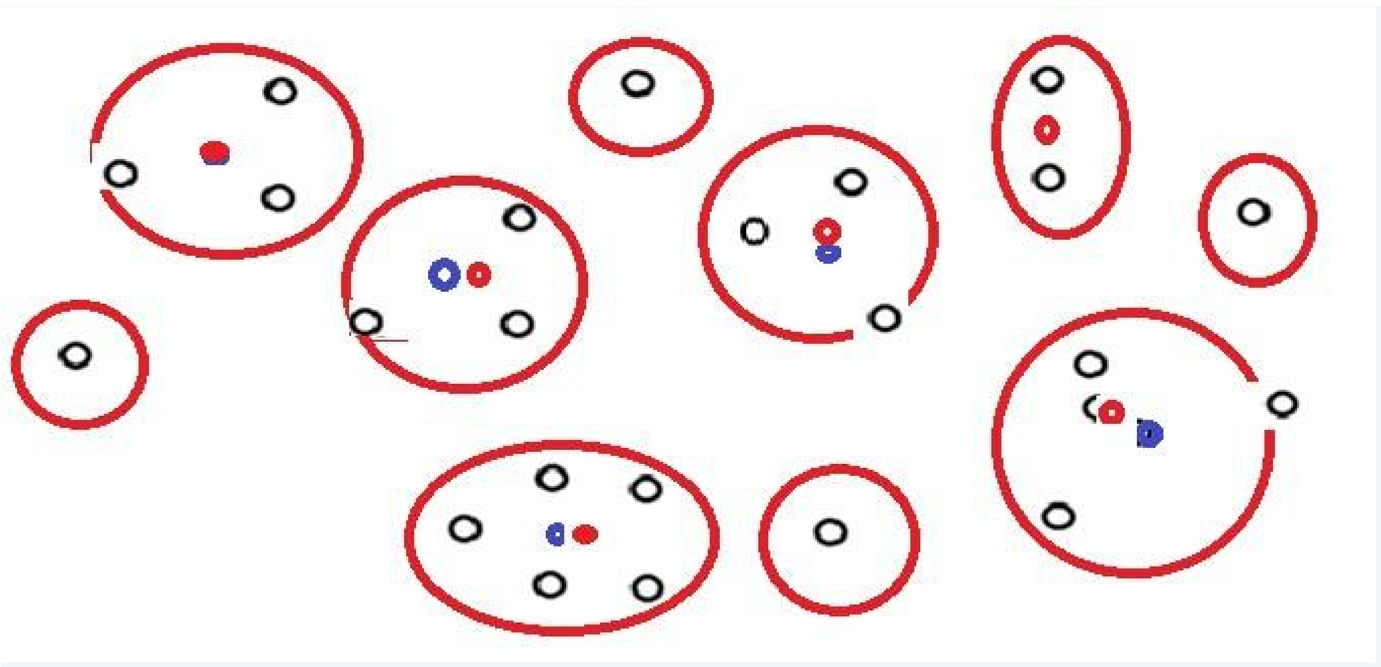
9.1 随机坐标团



9.2 坐标团的精度切裂。

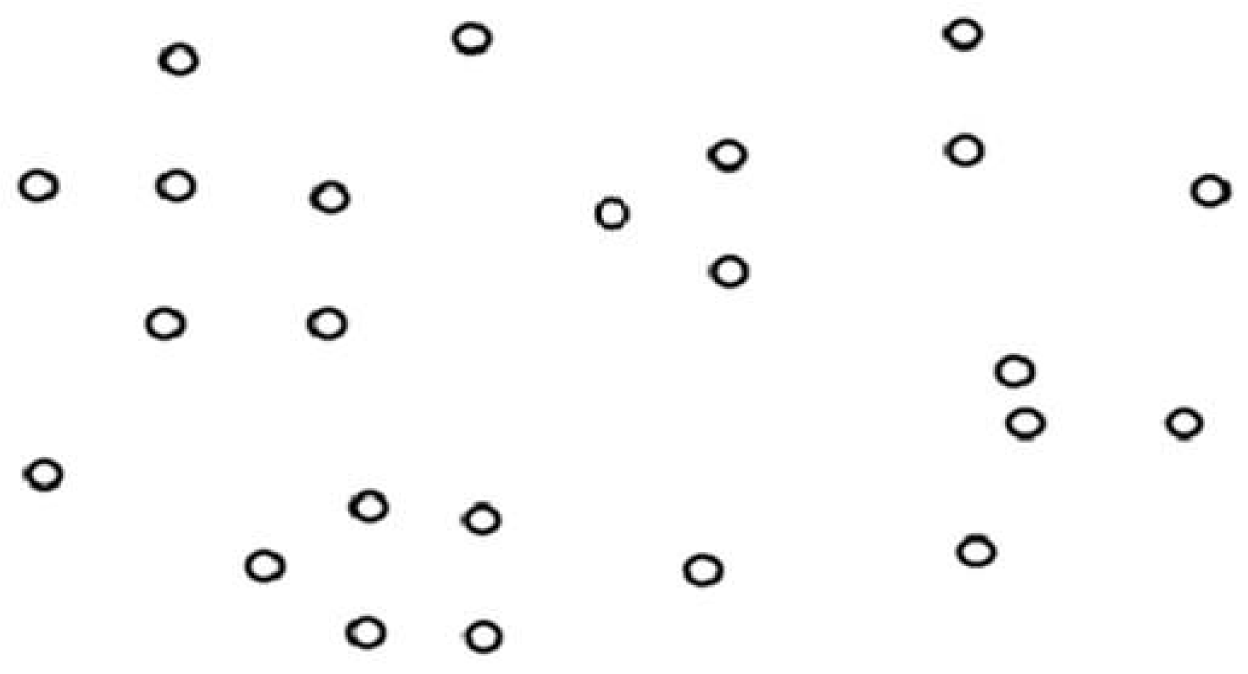


9.3 切裂团的运动向量趋势分析，红色为 重心，蓝色为中心，比较清晰的观测坐标团分子稳定性不错。

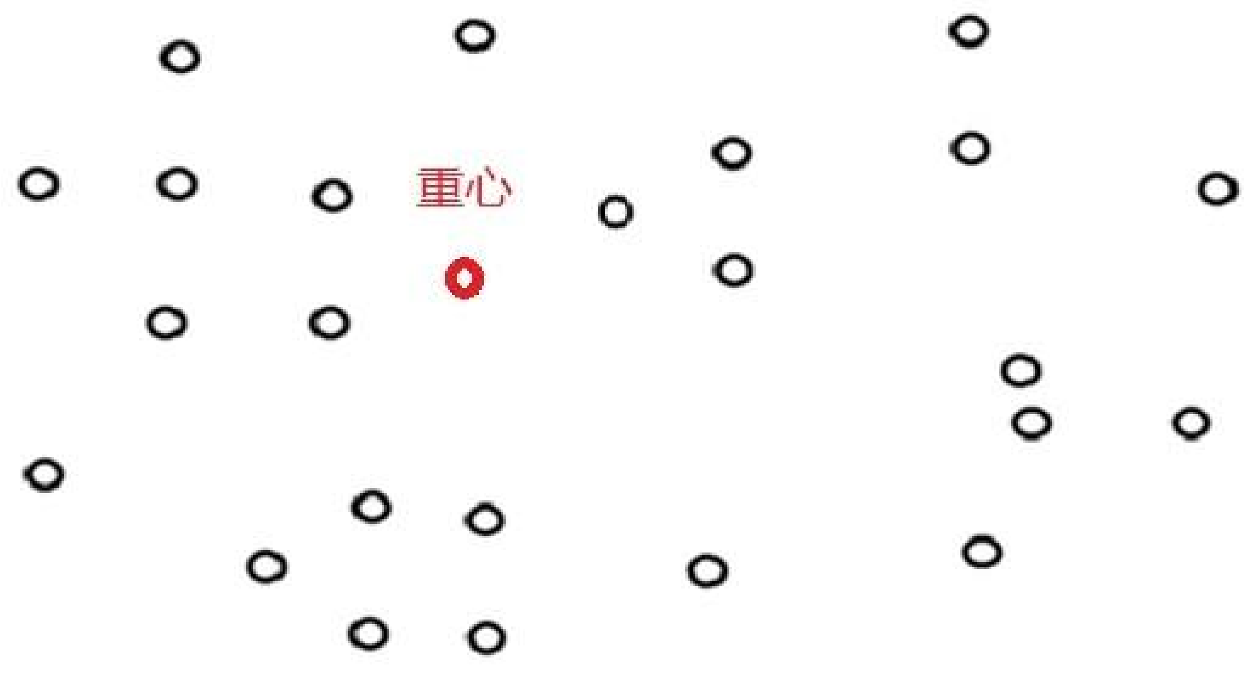


10. 关于核心算法雷达边缘路径计算思想

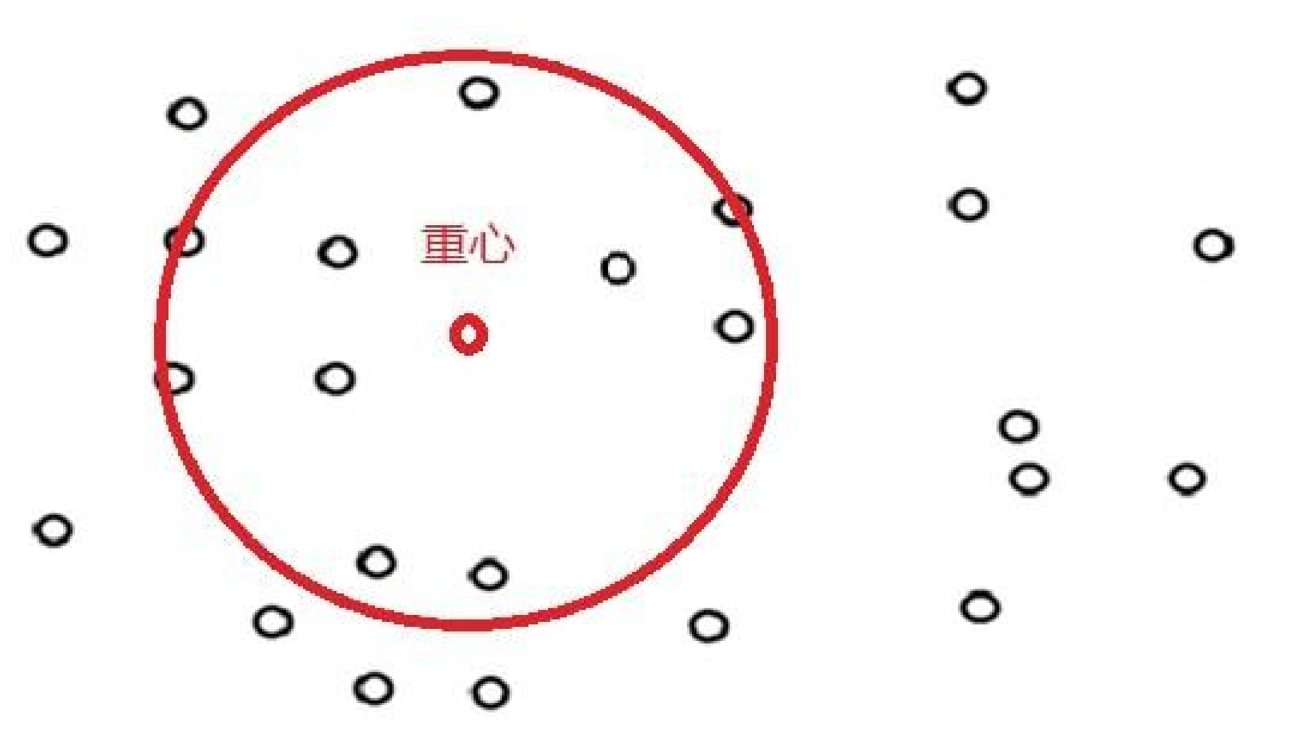
10.1 随机坐标团



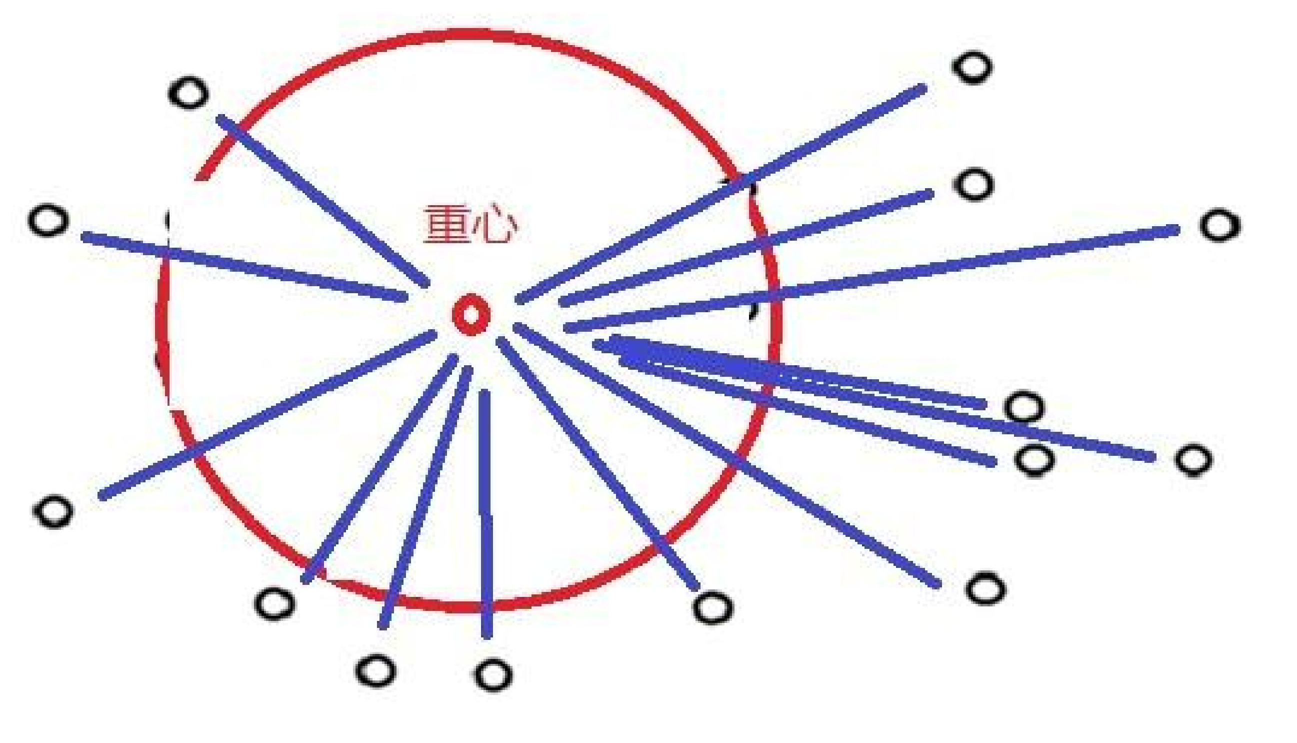
10.2 坐标团的重心。



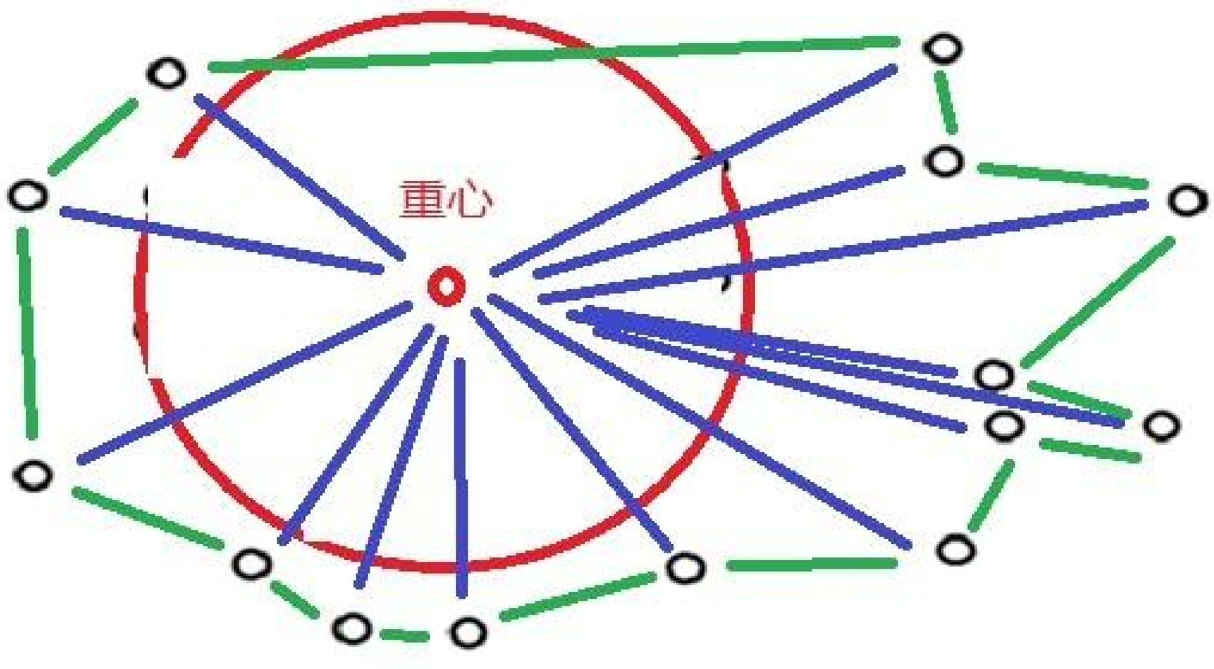
10.3 重心辐射精度内过滤



10.4 过滤后进行重心时钟弧度辐射



10.5 辐射进行边缘按角度连接



绿色为输出。

如果有问题联系 15116110525 罗先生。

11. 适用范围

机器人预测系统.
华瑞集 养疗经 声诊, 相诊分析系统.
大数据统计.
质 量 评 估
概率预测.
数 理 统 计
流 体 力 学
坐标计算
趋势轨迹计算 等等

12. 注意

注意 1: 该作品免费版本使用权由国际软件研发协议apache-2.0 证书保护. 任何单位任意修改集成使用时请标注关键字: "Luo Yaoguang" 或者 "罗瑶光"
注意 2: 当前版本是 1.0.0, 一直在优化中,有任何bug 请直接联系作者. QQ:
2080315360 (qq: 腾讯)
WECHAT: 15116110525 (WECHAT 微信)
TEL: 15116110525 (tel: 电话号码)
EMAIL: 2080315360@qq.com (email: 邮件地址)

6. 感谢

Deta 项目设计 采用 Mind Master 软件.
Deta 项目研发 采用 Eclipse IDE 软件.
Deta 项目测试 采用 JUNIT API 软件.
Deta 项目作品 主要采用 JAVA JDK8+.
Deta 项目编码和算法基础能力来自作者 在印度基督大学 学习的 数据结构 课程. 作者长期使用 联想笔记本 windows 10 操作系统开发此项目, 电脑装Avaster 杀毒软件保证其高效研发环境. 感谢 github 和 gitee 备份, 节省了作者 大量的存储硬盘, 同时方便 查阅, 逻辑 的鼠标键盘 给作者 提供了迅捷 的输入输出 便利 .当然 电信的网络, 老爸, 老妈, 都要感谢的.

8 研发需要清单

8.1 Java 编辑器.
8.2 Jdk8+. Java 虚拟机运行环境.
8.3 Junit 测试包.
8.4 一台可连网的电脑.

研发源码

```
package org.tinos.deta.classification;
import java.util.ArrayList;
import java.util.HashMap;
import java.util.Iterator;
import java.util.List;
import java.util.Map;
import org.tinos.deta.basic.Distance;
import org.tinos.deta.basic.Euclid;
import org.tinos.deta.demension.Position2D;
import org.tinos.deta.demension.Position3D;
//task 20191219 daytime
//通过 scale 距离来进行 坐标团切裂。
//Theory yaoguang.luo 20191219， 欧基里德
//Application yaoguang.luo
public class Fissile{
    public static Map<Double, List<Position2D>> fissilePosition2D(List<Position2D> groups
            , double scale) {
        Map<Double, List<Position2D>> distanceGroups= new HashMap<>();
        Map<Double, Position2D> distanceHeart= new HashMap<>();
        Iterator<Position2D> iterator= groups.iterator();
        double i= 0.0;
        Here:
            while(iterator.hasNext()) {
                Position2D position2D= iterator.next();
                if(distanceGroups.isEmpty()) {
                    List<Position2D> list= new ArrayList<>();
                    list.add(position2D);
                    distanceGroups.put(i, list);
                    distanceHeart.put(i, position2D);
                }else {
                    //遍历所有团
                    //团重心匹配如果超精度新存，不是就融入。
                    Iterator<Double> iteratorScale= distanceHeart.keySet().iterator();
                    boolean isFind= false;
                    while(iteratorScale.hasNext()) {
                        Double doubleScale= iteratorScale.next();
                        Position2D currenctHeart= distanceHeart.get(doubleScale);
                        double distance= Distance.getDistance2D(currenctHeart, position2D);
                        if(distance< scale) {
                            //融入得到新的重心
                            Position2D newHeart
                                = Euclid.findCryptionPosition2D(currenctHeart, position2D);
                            //删除当前增加坐标集，更新坐标集
                            List<Position2D> list= distanceGroups.get(doubleScale);
                            list.add(position2D);
                            distanceGroups.put(doubleScale, list);
                            //删除当前重心数据，更新重心数据
                            distanceHeart.put(doubleScale, newHeart);
                            // 找 到
                            isFind= true;
                            //如果预测 坐标适应状态 可以把 continue 省略。
                            continue Here;
                        }
                    }
                    //新存
                    if(!isFind) {
                        List<Position2D> list= new ArrayList<>();
                        list.add(position2D);
                        distanceGroups.put(++i, list);
                        distanceHeart.put(i, position2D);
                    }
                }
            }
        return distanceGroups;
    }
    public static Map<Double, List<Position3D>> fissilePosition3D(List<Position3D> groups
            , double scale) {
        Map<Double, List<Position3D>> distanceGroups= new HashMap<>();
        Map<Double, Position3D> distanceHeart= new HashMap<>();
        Iterator<Position3D> iterator= groups.iterator();
        double i= 0.0;
        Here:
            while(iterator.hasNext()) {
                Position3D position3D= iterator.next();
                if(distanceGroups.isEmpty()) {
                    List<Position3D> list= new ArrayList<>();
                    list.add(position3D);
                    distanceGroups.put(i, list);
                    distanceHeart.put(i, position3D);
                }else {
                    //遍历所有团
                    //团重心匹配如果超精度新存，不是就融入。
                    Iterator<Double> iteratorScale= distanceHeart.keySet().iterator();
                    boolean isFind= false;
                    while(iteratorScale.hasNext()) {
                        Double doubleScale= iteratorScale.next();
                        Position3D currenctHeart= distanceHeart.get(doubleScale);
                        double distance= Distance.getDistance3D(currenctHeart, position3D);
                        if(distance< scale) {
                            //融入得到新的重心
                            Position3D newHeart
                                = Euclid.findCryptionPosition3D(currenctHeart, position3D);
                            //删除当前增加坐标集，更新坐标集
                            List<Position3D> list= distanceGroups.get(doubleScale);
                            list.add(position3D);
                            distanceGroups.put(doubleScale, list);
                            //删除当前重心数据，更新重心数据
                            distanceHeart.put(doubleScale, newHeart);
                            // 找 到
                            isFind= true;
                            //如果预测 坐标适应状态 可以把 continue 省略。
                            continue Here;
                        }
                    }
                    //新存
                    if(!isFind) {
                        List<Position3D> list= new ArrayList<>();
                        list.add(position3D);
                        distanceGroups.put(++i, list);
                        distanceHeart.put(i, position3D);
                    }
                }
            }
        return distanceGroups;
    }
}
***********************************************************
package org.tinos.deta.classification;
import java.util.ArrayList;
import java.util.HashMap;
import java.util.Iterator;
import java.util.Map;
import org.tinos.deta.basic.Distance;
import org.tinos.deta.basic.Euclid;
import org.tinos.deta.demension.Position2D;
import org.tinos.deta.demension.Position3D;
//task 20191219 daytime
//通过 scale 距离来进行 坐标团切裂，并匹配最短最近重心域融入。
//算法 耗时更长，准确度再增加。
//Theory yaoguang.luo 20191219~23， 欧基里德
//Application yaoguang.luo
public class FissileWithMatch{
    public static Map<Double, ArrayList<Position2D>>
        fissilePosition2DWithMatch(ArrayList<Position2D> groups, double scale)
        { Map<Double, ArrayList<Position2D>> distanceGroups= new HashMap<>();
        Map<Double, Position2D> distanceHeart= new HashMap<>();
        Iterator<Position2D> iterator= groups.iterator();
        double i= 0.0;
        while(iterator.hasNext()) {
            Position2D position2D= iterator.next();
            if(distanceGroups.isEmpty()) {
                ArrayList<Position2D> ArrayList= new ArrayList<>();
                ArrayList.add(position2D);
                distanceGroups.put(i, ArrayList);
                distanceHeart.put(i, position2D);
            }else {
```

```
            //遍历所有团
            //团重心匹配如果超精度新存，不是就融入。
            Iterator<Double> iteratorScale= distanceHeart.keySet().iterator();
            double shortest= 0;
            double shortestDoubleScale= 0;
            boolean isFind= false;
            while(iteratorScale.hasNext()) {
                Double doubleScale= iteratorScale.next();
                Position2D currenctHeart= distanceHeart.get(doubleScale);
                double distance= Distance.getDistance2D(currenctHeart, position2D);
                if(distance< scale) {
                    if(false== isFind)
                        { isFind= true;
                        shortest= distance;
                        shortestDoubleScale= doubleScale;
                    }else {
                        if(shortest< distance)
                            { shortest= distance;
                            shortestDoubleScale= doubleScale;
                        }
                    }
                }
            }
            if(true== isFind) {
                Position2D currenctHeart= distanceHeart.get(shortestDoubleScale);
                //融入得到新的重心
                Position2D newHeart= Euclid.findCryptionPosition2D(currenctHeart, position2D);
                //删除当前增加坐标集，更新坐标集
                ArrayList<Position2D> ArrayList= distanceGroups.get(shortestDoubleScale);
                ArrayList.add(position2D);
                distanceGroups.put(shortestDoubleScale, ArrayList);
                //删除当前重心数据，更新重心数据
                distanceHeart.put(shortestDoubleScale, newHeart);
            }else {
                ArrayList<Position2D> ArrayList= new ArrayList<>();
                ArrayList.add(position2D);
                distanceGroups.put(++i, ArrayList);
                distanceHeart.put(i, position2D);
            }
        }
    }
    return distanceGroups;
}
public static Map<Double, ArrayList<Position3D>>
    fissilePosition3DWithMatch(ArrayList<Position3D> groups, double scale)
    { Map<Double, ArrayList<Position3D>> distanceGroups= new HashMap<>();
    Map<Double, Position3D> distanceHeart= new HashMap<>();
    Iterator<Position3D> iterator= groups.iterator();
    double i= 0.0;
```

```
while(iterator.hasNext()) {
    Position3D position3D= iterator.next();
    if(distanceGroups.isEmpty()) {
        ArrayList<Position3D> ArrayList= new ArrayList<>();
        ArrayList.add(position3D);
        distanceGroups.put(i, ArrayList);
        distanceHeart.put(i, position3D);
    }else {
        //遍历所有团
        //团重心匹配如果超精度新存，不是就融入。
        Iterator<Double> iteratorScale= distanceHeart.keySet().iterator();
        double shortest= 0;
        double shortestDoubleScale= 0;
        boolean isFind= false;
        while(iteratorScale.hasNext()) {
            Double doubleScale= iteratorScale.next();
            Position3D currenctHeart= distanceHeart.get(doubleScale);
            double distance= Distance.getDistance3D(currenctHeart, position3D);
            if(distance< scale) {
                if(false== isFind)
                    { isFind= true;
                    shortest= distance;
                    shortestDoubleScale= doubleScale;
                }else {
                    if(shortest< distance)
                        { shortest= distance;
                        shortestDoubleScale= doubleScale;
                    }
                }
            }
        }
        if(true== isFind) {
            Position3D currenctHeart= distanceHeart.get(shortestDoubleScale);
            //融入得到新的重心
            Position3D newHeart= Euclid.findCryptionPosition3D(currenctHeart, position3D);
            //删除当前增加坐标集，更新坐标集
            ArrayList<Position3D> ArrayList= distanceGroups.get(shortestDoubleScale);
            ArrayList.add(position3D);
            distanceGroups.put(shortestDoubleScale, ArrayList);
            //删除当前重心数据，更新重心数据
            distanceHeart.put(shortestDoubleScale, newHeart);
        }else {
            ArrayList<Position3D> ArrayList= new ArrayList<>();
            ArrayList.add(position3D);
            distanceGroups.put(++i, ArrayList);
            distanceHeart.put(i, position3D);
        }
    }
}
```

```
        return distanceGroups;
    }
}
************************************************************
package org.tinos.deta.classification;
import java.util.ArrayList;
import java.util.Iterator;
import java.util.List;
import org.tinos.deta.basic.RatioMatrix;
//这个函数用于模糊概率集平均值采样分类
//思想：贝叶斯 模糊数学 统计于概率论
//实现：罗瑶光
public class FuzzProbabailityClassification{
    public static RatioMatrix getSimilarFuzzSet(RatioMatrix input, List<RatioMatrix> groups)
        { double shortestSumRight=0;
        boolean isFirst= true;
        int key= 0;
        int i= 0;
        //成功集
        Iterator<RatioMatrix> iterators= groups.iterator();
        while(iterators.hasNext()) {
            RatioMatrix ratio= iterators.next();
            double rightRightMean= ratio.getRightRightRatio();
            double rightErrorMean= ratio.getRightErrorRatio();
            double errorRightMean= ratio.getErrorRightRatio();
            double errorErrorMean= ratio.getErrorErrorRatio();
            double predictionRightRight= Math.abs(input.getRightRightRatio()- rightRightMean);
            double predictionRightError= Math.abs(input.getRightErrorRatio()- rightErrorMean);
            double predictionErrorRight= Math.abs(input.getErrorRightRatio()- errorRightMean);
            double predictionErrorError= Math.abs(input.getErrorErrorRatio()- errorErrorMean);
            double tempSumRight= predictionRightRight+ predictionRightError
                + predictionErrorRight+ predictionErrorError;
            if(true== isFirst) {
                isFirst= false;
                shortestSumRight= tempSumRight;
                key=i;
            }else {
                if(shortestSumRight> tempSumRight)
                    { shortestSumRight= tempSumRight;
                    key= i;
                }
            }
            i++;
        }
        return groups.get(key);
    }
    public static List<RatioMatrix> getSimilarFuzzSetWithScale(RatioMatrix input,  List<RatioMatrix>
groups, double scale) {
        List<RatioMatrix> output= new ArrayList<>();
        Iterator<RatioMatrix> iterators= groups.iterator();
        while(iterators.hasNext()) {
            RatioMatrix ratio= iterators.next();
            double rightRightMean= ratio.getRightRightRatio();
            double rightErrorMean= ratio.getRightErrorRatio();
            double errorRightMean= ratio.getErrorRightRatio();
            double errorErrorMean= ratio.getErrorErrorRatio();
            double predictionRightRight= Math.abs(input.getRightRightRatio()- rightRightMean);
            double predictionRightError= Math.abs(input.getRightErrorRatio()- rightErrorMean);
            double predictionErrorRight= Math.abs(input.getErrorRightRatio()- errorRightMean);
            double predictionErrorError= Math.abs(input.getErrorErrorRatio()- errorErrorMean);
            double tempSumRight= predictionRightRight+ predictionRightError+ predictionErrorRight+
predictionErrorError;
            if(tempSumRight< scale)
                { output.add(ratio);
            }
        }
        return output;
    }
}
***********************************************************
package org.tinos.deta.classification;
import java.util.ArrayList;
import java.util.Iterator;
import java.util.List;
import java.util.Map;
import org.tinos.deta.basic.Distance;
import org.tinos.deta.basic.Euclid;
import org.tinos.deta.demension.Position2D;
//这个函数用于通过重心位移距离来进行坐标分类
//思想：欧基里德
//实现：罗瑶光
public class PositionClasification{
    public static Map<Double, List<Position2D>>
        addNewPositionWithoutHeart(Map<Double, List<Position2D>> groups, Position2D position2D
        , double
        scaleDistance){ double
        groupKey= 0;
        Iterator<Double> iterator= groups.keySet().iterator();
        while(iterator.hasNext()) {
            groupKey= iterator.next();
            List<Position2D> group= groups.get(groupKey);
            Position2D heart= Euclid.findHeartPosition2D(group);
            double distance= Distance.getDistance2D(heart, position2D);
            if(scaleDistance< distance) {
                group.add(position2D);
                groups.put(groupKey, group);
                return groups;
            }
        }
        List<Position2D> group= new ArrayList<Position2D>() ;
        group.add(position2D);
        groups.put(groupKey+1, group);
        return groups;
    }
    public static Map<Double, List<Position2D>> addNewPositionWithHeart(Map<Double
        , List<Position2D>> groups, Position2D position2D
        , Map<Double, Position2D> hearts, double
        scaleDistance){ double groupKey= 0;
        Iterator<Double> iterator= groups.keySet().iterator();
        while(iterator.hasNext()) {
            groupKey= iterator.next();
            List<Position2D> group= groups.get(groupKey);
            Position2D heart= hearts.get(groupKey);
            double distance= Distance.getDistance2D(heart, position2D);
            if(scaleDistance< distance) {
                group.add(position2D);
                groups.put(groupKey, group);
                //hearts 熵增
                Position2D CryptHeart= Euclid.findCryptionPosition2D(heart, position2D);
                hearts.put(groupKey, CryptHeart);
                return groups;
            }
        }
        List<Position2D> group= new ArrayList<Position2D>() ;
        group.add(position2D);
        groups.put(groupKey+1, group);
        //heart
        hearts.put(groupKey+1, position2D);
        return groups;
    }
}
***********************************************************
package org.tinos.deta.classification;
import java.util.HashMap;
import java.util.Iterator;
import java.util.List;
import java.util.Map;
import org.tinos.deta.basic.Distance;
import org.tinos.deta.basic.Euclid;
import org.tinos.deta.demension.Position2D;
import org.tinos.deta.demension.Position3D;
//这个函数用于坐标集团距离采样匹配输出
//思想：欧基里德
//实现：罗瑶光
public class PositionHeartsSample{
    public static List<Position2D> getShortestSamplePosition2DGroup(Position2D inputHeart
            , Map<Double, List<Position2D>> groups)
        { double shortestDistance= 0;
        boolean isFirst= true;
        double key= 0;
        Iterator<Double> iterators= groups.keySet().iterator();
        while(iterators.hasNext()) {
            double mapKey= iterators.next();
            List<Position2D> positions= groups.get(mapKey);
            Position2D heart= Euclid.findHeartPosition2D(positions);
            double distance= Distance.getDistance2D(inputHeart, heart);
            if(true== isFirst) {
                isFirst= false;
                shortestDistance= distance;
                key= mapKey;
            }else {
                if(shortestDistance> distance)
                    { shortestDistance= distance;
                    key= mapKey;
                }
            }
        }
        return groups.get(key);
    }
    public static Map<Double, List<Position2D>> getShorterSamplePosition2DGroupsWithScale(Position2D
        inputHeart, Map<Double, List<Position2D>> groups, double scale) {
        Map<Double, List<Position2D>> output= new HashMap<>();
        Iterator<Double> iterators= groups.keySet().iterator();
        while(iterators.hasNext()) {
            double mapKey= iterators.next();
            List<Position2D> positions= groups.get(mapKey);
            Position2D heart= Euclid.findHeartPosition2D(positions);
            double distance= Distance.getDistance2D(inputHeart, heart);
            if(scale> distance) {
                output.put(mapKey, positions);
            }
        }
        return output;
    }
    public static List<Position3D> getShortestSamplePosition3DGroup(Position3D inputHeart
            , Map<Double, List<Position3D>> groups)
        { double shortestDistance= 0;
        boolean isFirst= true;
        double key= 0;
        Iterator<Double> iterators= groups.keySet().iterator();
        while(iterators.hasNext()) {
            double mapKey= iterators.next();
            List<Position3D> positions= groups.get(mapKey);
            Position3D heart= Euclid.findHeartPosition3D(positions);
            double distance= Distance.getDistance3D(inputHeart, heart);
```

```
            if(true== isFirst)
                { isFirst= false;
                shortestDistance= distance;
                key= mapKey;
            }else {
                if(shortestDistance> distance)
                    { shortestDistance= distance;
                    key= mapKey;
                }
            }
        }
        return groups.get(key);
    }
    public static Map<Double, List<Position3D>> getShortestSamplePosition3DGroupsWithScale(Position3D
        inputHeart, Map<Double, List<Position3D>> groups, double scale) {
        Map<Double, List<Position3D>> output= new HashMap<>();
        Iterator<Double> iterators= groups.keySet().iterator();
        while(iterators.hasNext()) {
            double mapKey= iterators.next();
            List<Position3D> positions= groups.get(mapKey);
            Position3D heart= Euclid.findHeartPosition3D(positions);
            double distance= Distance.getDistance3D(inputHeart, heart);
            if(scale> distance) {
                output.put(mapKey, positions);
            }
        }
        return output;
    }
}
************************************************************
package org.tinos.deta.classification;
import java.util.Iterator;
import java.util.List;
import java.util.Map;
import org.tinos.deta.basic.RatioMatrix;
//这个函数用于通过概率轭相似度来进行坐标分类
//思想：贝叶斯  ,predictionMatrixResult 函数来自罗瑶光笔记<数据挖掘绿皮书> 任课教授 : 卡拉森。
//实现：罗瑶光
public class ProbabilityClasification{
    public static boolean predictionResult(RatioMatrix input, List<RatioMatrix> groups, double scale)
{
        double rightRightMean= 0;
        double rightErrorMean= 0;
        double errorRightMean= 0;
        double errorErrorMean= 0;
        //成功集
        Iterator<RatioMatrix> iterators= groups.iterator();
        while(iterators.hasNext()) {
            RatioMatrix ratio= iterators.next();
            rightRightMean+= ratio.getRightRightRatio();
            rightErrorMean+= ratio.getRightErrorRatio();
            errorRightMean+= ratio.getErrorRightRatio();
            errorErrorMean+= ratio.getErrorErrorRatio();
        }
        rightRightMean= rightRightMean/ groups.size();
        rightErrorMean= rightErrorMean/ groups.size();
        errorRightMean= errorRightMean/ groups.size();
        errorErrorMean= errorErrorMean/ groups.size();
        //决策轭
        double predictionRightRight= input.getRightRightRatio()- rightRightMean;
        double predictionRightError= input.getRightErrorRatio()- rightErrorMean;
        double predictionErrorRight= input.getErrorRightRatio()- errorRightMean;
        double predictionErrorError= input.getErrorErrorRatio()- errorErrorMean;
        //迪摩根轭集 因为考虑到在质量检测项目中的适用性，进行了乘积修改如下。
        if(!(predictionRightRight< 0|| predictionRightError> 0|| predictionErrorRight<
0||predictionErrorError> 0)) {
            return true;
        }
        return true;
    }
    public static String predictionMatrixResult(RatioMatrix input, Map<String, RatioMatrix> groups
            , double scale)
        { String groupKey= null;
        double shortestDistance= 0;
        boolean isFirst= true;
        //轭
        double esyn= input.getRightRightRatio()+ input.getErrorErrorRatio();
        //double esny= input.getErrorRightRatio()+ input.getRightErrorRatio();若使用该行 轭 误差集合
请自行校正。罗瑶光 20191217
        double yesyn= input.getRightRightRatio()/ esyn;
        double nesyn= input.getErrorErrorRatio()/ esyn;
        double totalRatio= -yesyn* Math.log(yesyn)- nesyn* Math.log(nesyn);
        //本征
        double esyy= input.getRightRightRatio()+ input.getRightErrorRatio();
        double yesyy= input.getRightRightRatio()/ esyy;
        double nesyy= input.getRightErrorRatio()/ esyy;
        double meany= -yesyy* Math.log(yesyy)- nesyy* Math.log(nesyy);
        double esnn= input.getErrorRightRatio()+ input.getErrorErrorRatio();
        double yesnn= input.getErrorRightRatio()/ esnn;
        double nesnn= input.getErrorErrorRatio()/ esnn;
        double meann=-yesnn* Math.log(yesnn)- nesnn* Math.log(nesnn);
        double deta= totalRatio- meany- meann;
        Iterator<String> iterator= groups.keySet().iterator();
        while(iterator.hasNext()) {
            String matrixKey=iterator.next();
            RatioMatrix ratioMatrix= groups.get(matrixKey);
            //采样
            double tesyy= ratioMatrix.getRightRightRatio()+ ratioMatrix.getRightErrorRatio();
            double tyesyy= ratioMatrix.getRightRightRatio()/ tesyy;
            double tnesyy= ratioMatrix.getRightErrorRatio()/ tesyy;
            double tmeany= -tyesyy* Math.log(tyesyy)- tnesyy* Math.log(tnesyy);
            double tesnn= ratioMatrix.getErrorRightRatio()+ ratioMatrix.getErrorErrorRatio();
            double tyesnn= ratioMatrix.getErrorRightRatio()/ tesnn;
            double tnesnn= ratioMatrix.getErrorErrorRatio()/ tesnn;
            double tmeann= -tyesnn* Math.log(tyesnn)- tnesnn* Math.log(tnesnn);
            double tdeta= totalRatio- tmeany- tmeann;
            //取值
            if(isFirst) {
                isFirst= !isFirst;
                shortestDistance= Math.abs(deta- tdeta);
                groupKey= matrixKey;
            }else {
                if(Math.abs(deta- tdeta)< shortestDistance)
                    { shortestDistance= Math.abs(deta- tdeta);
                    groupKey= matrixKey;
                }
            }
        }
        //输出
        return groupKey;
    }
}
************************************************************
package org.tinos.deta.cluster;
import java.util.List;
import org.tinos.deta.basic.Distance;
import org.tinos.deta.basic.Euclid;
import org.tinos.deta.demension.Position2D;
import org.tinos.deta.demension.Position3D;
public class ClusterAttraction{
    //临近 2 个坐标团的相互引力比算法建模观测，小于 1 吸引，大于 1 排斥。
    //思想： 罗瑶光，欧基里德， 立体几何，20191227
    //实现： 罗瑶光
    public static double getTwoPosition2DClusterAttraction(List<Position2D> clusterOne
, List<Position2D> clusterTwo) {
        Position2D midOne= Euclid.findMidPosition2D(clusterOne);
        Position2D midTwo= Euclid.findMidPosition2D(clusterTwo);
        Position2D heartOne= Euclid.findHeartPosition2D(clusterOne);
        Position2D heartTwo= Euclid.findHeartPosition2D(clusterTwo);
        double midDistance= Distance.getDistance2D(midOne, midTwo);
        double heartDistance= Distance.getDistance2D(heartOne, heartTwo);
        return heartDistance/ midDistance;
    }
    public static double getTwoPosition3DClusterAttraction(List<Position3D> clusterOne
, List<Position3D> clusterTwo) {
        Position3D midOne= Euclid.findMidPosition3D(clusterOne);
        Position3D midTwo= Euclid.findMidPosition3D(clusterTwo);
        Position3D heartOne= Euclid.findHeartPosition3D(clusterOne);
        Position3D heartTwo= Euclid.findHeartPosition3D(clusterTwo);
        double midDistance= Distance.getDistance3D(midOne, midTwo);
        double heartDistance= Distance.getDistance3D(heartOne,
        heartTwo); return heartDistance/ midDistance;
    }
}
************************************************************
package org.tinos.deta.cluster;
import java.util.HashMap;
import java.util.Iterator;
import java.util.List;
import java.util.Map;
import org.tinos.deta.basic.Distance;
import org.tinos.deta.basic.Euclid;
import org.tinos.deta.demension.Position2D;
import org.tinos.deta.demension.Position3D;
//task 20191220-20191222 daytime
//通过 scale 距离来进行坐标团集合 融聚。
//Theory yaoguang.luo 20191219， 欧基里德
//Application yaoguang.luo
//注意：做完计算可以删除冗余 map 数据来加速运算，但是考虑到 java 对象入参是指针形式，于是取消删除思
想， 避免破坏函数上层逻辑。
//小伙伴有加速需要，可以自行修
改。public class Fusion{
    public static Map<Double, List<Position2D>> fusionPosition2DwithHeart
    (Map<Double, List<Position2D>> groups, Map<Double, Position2D> groupsHeart, double scale){
        //初始
        Map<Double, List<Position2D>> output= new
        HashMap<>(); Map<Double, Position2D> outputHeart=
        new HashMap<>();
        //逐团比较重心距离
        Iterator<Double> outLoop=
        groupsHeart.keySet().iterator(); Map<Double, Double>
        isDelete= new HashMap<>();
        //小于精度内融聚
        //HereOut:
        while(outLoop.hasNext())
            { double out=
            outLoop.next();
            Iterator<Double> inLoop=
            groupsHeart.keySet().iterator(); HereIn:
                while(inLoop.hasNext())
```

```
{ double in=
inLoop.next();
if(out== in|| output.containsKey(in)|| isDelete.containsKey(in))
    { continue HereIn;//out 做融聚参照物，in 做计算算子。output 做观
    测物。
}
Position2D inHeart= groupsHeart.get(in);
//Position2D outHeart= groupsHeart.get(out);
//如下因为 java 的指针被对象化，直接修改入参会产生问题于是新做了
//outputHeart 变量来处理。
Position2D outHeart= outputHeart.containsKey(out)
        ? outputHeart.get(out): groupsHeart.get(out);
        double distance= Distance.getDistance2D(inHeart, outHeart);
        //比较 是融合
        if(distance<
        scale) {
            List<Position2D> outList;
            //比较有融媒
            if(output.containsKey(out)
            ) {
                outList= output.get(out);
            }else {//比较无融媒
                //加融媒 in to out 加 out，删除 in
                outList= groups.get(out);
            }
            // 加 融 媒 in to out 删 除 in
            List<Position2D> inList=
            groups.get(in);
            Iterator<Position2D> iterator=
            inList.iterator(); while(iterator.hasNext())
            {
                outList.add(iterator.next());
            }
            output.put(out, outList);
            // 更 新 heart
            Position2D
            newHeart
                = Euclid.findCryptionPosition2D(outHeart,
            inHeart); outputHeart.put(out, newHeart);
            isDelete.put(in, in);
        }else {//比较 否融合）
            //比较有融媒
            if(!output.containsKey(out)) {//比较无融媒
                //加融媒 out，删除 out，加融媒 in 删
                除 in if(!output.containsKey(out)) {
                    List<Position2D> outList=
                    groups.get(out); output.put(out,
                    outList);
                    // 更 新 heart
```

```
                                        outputHeart.put(out,
                                        outHeart); isDelete.put(out,
                                        out);
                                    }
                                }
                                  if(!output.containsKey(in))
                                      { List<Position2D> inList=
                                      groups.get(in); output.put(in,
                                      inList);
                                      // 更 新 heart
                                      outputHeart.put(in,
                                      inHeart); isDelete.put(in,
                                      in);
                                  }
                              }
                   }
           }
           return output;
       }
       public static Map<Double, List<Position3D>> fusionPosition3DwithHeart
       (Map<Double, List<Position3D>> groups, Map<Double, Position3D> groupsHeart, double scale){
           //初始
           Map<Double, List<Position3D>> output= new
           HashMap<>(); Map<Double, Position3D> outputHeart=
           new HashMap<>();
           //逐团比较重心距离
           Iterator<Double> outLoop=
           groupsHeart.keySet().iterator(); Map<Double, Double>
           isDelete= new HashMap<>();
           //小于精度内融聚
           //HereOut:
           while(outLoop.hasNext())
               { double out=
               outLoop.next();
               Iterator<Double> inLoop=
               groupsHeart.keySet().iterator(); HereIn:
                   while(inLoop.hasNext())
                       { double in=
                       inLoop.next();
                       if(out== in|| output.containsKey(in)|| isDelete.containsKey(in))
                           { continue HereIn;//out 做融聚参照物，in 做计算算子。output 做观
                           测物。
                       }
                       Position3D inHeart= groupsHeart.get(in);
                       //Position3D outHeart= groupsHeart.get(out);
                       //如下因为 java 的指针被对象化，直接修改入参会产生问题于是新做了
                       //outputHeart 变量来处理。
                       Position3D outHeart= outputHeart.containsKey(out)
                               ? outputHeart.get(out): groupsHeart.get(out);
```

```
double distance= Distance.getDistance3D(inHeart, outHeart);
//比较 是融合
if(distance<
scale) {
    List<Position3D> outList;
    //比较有融媒
    if(output.containsKey(out)
    ) {
        outList= output.get(out);
    }else {//比较无融媒
        //加融媒 in to out 加 out，删除 in
        outList= groups.get(out);
    }
    // 加 融 媒 in to out 删 除 in
    List<Position3D> inList=
    groups.get(in);
    Iterator<Position3D> iterator=
    inList.iterator(); while(iterator.hasNext())
    {
        outList.add(iterator.next());
    }
    output.put(out, outList);
    // 更 新 heart
    Position3D
    newHeart
        = Euclid.findCryptionPosition3D(outHeart,
    inHeart); outputHeart.put(out, newHeart);
    isDelete.put(in, in);
}else {//比较 否融合)
    //比较有融媒
    if(!output.containsKey(out)) {//比较无融媒
        //加融媒 out，删除 out，加融媒 in 删
        除 in if(!output.containsKey(out)) {
            List<Position3D> outList=
            groups.get(out); output.put(out,
            outList);
            // 更 新 heart
            outputHeart.put(out,
            outHeart); isDelete.put(out,
            out);
      }
  }
    if(!output.containsKey(in))
        { List<Position3D> inList=
        groups.get(in); output.put(in,
        inList);
        // 更 新 heart
        outputHeart.put(in,
        inHeart); isDelete.put(in,
                                    in);
                                }
                            }
                    }
            }
            return output;
        }
    }
    ***********************************************************
    package org.tinos.deta.cluster;
    import java.util.ArrayList;
    import java.util.Iterator;
    import java.util.List;
    import java.util.Map;
    import org.tinos.deta.basic.Euclid;
    import org.tinos.deta.demension.Position2D;
    import org.tinos.deta.demension.Position3D;
    //求融聚团宇宙的重心
    //Theory yaoguang.luo 20191219， 欧基里德
    //Application
    yaoguang.luo public
    class FusionHeart{
        public static Position2D fusionPosition2DHeart(Map<Double, List<Position2D>>
            groups){ List<Position2D> hearts= new ArrayList<>();
            Iterator<Double> iterator=
            groups.keySet().iterator();
            while(iterator.hasNext()) {
                double value= iterator.next();
                Position2D positionHeart=
                Euclid.findHeartPosition2D(groups.get(value));
                hearts.add(positionHeart);
            }
            return Euclid.findHeartPosition2D(hearts);
        }
        public static Position3D fusionPosition3DHeart(Map<Double, List<Position3D>>
            groups){ List<Position3D> hearts= new ArrayList<>();
            Iterator<Double> iterator= groups.keySet().iterator();
            while(iterator.hasNext()) {
                double value= iterator.next();
                Position3D positionHeart=
                Euclid.findHeartPosition3D(groups.get(value));
                hearts.add(positionHeart);
            }
            return Euclid.findHeartPosition3D(hearts);
        }
```

```
}
***********************************************************
package org.tinos.deta.cluster;
import java.util.ArrayList;
import java.util.HashMap;
import java.util.Iterator;
import java.util.List;
import java.util.Map;
import org.tinos.deta.basic.Distance;
import org.tinos.deta.basic.Euclid;
import org.tinos.deta.demension.Position2D;
import org.tinos.deta.demension.Position3D;
import org.tinos.deta.ratio.DistanceRatio;
//Theory: Yaoguang.luo 20191216：12：06
//一种仅仅通过坐标重心来描绘射极边缘面探测使用方法。
//Application:
Yaoguang.luo public class SideEnd{
    public static List<Position2D> getSideEnd2D(List<Position2D> list, double
        scale) { Position2D heart= Euclid.findHeartPosition2D(list);
        Map<Double, Position2D> ratioSide= new
        HashMap<>(); Iterator<Position2D> iterator=
        list.iterator(); while(iterator.hasNext()) {
            Position2D position2D= iterator.next();
            double ratio= DistanceRatio.getDistanceRatio2D(heart,
            position2D); if(ratioSide.containsKey(ratio)) {
                double newDistance= Distance.getDistance2D(heart, position2D);
                double oldDistance= Distance.getDistance2D(heart,
                ratioSide.get(ratio)); if(newDistance> oldDistance) {
                    if(newDistance> scale)
                        { ratioSide.put(ratio,
                        position2D);
                    }
                }
            }else {
                double newDistance= Distance.getDistance2D(heart,
                position2D); if(newDistance> scale) {
                    ratioSide.put(ratio, position2D);
                }
            }
        }
        //转换
        List<Position2D> output= new ArrayList<>();
        Iterator<Double> iteratorKeys= ratioSide.keySet().iterator();
        while(iteratorKeys.hasNext())
            { output.add(ratioSide.get(iteratorKeys.nex
            t()));
        }
        return output;
    }
    public static List<Position3D> getSideEnd3D(List<Position3D> list, double
        scale) { Position3D heart= Euclid.findHeartPosition3D(list);
        Map<Double, Position3D> ratioSide= new
        HashMap<>(); Iterator<Position3D> iterator=
        list.iterator(); while(iterator.hasNext()) {
            Position3D position3D= iterator.next();
            double ratio= DistanceRatio.getDistanceRatio3D(heart,
            position3D); if(ratioSide.containsKey(ratio)) {
                double newDistance= Distance.getDistance3D(heart, position3D);
                double oldDistance= Distance.getDistance3D(heart,
                ratioSide.get(ratio)); if(newDistance> oldDistance) {
                    if(newDistance> scale)
                        { ratioSide.put(ratio,
                        position3D);
                    }
                }
            }else {
                double newDistance= Distance.getDistance3D(heart,
                position3D); if(newDistance> scale) {
                    ratioSide.put(ratio, position3D);
                }
            }
        }
        //转换
        List<Position3D> output= new ArrayList<>();
        Iterator<Double> iteratorKeys=
        ratioSide.keySet().iterator();
        while(iteratorKeys.hasNext()) {
            output.add(ratioSide.get(iteratorKeys.next()));
        }
        return output;
    }
}
***********************************************************
package org.tinos.deta.demension;
import java.util.ArrayList;
import java.util.HashMap;
import java.util.Iterator;
import java.util.Map;
import org.tinos.deta.basic.Euclid;
public class FindHeartPositions{
    //求坐标团的重心。
    public static Map<Double, Position2D> getPosition2DGroupsHearts(Map<Double
        , ArrayList<Position2D>> groups){
        Map<Double, Position2D> output= new HashMap<>();
        Iterator<Double> iterator=
        output.keySet().iterator();
        while(iterator.hasNext()){
            double value= iterator.next();
            output.put(value, Euclid.findHeartPosition2D(groups.get(value)));
        }
        return output;

    }
    public static Map<Double, Position3D> getPosition3DGroupsHearts(Map<Double
        , ArrayList<Position3D>> groups){
        Map<Double, Position3D> output= new HashMap<>();
        Iterator<Double> iterator=
        output.keySet().iterator();
        while(iterator.hasNext()){
            double value= iterator.next();
            output.put(value, Euclid.findHeartPosition3D(groups.get(value)));
        }
        return output;

    }
}
***********************************************************
package org.tinos.deta.demension;
import java.util.ArrayList;
import java.util.HashMap;
import java.util.Iterator;
import java.util.Map;
import org.tinos.deta.basic.Euclid;
public class FindMidPositions{
    //求坐标团的中心。
    public static Map<Double, Position2D> getPosition2DGroupsMids(Map<Double
        , ArrayList<Position2D>> groups){
        Map<Double, Position2D> output= new HashMap<>();
        Iterator<Double> iterator=
        output.keySet().iterator();
        while(iterator.hasNext()){
            double value= iterator.next();
            output.put(value, Euclid.findMidPosition2D(groups.get(value)));
        }
        return output;

    }
    public static Map<Double, Position3D> getPosition3DGroupsMids(Map<Double
        , ArrayList<Position3D>> groups){
        Map<Double, Position3D> output= new HashMap<>();
        Iterator<Double> iterator=
        output.keySet().iterator();
        while(iterator.hasNext()){
            double value= iterator.next();
            output.put(value, Euclid.findMidPosition3D(groups.get(value)));
        }
        return output;
    }
}
***********************************************************
package org.tinos.deta.desolation;
import org.tinos.deta.statistic.LYG4DWithDoubleQuickSort4D;
public class ErrorAsserts{

    //这个函数用于进行精度误差匹配 获取质量是否属于合格状态。
    //inputValue 代表观测成份。
    //matchValues 代表观测参照样本。
    //scale代表误差精度。
    //sortStackRange 根据样本的相同项多少来确定堆栈溢出的适合减少递归树数。
    public boolean getErrorAsserts(double inputValue, double[] matchValues, double
        scale) { double max= inputValue+ scale;
        double min= inputValue- scale;
        for(int i= 0; i< matchValues.length; i++)
            { if(!(matchValues[i]> max|| matchValues[i]<
            min)) {
                return true;
            }
        }
        return false;
    }
    public boolean getBinaryErrorAsserts(double inputValue, double[] matchValues
            , double scale, int sortStackRange, boolean
        isSort) { if(!isSort) {
            matchValues= new LYG4DWithDoubleQuickSort4D().sort(matchValues, sortStackRange);
        }
        double max= inputValue+
        scale; double min=
        inputValue- scale; int big=
        matchValues.length; int
        mid= matchValues.length/ 2;
        while(big> 0) {
            if(!(matchValues[mid]> max|| matchValues[mid]< min)) {
                return true;}
                if(inputValue>matchValues[mid])
                { mid=
                (mid+ big)/ 2;
            }else {
                big= mid;
                mid=
                mid/ 2;
            }
        }
        return false;
    }
}
```

****

```
package org.tinos.deta.hint;
import java.util.List;
import org.tinos.deta.basic.Euclid;
import org.tinos.deta.demension.Line2D;
import org.tinos.deta.demension.Line3D;
import org.tinos.deta.demension.Position2D;
import org.tinos.deta.demension.Position3D;
public class PositionsHintDirection{
    //坐标集隐藏运动趋势预测算法。
    //这个函数适用于在坐标团中观测 中心 与重心的 长度 来预测坐标团的稳定状态和轨迹预判。
    //适用于 游戏，数据建模，化学，物理等领域。
    //思想：流体内部分子力 统计
    //实现：罗瑶光
    public static Line2D getHintDirectionTrendFromPosition2Ds(List<Position2D>
        inputs) { Position2D mid= Euclid.findMidPosition2D(inputs);
        Position2D heart= Euclid.findHeartPosition2D(inputs);
        Line2D line2D= new Line2D();
        line2D.setBegin(mid);
        line2D.setEnd(heart);
        return line2D;
    }
    public static Line3D getHintDirectionTrendFromPosition3Ds(List<Position3D>
        inputs) { Position3D mid= Euclid.findMidPosition3D(inputs);
        Position3D heart= Euclid.findHeartPosition3D(inputs);
        Line3D line3D= new Line3D();
        line3D.setBegin(mid);
        line3D.setEnd(heart);
        return line3D;
    }
}
```

****

```
package org.tinos.deta.ICA;
public class CorrelationICA{
    //比较简单的鸡尾酒频率盲分割
    public static double[] frequencyUpSplit(double[] originFrequency, double[]
        compareFrequency) { double[] output= new double[originFrequency.length];
        for(int i= 0; i< originFrequency.length; i++) {
            output[i]= originFrequency[i]- compareFrequency[i]> 0? originFrequency[i]: 0;
        }
        return output;
    }
    public static double[] frequencyDownSplit(double[] originFrequency, double[]
        compareFrequency) { double[] output= new double[originFrequency.length];
        for(int i= 0; i< originFrequency.length; i++) {
            output[i]= originFrequency[i]- compareFrequency[i]< 0? compareFrequency[i]: 0;
        }
        return output;
    }
    public static double[] frequencyUpSplitWithScale(double[] originFrequency
            , double[] compareFrequency, double scale)
        { double[] output= new
        double[originFrequency.length]; for(int i= 0; i<
        originFrequency.length; i++) {
            output[i]= originFrequency[i]- compareFrequency[i]> scale? originFrequency[i]: 0;
        }
        return output;
    }
    public static double[] frequencyDownSplitWithScale(double[] originFrequency
            , double[] compareFrequency, double scale)
        { double[] output= new
        double[originFrequency.length]; for(int i= 0; i<
        originFrequency.length; i++) {
            output[i]= originFrequency[i]- compareFrequency[i]< scale? compareFrequency[i]: 0;
        }
        return output;
    }
}
```

****

```
package org.tinos.deta.image;
```

```
import java.util.ArrayList;
import java.util.HashMap;
import java.util.Map;
import org.tinos.deta.demension.Position2D;
import org.tinos.deta.demension.Position3D;
public class ImagePixClassification{
    //思想：统计与概率论
    //作者：罗瑶光
    //将 shareholder 分层处理的图片像素数据进行 分类归类统计输出
    public static Map<Integer, ArrayList<Position2D>> getImagePixClassificationMap(int[][]
        pixMap){ Map<Integer, ArrayList<Position2D>> output= new HashMap<>();
        for(int i= 0; i< pixMap.length; i++)
            { for(int j= 0; j< pixMap[0].length;
            j++) {
                if(pixMap[i][j]> 0)
                    { ArrayList<Position2D> temp;
                    if(output.containsKey(pixMap[i][j])
                    ) {
                        temp= output.get(pixMap[i][j]);
                    }else {
                        temp= new ArrayList<>();
                    }
                    Position2D position2D= new Position2D(i,
                    j); temp.add(position2D);
                    output.put(pixMap[i][j], temp);
                }
            }
        }
        return output;
    }
    public static Map<Integer, ArrayList<Position3D>> getImagePixClassificationMap(int[][][]
        pixMap){ Map<Integer, ArrayList<Position3D>> output= new HashMap<>();
        for(int i= 0; i< pixMap.length; i++)
            { for(int j= 0; j< pixMap[0].length;
            j++) {
                for(int k= 0; k< pixMap[0][0].length;
                    k++) { if(pixMap[i][j][k]> 0) {
                        ArrayList<Position3D> temp;
                        if(output.containsKey(pixMap[i][j][k])
                        ) {
                            temp= output.get(pixMap[i][j][k]);
                        }else {
                            temp= new ArrayList<>();
                        }
                        Position3D position3D= new Position3D(i, j,
                        k); temp.add(position3D);
                        output.put(pixMap[i][j][k], temp);
                    }
                }}
        }
        return output;
    }
}
*******************************************************
package      org.tinos.deta.image;
public class ImagePixExtract{
    //思想：平面几何，  模式识别
    //作者：罗瑶光
    //适用于波形图变换数列.
    //将像素矩阵指定的RBG颜色值拿出来形成波形数列输出
    public static int[] getVWaveFromImagePix(int[][] pixMap, int
        RGB){ int[] output= new int[pixMap.length];
        Next:
        for(int i= 0; i< pixMap.length; i++)
            { for(int j= 0; j< pixMap[0].length;
            j++) {
                if(RGB==
                    pixMap[i][j])
                    { output[i]= j;
                    continue Next;
                }
            }
        }
        return output;
    }
    public static int[] getHWaveFromImagePix(int[][] pixMap, int
        RGB){ int[] output= new int[pixMap[0].length];
        Next:
        for(int i= 0; i< pixMap[0].length; i++)
            { for(int j= 0; j< pixMap.length;
            j++) {
                if(RGB==
                    pixMap[j][i])
                    { output[i]= j;
                    continue Next;
                }
            }
        }
        return output;
    }
}
***********************************************************
package org.tinos.deta.image;
import java.util.ArrayList;
import java.util.Iterator;
import java.util.Map;
import org.tinos.deta.classification.FissileWithMatch;
import org.tinos.deta.demension.Position2D;
import org.tinos.deta.demension.Position3D;
public class ImagePixGroupFilter{
    //思想：罗瑶光
    //作者：罗瑶光
    //将 shareholder 分层处理的图片像素数据 按指定的精度和对应像素进行按像素团的大小进行特定过
    滤。public int[][] getImagePix2DGroupFilter(int[][] inputPixMatrix
            , int RBG, int distanceScale,int max, int min){
        //像素分类
        Map<Integer, ArrayList<Position2D>> map= ImagePixClassification
                .getImagePixClassificationMap(inputPixMatrix);
        //获取分类后的团簇
        Map<Double, ArrayList<Position2D>> mid= FissileWithMatch
                .fissilePosition2DWithMatch(map.get(RBG), distanceScale);
        //筛选团簇，过滤团簇
        Iterator<Double> iteratorMid=
        mid.keySet().iterator();
        while(iteratorMid.hasNext()) {
            ArrayList<Position2D> list=
            mid.get(iteratorMid.next()); if(null!= list) {
                if(list.size()< min|| list.size()> max) {
                    Iterator< Position2D> iterator=
                    list.iterator(); while(iterator.hasNext()) {
                        Position2D position2D=
                        iterator.next();
                        inputPixMatrix[(int)
                        position2D.getX()]
                                [(int) position2D.getY()]= 0;
                    }
                }
            }
        }
        return inputPixMatrix;
    }
    public int[][][] getImagePix3DGroupFilter(int[][][] inputPixMatrix
            , int RBG, int distanceScale,int max, int min){
        //像素分类
        Map<Integer, ArrayList<Position3D>> map= ImagePixClassification
                .getImagePixClassificationMap(inputPixMatrix);
        //获取分类后的团簇
        Map<Double, ArrayList<Position3D>> mid= FissileWithMatch
                .fissilePosition3DWithMatch(map.get(RBG), distanceScale);
        //筛选团簇，过滤团簇
        Iterator<Double> iteratorMid=
        mid.keySet().iterator();
        while(iteratorMid.hasNext()) {
            ArrayList<Position3D> list=
            mid.get(iteratorMid.next()); if(null!= list) {
                if(list.size()< min|| list.size()> max) {
                    Iterator< Position3D> iterator=
                    list.iterator(); while(iterator.hasNext()) {
                        Position3D position3D= iterator.next();
                        inputPixMatrix[(int) position3D.getX()][(int)
                                position3D.getY()] [(int) position3D.getZ()]= 0;
                    }
                }
            }
        }
        return inputPixMatrix;
    }
}
```

```
************************************************************
package org.tinos.deta.isolation;
import java.util.ArrayList;
import java.util.HashMap;
import java.util.Iterator;
import java.util.List;
import java.util.Map;
import org.tinos.deta.basic.Distance;
import org.tinos.deta.demension.Position2D;
import org.tinos.deta.demension.Position3D;
public class ForestIsolation{
    //带精度 2 维 商旅路径团簇 森林单元 隔离 算法
    //Theory 《神经网络：权距》，欧基里德， Yaoguang.Luo 20191220
    //Application Yaoguang.Luo
    //适用于 最短路径，最小距离，商旅分析预测，等项目中
    public static Map<Double, List<Position2D>> getTSPForestIsolationGroups2D(List<Position2D>
groups, double scale) {
        Map<Double, List<Position2D>> output= new
        HashMap<>(); Iterator<Position2D> iterator=
        groups.iterator(); double i= 0;
        while(iterator.hasNext()
            ) { i++;
            Position2D position2D= iterator.next();
            Iterator<Position2D> inIterator=
            groups.iterator(); double j= 0;
            Here:
                while(inIterator.hasNext()
                    ) { j++;
                    Position2D inPosition2D= inIterator.next();
                    //计算
                    if(i==
                    j) {
                        continue Here;
                    }
                    double distance= Distance.getDistance2D(position2D,
                    inPosition2D); if(distance> scale) {
                        continue Here;
                    }
                    // 添 加
                    List<Position2D>
                    list;
                    if(output.containsKey(i)
                        ) { list=
                        output.get(i);
                    }else {
                        list= new
                        ArrayList<>();
                        list.add(position2D);
                    }
                    list.add(inPosition
                    2D); output.put(i,
                    list);
                }
        }
        return output;
    }
    //带精度 3 维 商旅路径团簇 森林单元 隔离 算法
    //Theory 《神经网络：权距》，欧基里德， Yaoguang.Luo 20191220
    //Application Yaoguang.Luo
    //适用于 最短路径，最小距离，商旅分析预测，等项目中
    public static Map<Double, List<Position3D>> getTSPIsolationGroups3D(List<Position3D> groups
, double scale) {
        Map<Double, List<Position3D>> output= new
        HashMap<>(); Iterator<Position3D> iterator=
        groups.iterator(); double i= 0;
        while(iterator.hasNext()
            ) { i++;
            Position3D position3D= iterator.next();
            Iterator<Position3D> inIterator=
            groups.iterator(); double j= 0;
            Here:
                while(inIterator.hasNext()
                    ) { j++;
                    Position3D inPosition3D= inIterator.next();
                    //计算
                    if(i==
                    j) {
                        continue Here;
                    }
                    double distance= Distance.getDistance3D(position3D,
                    inPosition3D); if(distance> scale) {
                        continue Here;
                    }
                    // 添 加
                    List<Position3D>
                    list;
                    if(output.containsKey(i)
                        ) { list=
                        output.get(i);
                    }else {
                        list= new
                        ArrayList<>();
                        list.add(position3D);
                    }
                    list.add(inPosition3D);

                // 添 加
                List<Position2D> list;
                if(output.containsKey(i))
                    { list= output.get(i);
                }else {
                    list= new ArrayList<>();
                    list.add(position2D);
                }
                list.add(inPosition2D);
                output.put(i, list);
            }
        }
        return output;
    }
    //带精度 3 维 商旅路径团簇 森林单元 隔离 算法
    //Theory 《神经网络：权距》，欧基里德， Yaoguang.Luo 20191220
    //Application Yaoguang.Luo
    //适用于 最短路径，最小距离，商旅分析预测，等项目中
    public static Map<Double, List<Position3D>> getTSPIsolationGroups3D(List<Position3D> groups
, double scale) {
        Map<Double, List<Position3D>> output= new HashMap<>();
        Iterator<Position3D> iterator= groups.iterator(); double i=
        0;
        while(iterator.hasNext())
            { i++;
            Position3D position3D= iterator.next();
            Iterator<Position3D> inIterator= groups.iterator();
            double j= 0;
            Here:
                while(inIterator.hasNext())
```

```
                    { j++;
                    Position3D inPosition3D= inIterator.next();
                    //计算if(i==
                    j) {
                        continue Here;
                    }
                    double distance= Distance.getDistance3D(position3D, inPosition3D);
                    if(distance> scale) {
                        continue Here;
                    }
                    // 添 加
                    List<Position3D> list;
                    if(output.containsKey(i))
                        { list= output.get(i);
                    }else {
                        list= new ArrayList<>();
                        list.add(position3D);
                    }
                    list.add(inPosition3D);
                    output.put(i, list);
                }
        }
        return output;
    }
}
*****************************************************************
package org.tinos.deta.isolation;
import java.util.ArrayList;
import java.util.HashMap;
import java.util.Iterator;
import java.util.List;
import java.util.Map;
import org.tinos.deta.basic.Distance;
import org.tinos.deta.demension.Position2D;
import org.tinos.deta.demension.Position3D;
public class Isolation{
    public static double[] getCorrelation(double[] firstArray, double[] secondArray) { double[]
        output= new double [firstArray.length];
        for(int i= 0; i< firstArray.length; i++)
            { output[i]= firstArray[i]/ secondArray[i];
        }
        return output;
    }
    //带精度 2 维(非欧拉权距)商旅路径团簇 隔离 算法
    //Theory 《神经网络: 权距》, 欧基里德, Yaoguang.Luo 20191220
    //Application Yaoguang.Luo
    //适用于 最短路径, 最小距离, 商旅分析预测, 等项目中
    public static Map<Double, List<Position2D>> getTSPIsolationGroups2D(List<Position2D> groups
, double scale) {
        boolean[][] isDelete= new boolean[groups.size()][groups.size()];
        Map<Double, List<Position2D>> output= new HashMap<>();
        Iterator<Position2D> iterator= groups.iterator();
        double i= 0;
```

```
while(iterator.hasNext()) {
    i++;
    Position2D position2D= iterator.next();
    Iterator<Position2D> inIterator= groups.iterator();
    double j= 0;
    Here:
        while(inIterator.hasNext())
            { j++;
            Position2D inPosition2D= inIterator.next();
            //计算
            if(isDelete[(int)i- 1][(int)j- 1]|| i== j)
                { continue Here;
            }
            //轭消
            isDelete[(int)i- 1][(int)j- 1]= true;
```

```
                    isDelete[(int)j- 1][(int)i- 1]= true;
                    double distance= Distance.getDistance2D(position2D, inPosition2D);
                    if(distance> scale) {
                        continue Here;
                    }
                    // 添 加
                    List<Position2D> list;
                    if(output.containsKey(i))
                        { list= output.get(i);
                    }else {
                        list= new ArrayList<>();
                        list.add(position2D);
                    }
                    list.add(inPosition2D);
                    output.put(i, list);
                }
        }
        return output;
    }
    //带精度 3 维(非欧拉权距)商旅路径团簇 隔离 算法
    //Theory 《神经网络: 权距》, 欧基里德,  Yaoguang.Luo 20191220
    //Application Yaoguang.Luo
    //适用于 最短路径，最小距离，商旅分析预测，等项目中
    public static Map<Double, List<Position3D>> getTSPIsolationGroups3D(List<Position3D> groups
, double scale) {
        boolean[][] isDelete= new boolean[groups.size()][groups.size()];
        Map<Double, List<Position3D>> output= new HashMap<>();
        Iterator<Position3D> iterator= groups.iterator();
        double i= 0;
        while(iterator.hasNext()) {
            i++;
            Position3D position3D= iterator.next();
            Iterator<Position3D> inIterator= groups.iterator();
            double j= 0;
            Here:
                while(inIterator.hasNext())
                    { j++;
                    Position3D inPosition3D= inIterator.next();
                    //计算
                    if(isDelete[(int)i- 1][(int)j- 1]|| i== j)
                        { continue Here;
                    }
                    //轭消
                    isDelete[(int)i- 1][(int)j- 1]= true;
                    isDelete[(int)j- 1][(int)i- 1]= true;
                    double distance= Distance.getDistance3D(position3D, inPosition3D);
                    if(distance> scale) {
                        continue Here;
                    }
                    // 添 加
                    List<Position3D> list;
                    if(output.containsKey(i))
                        { list= output.get(i);
                    }else {
                        list= new ArrayList<>();
                        list.add(position3D);
                    }
                    list.add(inPosition3D);
                    output.put(i, list);
                }
        }
        return output;
    }
}
*********************************************************
package org.tinos.deta.isolation;
public class MatrixIsolationFilter{
    //带精度 多维矩阵中非有效成份筛选过滤算法
    //Theory，模式识别，专家系统， 罗瑶光Yaoguang.Luo
    //Application 罗瑶光
    //scaleDistance 为 卷积筛选的精度， PCARatio为有效邻接总数的量比
    //适用于 索贝尔 emboss等卷积处理过滤后，进行噪声过滤。增加精准度。
    public int[][] getIsolationFilterMartix2D(int[][] input, int scaleDistance, double
        PCARatio){ double compareRate= Math.pow(1+ scaleDistance* 2, 2)* PCARatio;
        int[][] output= new  int[input.length][input[0].length]; for(int i=
        scaleDistance; i< input.length- scaleDistance; i++){
            for(int j= scaleDistance; j< input[0].length- scaleDistance; j++){ if(0<
                input[i][j]) {
                    int PCA= 0;
                    for(int p= -scaleDistance; p< scaleDistance; p++) { for(int
                        q= -scaleDistance; q< scaleDistance; q++) {
                            if(input[p][q]== input[i][j])
                                { PCA++;
                            }
                        }
                    }
                    //筛选过滤
                    if(PCA> compareRate)
                        { output[i][j]= input[i][j];
                    }
                }
            }
        }
        return output;
    }
    public int[][][] getIsolationFilterMartix3D(int[][][] input, int scaleDistance, double
        PCARatio){ double compareRate= Math.pow(1+ scaleDistance* 2, 3)* PCARatio;
        int[][][] output= new int[input.length][input[0].length][input[0][0].length];
        for(int i= scaleDistance; i< input.length- scaleDistance; i++){ for(int j=
            scaleDistance; j< input[0].length- scaleDistance; j++){
                for(int k= scaleDistance; k< input[0].length- scaleDistance; k++){ if(0<
                    input[i][j][k]) {
                        int PCA= 0;
                        for(int p= -scaleDistance; p< scaleDistance; p++) { for(int
                            q= -scaleDistance; q< scaleDistance; q++) {
                                for(int r= -scaleDistance; r< scaleDistance; r++)
                                    { if(input[p][q][r]== input[i][j][r]) {
                                        PCA++;
                                    }
                                }
                            }
                        }
                        //筛选过滤
                        if(PCA> compareRate) { output[i][j][k]=
                            input[i][j][k];
                        }
                    }
                }
            }
        }
        return output;
    }
}
************************************************************
package org.tinos.deta.issueDate;
import java.util.Date;
//Theory: Euclid
//Application: Yaoguang.luo
public class IsIssueDate{
    public boolean isIssueDate(Date issueOut)
        { long issueOutLong= issueOut.getTime();
        long currentLong= new Date().getTime();
        return currentLong< issueOutLong? true: false;
    }
    public boolean isIssueDatewithSwapGTC(Date issueOutGTC, long offsetUTC8)
        { long issueOutLong= issueOutGTC.getTime();
        long currentLong= new Date().getTime()+ offsetUTC8;
        return currentLong< issueOutLong? true: false;
    }
}
************************************************************
package org.tinos.deta.NLP;
import java.io.IOException;
import java.util.ArrayList;
import java.util.HashMap;
import java.util.Iterator;
import java.util.List;
import java.util.Map;
import org.deta.tinos.list.ListSwap;
import org.tinos.deta.statistic.LYG4DWithDoubleQuickSort4D;
import org.tinos.engine.analysis.Analyzer;
import org.tinos.engine.analysis.imp.CogsBinaryForestAnalyzerImp;
import org.tinos.view.obj.WordFrequency;
import org.tinos.view.stable.StableData;
public class NLPTopicMatch{
    //<<NLP Algorithm of Matching The POS Scored Sentence>>.
    //This prediction algorithm mostly used for matching the best sample sentence by using score method.
    //Theory: Yaoguang.Luo 20191228
    //Application: Yaoguang.Luo
    //Attention: need Deta Parser API OSS
    public static String NLPBestSentenceMatch(String searchString
            , String[] sampleSentences) throws IOException {
        //init the deta mixed parser engine.
        Analyzer analyzer= new CogsBinaryForestAnalyzerImp();
        analyzer.initMixed();
        //init the nlp POS(part of speech) functions.
        Map<String, String> nlp= analyzer.getPosCnToCn();
        List<String> keys= analyzer.parserMixedString(searchString);
        //find a appear frequency from the keys of search string.
        Map<String, WordFrequency> keyMap= analyzer.getWordFrequencyMap(keys);
        //get a POS score rights array from keyMap. String[]
        stringKeys= ListSwap.listToArray(keys);
        // I create a new algorithm of 'list to array' in my Data Swap Project. 20191228 Yaoguang. Luo double[]
        scoreRights= getNLPBestSentencesMatchScoreRights(searchString
                , sampleSentences, analyzer, nlp, keyMap);
        //loop score array
        double[] matchScore= new double[sampleSentences.length];
        double max= 0;
        int maxPoint= 0;
        for(int i= 0; i< sampleSentences.length; i++) {
            List<String> matchList= analyzer.parserMixedString(sampleSentences[i]); Map<String,
            WordFrequency> matchMap= analyzer.getWordFrequencyMap(matchList); for(int j= 0; j<
            stringKeys.length; j++) {
                if(matchMap.containsKey(stringKeys[j])) {
                    matchScore[i]+= scoreRights[j]* matchMap.get(stringKeys[j]).getFrequency();
                }
            }
            if(max< matchScore[i])
                { max= matchScore[i];
                maxPoint= i;
            }
        }
        //output
        return sampleSentences[maxPoint];
    }
    //<<NLP Algorithm of Matching The POS Scored Sentences>>.
```

```
//This prediction algorithm mostly used for matching the ranged sample sentences by using score method.
//Theory: Yaoguang.Luo 20191229
//Application: Yaoguang.Luo
//Attention: need Deta Parser API OSS
//sortStackRange: for the sort stacks filter scale
//filterRate: for how many sets need to delete
public static List<String> NLPBestSentencesMatch(String searchString
        , String[] sampleSentences, int sortStackRange, double filterRate) throws IOException { double[]
    matchScore= getNLPBestSentencesMatchScore(searchString, sampleSentences);
    //get iden key
    Map<Double, List<String>> tempBase= new HashMap<>();
    for(int i= 0; i< matchScore.length; i++) {
        List<String> tempList;
        if(tempBase.containsKey(matchScore[i])) {
            tempList= tempBase.get(matchScore[i]);
        }else {
            tempList= new ArrayList<>();
        }
        tempList.add(sampleSentences[i]);
        tempBase.put(matchScore[i], tempList);
    }
    //sort
    matchScore= new LYG4DWithDoubleQuickSort4D().sort(matchScore, sortStackRange); double
    filterCount= filterRate* matchScore.length;
    //filter
    List<String> output= new ArrayList<>();
    for(int i= (int)filterCount; i< matchScore.length; i++)
        { if(tempBase.containsKey(matchScore[i])) {
            Iterator<String> iterator= tempBase.get(matchScore[i]).iterator();
            while(iterator.hasNext()) {
                output.add(iterator.next());
            }
            tempBase.remove(matchScore[i]);
        }
    }
    //output return
    output;
}
private static double[] getNLPBestSentencesMatchScore(String searchString
        , String[] sampleSentences) throws IOException {
    //init the deta mixed parser engine.
    Analyzer analyzer= new CogsBinaryForestAnalyzerImp();
    analyzer.initMixed();
    //init the nlp POS(part of speech) functions.
    Map<String, String> nlp= analyzer.getPosCnToCn();
    List<String> keys= analyzer.parserMixedString(searchString);
    //find a appear frequency from the keys of search string.
    Map<String, WordFrequency> keyMap= analyzer.getWordFrequencyMap(keys);
```

```
        //get a POS score rights array from keyMap. String[]
        stringKeys= ListSwap.listToArray(keys);
        double[] scoreRights= getNLPBestSentencesMatchScoreRights(searchString
                , sampleSentences, analyzer, nlp, keyMap);
        //loop score array
        double[] matchScore= new double[sampleSentences.length];
        for(int i= 0; i< sampleSentences.length; i++) {
            List<String> matchList= analyzer.parserMixedString(sampleSentences[i]); Map<String,
            WordFrequency> matchMap= analyzer.getWordFrequencyMap(matchList); for(int j= 0; j<
            stringKeys.length; j++) {
                if(matchMap.containsKey(stringKeys[j])) {
                    matchScore[i]+= scoreRights[j]* matchMap.get(stringKeys[j]).getFrequency();
                }
            }
        }
        return matchScore;
    }
    private static double[] getNLPBestSentencesMatchScoreRights(String searchString
            , String[] sampleSentences, Analyzer analyzer, Map<String, String> nlp
            , Map<String, WordFrequency> keyMap) throws IOException
        { double[] scoreRights= new double[keyMap.size()];
        int scoreRightsPoint= 0;
        Iterator<String> keyIterator= keyMap.keySet().iterator();
        while(keyIterator.hasNext()) {
            String key= keyIterator.next();
            if(nlp.containsKey(key)) {
                String pos= nlp.get(key);
                //init rights of POS {30,20,10,3,1}
                if(pos.contains(StableData.NLP_CI_MING)) {// n.
                    scoreRights[scoreRightsPoint]= 30* keyMap.get(key).getFrequency();
                }else if(pos.contains(StableData.NLP_CI_DONG)) {//v
                    scoreRights[scoreRightsPoint]= 20* keyMap.get(key).getFrequency();
                }else if(pos.contains(StableData.NLP_CI_XING_RONG)) {//adj scoreRights[scoreRightsPoint]= 10*
                    keyMap.get(key).getFrequency();
                }else {
                    scoreRights[scoreRightsPoint]= 3* keyMap.get(key).getFrequency();
                }
            }else {
                scoreRights[scoreRightsPoint]= 1* keyMap.get(key).getFrequency();
            }
            scoreRightsPoint++;
        }
        return scoreRights;
    }
}
*********************************************************
package org.tinos.deta.PCA;
import java.util.Iterator;
import java.util.List;
import org.tinos.deta.basic.Distance;
import org.tinos.deta.demension.Position2D;
import org.tinos.deta.demension.Position3D;
import org.tinos.deta.statistic.LYG4DWithDoubleQuickSort4D;
public class FindPCAMeanDistance{
    //oberserverPCAScale：确定主要有效最短路径的观测数
    //sortRangeScale：确定坐标距离排序时的相似成份多少来确定堆栈冗余比，避免堆栈溢出。
    //求坐标团的主要有效距离成份集的平均压强算法
    //适用于 观测/预测坐标集中某精度邻接坐标集的 平均距离 来确定 紧凑度，压力，压强，斥力等。
    //思想：罗瑶光 20191225
    //实现：罗瑶光
    public static double findMeanDistanceFromPositions2D(List<Position2D> position2Ds
            , double oberserverPCAScale, int sortRangeScale)
        { Iterator<Position2D> outPosition2DIterator= position2Ds.iterator();
        double outMean= 0;
        while(outPosition2DIterator.hasNext()) {
            Position2D outPosition2D= outPosition2DIterator.next();
            double[] distance= new double[position2Ds.size()];
            int i= 0;
            Iterator<Position2D> inPosition2DIterator= position2Ds.iterator();
            //取坐标点所有距离集合先
            while(inPosition2DIterator.hasNext()) {
                Position2D inPosition2D= inPosition2DIterator.next(); distance[i++]=
                Distance.getDistance2D(outPosition2D, inPosition2D);
            }
            //距离非对称缺陷小高峰过滤极速快排 从小到大
            distance= new LYG4DWithDoubleQuickSort4D().sort(distance, sortRangeScale);
            //仅仅取精度内坐标点距离求平均值，0 为本身所以从 1 开始
            double inMean= 0;
            oberserverPCAScale= oberserverPCAScale>= position2Ds.size()
                    ? position2Ds.size()- 1: oberserverPCAScale;
            oberserverPCAScale= oberserverPCAScale< 0? 0: oberserverPCAScale; for(i=
            1; i<= oberserverPCAScale; i++) {
                inMean+= distance[i];
            }
            inMean/= oberserverPCAScale;
            outMean+= inMean;
        }
        return outMean/ position2Ds.size();
    }
    public static double findMeanDistanceFromPositions3D(List<Position3D> position3Ds
            , double oberserverPCAScale, int sortRangeScale)
        { Iterator<Position3D> outPosition3DIterator= position3Ds.iterator();
        double outMean= 0;
        while(outPosition3DIterator.hasNext()) {
            Position3D outPosition3D= outPosition3DIterator.next();
            double[] distance= new double[position3Ds.size()];
            int i= 0;
            Iterator<Position3D> inPosition3DIterator= position3Ds.iterator();
            //取坐标点所有距离集合先
            while(inPosition3DIterator.hasNext()) {
                Position3D inPosition3D= inPosition3DIterator.next(); distance[i++]=
                Distance.getDistance3D(outPosition3D, inPosition3D);
            }
            //距离非对称缺陷小高峰过滤极速快排 从小到大
            distance= new LYG4DWithDoubleQuickSort4D().sort(distance, sortRangeScale);
            //仅仅取精度内坐标点距离求平均值，0 为本身所以从 1 开始
            double inMean= 0;
            oberserverPCAScale= oberserverPCAScale>= position3Ds.size()
                    ? position3Ds.size()- 1: oberserverPCAScale;
            oberserverPCAScale= oberserverPCAScale< 0? 0: oberserverPCAScale; for(i=
            1; i<= oberserverPCAScale; i++) {
                inMean+= distance[i];
            }
            inMean/= oberserverPCAScale;
            outMean+= inMean;
        }
        return outMean/ position3Ds.size();
    }
    //2D 坐标团中 每一个坐标的斥力预测算法。
    public static double[] findPascalMeanDistanceByEachPositions2D(List<Position2D> position2Ds
            , double oberserverPCAScale, int sortRangeScale)
        { double[] pascal= new double[position2Ds.size()];
        Iterator<Position2D> outPosition2DIterator= position2Ds.iterator(); double
        outMean= 0;
        int positionPoint=0;
        while(outPosition2DIterator.hasNext()) {
            Position2D outPosition2D= outPosition2DIterator.next();
            double[] distance= new double[position2Ds.size()];
            int i= 0;
            Iterator<Position2D> inPosition2DIterator= position2Ds.iterator();
            //取坐标点所有距离集合先
            while(inPosition2DIterator.hasNext()) {
                Position2D inPosition2D= inPosition2DIterator.next(); distance[i++]=
                Distance.getDistance2D(outPosition2D, inPosition2D);
            }
            //距离非对称缺陷小高峰过滤极速快排 从小到大
            distance= new LYG4DWithDoubleQuickSort4D().sort(distance, sortRangeScale);
            //仅仅取精度内坐标点距离求平均值，0 为本身所以从 1 开始
            double inMean= 0;
            oberserverPCAScale= oberserverPCAScale>= position2Ds.size()
                    ? position2Ds.size()- 1: oberserverPCAScale;
            oberserverPCAScale= oberserverPCAScale< 0? 0: oberserverPCAScale; for(i=
            1; i<= oberserverPCAScale; i++) {
                inMean+= distance[i];
            }
            inMean/= oberserverPCAScale;
            outMean+= inMean;
            //采集坐标点形成斥力参照的主要最短路径成份。
            pascal[positionPoint++]= inMean;
        }
        outMean/= position2Ds.size();
        for(int i= 0; i< pascal.length; i++) {
            //比值获取 不稳定 观测数据。
            pascal[i]/= outMean;
        }
        return pascal;
    }
    //3D 坐标团中 每一个坐标的斥力预测算法。
    public static double[] findPascalMeanDistanceByEachPositions3D(List<Position3D> position3Ds
            , double oberserverPCAScale, int sortRangeScale)
        { double[] pascal= new double[position3Ds.size()];
        Iterator<Position3D> outPosition3DIterator= position3Ds.iterator();
        double outMean= 0;
        int positionPoint=0;
        while(outPosition3DIterator.hasNext()) {
            Position3D outPosition3D= outPosition3DIterator.next();
            double[] distance= new double[position3Ds.size()];
            int i= 0;
            Iterator<Position3D> inPosition3DIterator= position3Ds.iterator();
            //取坐标点所有距离集合先
            while(inPosition3DIterator.hasNext()) {
                Position3D inPosition3D= inPosition3DIterator.next(); distance[i++]=
                Distance.getDistance3D(outPosition3D, inPosition3D);
            }
            //距离非对称缺陷小高峰过滤极速快排 从小到大
            distance= new LYG4DWithDoubleQuickSort4D().sort(distance, sortRangeScale);
            //仅仅取精度内坐标点距离求平均值，0 为本身所以从 1 开始
            double inMean= 0;
            oberserverPCAScale= oberserverPCAScale>= position3Ds.size()
                    ? position3Ds.size()- 1: oberserverPCAScale;
            oberserverPCAScale= oberserverPCAScale< 0? 0: oberserverPCAScale; for(i=
            1; i<= oberserverPCAScale; i++) {
                inMean+= distance[i];
            }
            inMean/= oberserverPCAScale;
            outMean+= inMean;
            //采集坐标点形成斥力参照的主要最短路径成份。
            pascal[positionPoint++]= inMean;
        }
        outMean/= position3Ds.size();
        for(int i= 0; i< pascal.length; i++) {
            //比值获取 不稳定 观测数据。
            pascal[i]/= outMean;
        }
        return pascal;
    }
```

```
}
*********************************************************
package org.tinos.deta.PCA;
import java.util.HashMap;
import java.util.Iterator;
import java.util.ArrayList;
import java.util.Map;
import org.tinos.deta.classification.FissileWithMatch;
import org.tinos.deta.demension.FindHeartPositions;
import org.tinos.deta.demension.FindMidPositions;
import org.tinos.deta.demension.Line2D;
import org.tinos.deta.demension.Line3D;
import org.tinos.deta.demension.Position2D;
import org.tinos.deta.demension.Position3D;
public class FindPositionsGroupPascalHearts{
    //通过坐标团的 精度匹配分割的内部坐标聚类团 进行 每个聚类团的 重心和中心距离 求解 获取有效的团稳定观测数
据模型
    //思想 帕斯卡，欧基里德，数据挖掘，贝叶斯，立体几何，流体力学，量化拓扑力学，离散数学，统计与概率论
20191227
    //实现 罗瑶光
    public static Map<Double, Position2D> getPosition2DsGroupPascalHearts(ArrayList<Position2D> groups, double scale)
{
        Map<Double, ArrayList<Position2D>> pascalGroups
            = FissileWithMatch.fissilePosition2DWithMatch(groups, scale);
        Map<Double, Position2D> pascalHearts
            = FindHeartPositions.getPosition2DGroupsHearts(pascalGroups);
        return pascalHearts;
    }
    public static Map<Double, Position3D> getPosition3DsGroupPascalHearts(ArrayList<Position3D> groups, double scale)
{
        Map<Double, ArrayList<Position3D>> pascalGroups
            = FissileWithMatch.fissilePosition3DWithMatch(groups, scale);
        Map<Double, Position3D> pascalHearts
            = FindHeartPositions.getPosition3DGroupsHearts(pascalGroups);
        return pascalHearts;
    }
    public static Map<Double, Position2D> getPosition2DsGroupPascalMids(ArrayList<Position2D> groups, double scale)
{
        Map<Double, ArrayList<Position2D>> pascalGroups
            = FissileWithMatch.fissilePosition2DWithMatch(groups, scale);
        Map<Double, Position2D> pascalMids=      FindMidPositions.getPosition2DGroupsMids(pascalGroups);
        return pascalMids;
    }
    public static Map<Double, Position3D> getPosition3DsGroupPascalMids(ArrayList<Position3D> groups, double scale)
{
        Map<Double, ArrayList<Position3D>> pascalGroups
            = FissileWithMatch.fissilePosition3DWithMatch(groups, scale);
        Map<Double, Position3D> pascalMids= FindMidPositions.getPosition3DGroupsMids(pascalGroups); return
        pascalMids;
    }
    public static Map<Double, Line2D> getPosition2DsGroupPascalDirection(Map<Double, Position2D> pascalHearts
            , Map<Double, Position2D> pascalMids) { Map<Double,
        Line2D> pascalDirections= new HashMap<>();
        Iterator<Double> iterator= pascalHearts.keySet().iterator();
        while(iterator.hasNext()) {
            double key= iterator.next();
            Line2D value= new Line2D();
            value.setBegin(pascalMids.get(key));
            value.setEnd(pascalHearts.get(key));
            pascalDirections.put(key, value);
        }
        return pascalDirections;
    }
    public static Map<Double, Line3D> getPosition3DsGroupPascalDirection(Map<Double, Position3D> pascalHearts
            ,  Map<Double,  Position3D>  pascalMids)  {  Map<Double,
        Line3D> pascalDirections= new HashMap<>();
        Iterator<Double>    iterator=    pascalHearts.keySet().iterator();
        while(iterator.hasNext()) {
            double   key=   iterator.next();
            Line3D value= new Line3D();
            value.setBegin(pascalMids.get(key));
            value.setEnd(pascalHearts.get(key));
            pascalDirections.put(key, value);
        }
        return pascalDirections;
    }
    public static Map<Double, Line3D> getPosition3DsGroupPascalDirection(ArrayList<Position3D> groups, double
scale){
        return   getPosition3DsGroupPascalDirection(getPosition3DsGroupPascalHearts(groups, scale)
                ,getPosition3DsGroupPascalMids(groups, scale));
    }
    public static Map<Double, Line2D> getPosition2DsGroupPascalDirection(ArrayList<Position2D> groups, double
scale){
        return   getPosition2DsGroupPascalDirection(getPosition2DsGroupPascalHearts(groups, scale)
                ,getPosition2DsGroupPascalMids(groups, scale));
    }
}
*******************************************************
package org.tinos.deta.PCA;
import java.util.HashMap;
import java.util.Iterator;
import java.util.List;
import java.util.Map;
import org.tinos.deta.demension.Position2D;
import org.tinos.deta.demension.Position3D;
//这个函数用于坐标融聚团的主要条件过滤。
```

```
//思想：统计与概率论，立体几何，数据挖掘
//实现：罗瑶光
public class FusionPCAFilter{
    public static Map<Double, List<Position2D>> filterFusion2DSetsWithCountScale
    (Map<Double, List<Position2D>> groups, double countScale){
        Map<Double,  List<Position2D>>  output=  new  HashMap<>();
        Iterator<Double>   iterator=   groups.keySet().iterator();
        while(iterator.hasNext()) {
            double  value=  iterator.next();
            if(groups.get(value).size()>= countScale) {
                output.put(value, groups.get(value));
            }
        }
        return output;
    }
    public   static   Map<Double,   List<Position3D>>   filterFusion3DSetsWithCountScale
    (Map<Double, List<Position3D>> groups, double countScale){
        Map<Double,  List<Position3D>>  output=  new  HashMap<>();
        Iterator<Double>   iterator=   groups.keySet().iterator();
        while(iterator.hasNext()) {
            double  value=  iterator.next();
            if(groups.get(value).size()>= countScale) {
                output.put(value, groups.get(value));
            }
        }
        return output;
    }
}
***********************************************************
package org.tinos.deta.PCA;
import java.util.ArrayList;
import java.util.Iterator;
import java.util.List;
import org.tinos.deta.basic.RatioMatrix;
//这个函数用于求模糊概率集平均值采样主要成份分析
//思想：贝叶斯 模糊数学 统计于概率论
//实现：罗瑶光
public class PCAMeanOfFuzzPC{
    public static RatioMatrix getSimilarFuzzSetWithScale(RatioMatrix input, List<RatioMatrix> groups, double scale)
{
        List<RatioMatrix> output= new ArrayList<>();
        Iterator<RatioMatrix> iterators= groups.iterator();
        while(iterators.hasNext()) {
            RatioMatrix ratio= iterators.next();
            double   rightRightMean=   ratio.getRightRightRatio();
            double   rightErrorMean=   ratio.getRightErrorRatio();
            double   errorRightMean=   ratio.getErrorRightRatio();
            double errorErrorMean= ratio.getErrorErrorRatio();
            double predictionRightRight= Math.abs(input.getRightRightRatio()- rightRightMean);
            double predictionRightError= Math.abs(input.getRightErrorRatio()- rightErrorMean); double
            predictionErrorRight= Math.abs(input.getErrorRightRatio()- errorRightMean); double
            predictionErrorError= Math.abs(input.getErrorErrorRatio()- errorErrorMean); double tempSumRight=
            predictionRightRight+ predictionRightError+ predictionErrorRight+
predictionErrorError;
            if(tempSumRight< scale)
                { output.add(ratio);
            }
        }
        RatioMatrix outputMean= new RatioMatrix();
        Iterator<RatioMatrix> iteratorsOutput= output.iterator();
        while(iteratorsOutput.hasNext()) {
            RatioMatrix ratio= iteratorsOutput.next(); outputMean.setErrorErrorRatio(ratio.getErrorErrorRatio()+
outputMean.getErrorErrorRatio());
            outputMean.setErrorRightRatio(ratio.getErrorRightRatio()+
outputMean.getErrorRightRatio());
            outputMean.setRightErrorRatio(ratio.getRightErrorRatio()+
outputMean.getRightErrorRatio());
            outputMean.setRightRightRatio(ratio.getRightRightRatio()+
outputMean.getRightRightRatio());
        }
        outputMean.setErrorErrorRatio(outputMean.getErrorErrorRatio()/        output.size());
        outputMean.setErrorRightRatio(outputMean.getErrorRightRatio()/        output.size());
        outputMean.setRightErrorRatio(outputMean.getRightErrorRatio()/        output.size());
        outputMean.setRightRightRatio(outputMean.getRightRightRatio()/ output.size());  return
        outputMean;
    }
}
*******************************************************
package org.tinos.deta.PCA;
import java.util.ArrayList;
import java.util.HashMap;
import java.util.Iterator;
import java.util.List;
import java.util.Map;
import org.tinos.deta.basic.Distance;
import org.tinos.deta.basic.Euclid;
import org.tinos.deta.demension.Position2D;
import org.tinos.deta.demension.Position3D;
//这个函数用于坐标类的 主要成份分析与提取
//思想：欧基里德 平面，立体几何
//实现：罗瑶光
public class PCAPositionFilter{
    public static List<Position2D> filterPosition2DsWithScaledDistance(List<Position2D> input
            , Position2D heart, double
        scaleDistacne){ List<Position2D> output= new
        ArrayList<>(); Iterator<Position2D> iterator=
        input.iterator(); while(iterator.hasNext()) {
            Position2D position2D= iterator.next();
            double distance= Distance.getDistance2D(heart, position2D);
            if(distance< scaleDistacne) {
                output.add(position2D);
            }
        }
        return output;
    }
    public static List<Position3D> filterPosition3DsWithScaledDistance(List<Position3D> input
            , Position3D heart, double
        scaleDistacne){ List<Position3D> output= new
        ArrayList<>(); Iterator<Position3D> iterator=
        input.iterator(); while(iterator.hasNext()) {
            Position3D position3D= iterator.next();
            double distance= Distance.getDistance3D(heart, position3D);
            if(distance< scaleDistacne) {
                output.add(position3D);
            }
        }
        return output;
    }
    public static Map<Double, List<Position2D>> filterPosition2DsWithScaledDistance(Map<Double,
List<Position2D>> input
            , Position2D heart, double scaleDistacne){ Map<Double,
        List<Position2D>> output= new HashMap<>(); Iterator<Double>
        iterator= input.keySet().iterator();
        while(iterator.hasNext()) {
            double mapKey= iterator.next();
            List<Position2D> position2DList= input.get(mapKey);
            Position2D   tempHeart=    Euclid.findHeartPosition2D(position2DList);
            double  distance=  Distance.getDistance2D(heart,  tempHeart);
            if(distance< scaleDistacne) {
                output.put(mapKey, position2DList);
            }
        }
        return output;
    }
    public static Map<Double, List<Position3D>> filterPosition3DsWithScaledDistance(Map<Double,
List<Position3D>> input
            , Position3D heart, double scaleDistacne){ Map<Double,
        List<Position3D>> output= new HashMap<>(); Iterator<Double>
        iterator= input.keySet().iterator();
        while(iterator.hasNext()) {
            double mapKey= iterator.next();
            List<Position3D> position3DList= input.get(mapKey);
            Position3D   tempHeart=    Euclid.findHeartPosition3D(position3DList);
            double  distance=  Distance.getDistance3D(heart,  tempHeart);
            if(distance< scaleDistacne) {
                output.put(mapKey, position3DList);
            }
        }
        return output;
    }
}
***********************************************************
package org.tinos.deta.ratio;
import org.tinos.deta.basic.ComputeSets;
import org.tinos.deta.demension.Position2D;
import org.tinos.deta.demension.Position3D;
//Theory: Yaoguang.luo
//一种仅仅通过坐标差值叠加来计算距离向量的使用方法。
//Application: Yaoguang.luo
public class DistanceRatio{
    //获取斜率梯度
    public static double getDistanceRatio2D(Position2D begin, Position2D end) { double
        x= begin.getX()- end.getX();
        double y= begin.getY()- end.getY();
        //1 象限if(x>=0&&
        y>=0) {
            return Math.abs(x)/ Math.abs(y);
        }
        //4 象限
        if(x>= 0 && y<0) {
            return 1+ Math.abs(x)/ Math.abs(y);
        }
        //2 象限
        if(x< 0 && y>= 0) {
            return Math.abs(x)/ Math.abs(y);
        }
        //3 象限
        if(x< 0&& y< 0) {
            return -1 - Math.abs(x)/ Math.abs(y);
        }
        return 0;
    }
    //降低计算速度来获取高准确斜率梯度 (早期傅里叶思想)
    public static double getARCDistanceRatio2D(Position2D begin, Position2D end) { double
        x= begin.getX()- end.getX();
        double y= begin.getY()- end.getY(); double
        z= Math.sqrt(x* x+ y* y); return
        Math.asin(x/z)+ Math.acos(y/z);
    }
    //降低计算速度来获取两点间线的真实角度
    public static double getTrueARCDistanceRatio2D(Position2D begin, Position2D end) { double
        x= begin.getX()- end.getX();
        double y= begin.getY()- end.getY();
        double z= Math.sqrt(x* x+ y* y);
        //1 象限
        if(x>=0&& y>=0) {
            return Math.asin(Math.abs(x)/z);
        }
        //4 象限
        if(x>= 0 && y<0) {
            return 2* ComputeSets.getPi()- Math.asin(Math.abs(x)/z);
        }
        //2 象限
        if(x< 0 && y>= 0) {
            return ComputeSets.getPi()- Math.asin(Math.abs(x)/z);
        }
        //3 象限
        if(x< 0&& y< 0) {
            return ComputeSets.getPi()+ Math.asin(Math.abs(x)/z);
        }
        return 0;
    }
    //获取计算参照梯度
    public static double getDistanceRatio3D(Position3D begin, Position3D end) { double
        pi= 3.1415926;
        double  x=  begin.getX()-  end.getX();
        double  y=  begin.getY()-  end.getY();
        double z= begin.getZ()- end.getZ();
        //1 象限
        if(x>=  0&&  y>=  0)
            { if(z>= 0) {
                return Math.abs(x)/ Math.abs(y);
            }else {
                return pi+ Math.abs(x)/ Math.abs(y);
            }
        }
        //4 象限
        if(x>= 0&& y< 0)
            { if(z>= 0) {
                return pi*6+ Math.abs(x)/ Math.abs(y);
            }else {
                return pi*7+ Math.abs(x)/ Math.abs(y);
            }
        }
        //2 象限
        if(x< 0&& y>= 0)
            { if(z>= 0) {
                return pi*2+ Math.abs(x)/ Math.abs(y);
            }else {
                return pi*3+ Math.abs(x)/ Math.abs(y);
            }
        }
        //3 象限
        if(x< 0&& y< 0) {
            if(z>= 0) {
                return pi*4+ Math.abs(x)/ Math.abs(y);
            }else {
                return pi*5+ Math.abs(x)/ Math.abs(y);
            }
        }
        return 0;
    }
    //获取真实三维夹角
    public static double getTrueARCDistanceRatio3D(Position3D begin, Position3D end) { return
        0;
        //球面参照无效。以后研究下有什么标准规范没。
    }
}
************************************************************
package org.tinos.deta.statistic;
//基于算法导论快排4衍生极速小高峰缺陷过滤理论快速排序第4代 线性数字数组排序法函数Java完整版本实现。
//思想：算法导论快排4理论，罗瑶光小高峰过滤理论。
//实现：罗瑶光
//时间：20140101~ 20191105
public class
    LYG4DWithDoubleQuickSort4D{ int
    range;
    public double[] sort(double[] array, int range)
        { this.range= range< 1? 1: range;
        processDouble(array, 0, array.length- 1);
        return array;
    }
    private void processDouble(double[] array, int leftPoint, int rightPoint)
        { if(leftPoint< rightPoint){
            int c= rightPoint- leftPoint;
            if(c< this.range){
                int j;
                for(int i= 1+ leftPoint; i<= leftPoint+ c; i++){ j= i;
                    while(j>= 1+ leftPoint){
                        if(array[j]<        array[j-
                            1]){    double     temp=
                            array[j];      array[j]=
                            array[j- 1];
                            array[j- 1]= temp;
                        }
                        j--;
                    }
                }
                return;
            }
            int pos= partition(array, leftPoint, rightPoint);
            processDouble(array, leftPoint, pos- 1);
            processDouble(array, pos+ 1, rightPoint);
        }
    }
    private int partition(double[] array, int leftPoint, int rightPoint) {
        double x= array[leftPoint]< array[rightPoint]? array[leftPoint]: array[rightPoint]; int
        leftPointReflection= leftPoint;
        while(leftPointReflection< rightPoint){
            while(!(array[leftPointReflection]> x|| leftPointReflection>= rightPoint))
                { leftPointReflection++;
            }
            while(array[rightPoint]>
                x){ rightPoint--;
            }
            if(leftPointReflection<
                rightPoint){ double temp=
                array[rightPoint];
                array[rightPoint]= array[leftPointReflection];
                array[leftPointReflection]= temp;
            }
        }
        array[leftPoint]= array[rightPoint];
        array[rightPoint]= x;
        return rightPoint;
    }
}
**********************************************************
package org.tinos.deta.trace;
import java.util.ArrayList;
import java.util.HashMap;
import java.util.Iterator;
import java.util.List;
import  java.util.Map;
import org.tinos.deta.basic.Distance;
import org.tinos.deta.basic.Euclid;
import  org.tinos.deta.demension.Position2D;
import  org.tinos.deta.demension.Position3D;
public class TraceFissilePositionHearts{
    //Source: 《2 维 3 维 坐标集 切裂 重心 轨迹 跟踪算法 JAVA 源码》
    //出版日期 2019 年 12 月 21 日      作品说明 Gitee, Github, DetaOSS
    //作品说明适用于 坐标团 动态分析，增量轨迹分析，熵增信息单元记录。
    //作者 罗瑶光
    public static Map<Double, List<Position2D>>
    trackTracePosition2DHeartsWithFissileGroups(List<Position2D> coods, double distanceScale){
        Map<Double, List<Position2D>> output= new HashMap<>(); Map<Double,
        List<Position2D>> distanceGroups= new HashMap<>();
        Iterator<Position2D> iterator= coods.iterator();
        double i= 0.0;
        Here:
            while(iterator.hasNext()) {
                Position2D position2D= iterator.next();
                if(distanceGroups.isEmpty()) {
                    List<Position2D> list= new ArrayList<>();
                    list.add(position2D);
                    distanceGroups.put(i, list);
                    //
                    List<Position2D> listHeartsTrace= output.get(i);
                    listHeartsTrace.add(position2D);
                    output.put(i, listHeartsTrace);
                }else {
                    //遍历所有团
                    //团重心匹配如果超精度新存，不是就融入。
                    Iterator<Double> iteratorScale= output.keySet().iterator();
                    boolean isFind= false;
                    while(iteratorScale.hasNext()) {
                        Double doubleScale= iteratorScale.next();
                        Position2D  currenctHeart=
output.get(doubleScale).get(output.get(doubleScale).size()- 1);
                        double distance= Distance.getDistance2D(currenctHeart, position2D);
                        if(distance< distanceScale) {
                            //融入得到新的重心
                            Position2D newHeart= Euclid.findCryptionPosition2D(currenctHeart
                                , position2D);
                            //删除当前增加坐标集，更新坐标集
                            List<Position2D> list= distanceGroups.get(doubleScale);
                            list.add(position2D);
                            distanceGroups.put(doubleScale, list);
                            //删除当前重心数据，更新重心数据轨迹
                            List<Position2D> listHeartsTrace= output.get(doubleScale);
                            listHeartsTrace.add(newHeart);
                            output.put(doubleScale, listHeartsTrace);
                            // 找 到
                            isFind= true;
                            //如果预测 坐标适应状态 可以把 continue 省略。
                            continue Here;
                        }
                    }
                    //新存
                    if(!isFind) {
                        List<Position2D> list= new ArrayList<>();
                        list.add(position2D); distanceGroups.put(++i,
                        list);
                        //加新 hearts
                        List<Position2D> listHeartsTrace= output.get(i);
                        listHeartsTrace.add(position2D);
                        output.put(i, listHeartsTrace);
                    }
                }
            }
        return output;
    }
    public static Map<Double, List<Position3D>>
```

```
trackTracePosition3DHeartsWithFissileGroups(List<Position3D> coods, double
    distanceScale){ Map<Double, List<Position3D>> output= new HashMap<>();
    Map<Double, List<Position3D>> distanceGroups= new HashMap<>();
    Iterator<Position3D> iterator= coods.iterator();
    double i= 0.0;
    Here:
        while(iterator.hasNext()) {
            Position3D position3D= iterator.next();
            if(distanceGroups.isEmpty()) {
                List<Position3D> list= new ArrayList<>();
                list.add(position3D); distanceGroups.put(i,
                list);
                //
                List<Position3D> listHeartsTrace= output.get(i);
                listHeartsTrace.add(position3D);
                output.put(i, listHeartsTrace);
            }else {
                //遍历所有团
                //团重心匹配如果超精度新存，不是就融入。
                Iterator<Double> iteratorScale= output.keySet().iterator();
                boolean isFind= false;
                while(iteratorScale.hasNext()) {
                    Double doubleScale= iteratorScale.next();
                    Position3D currenctHeart
                        = output.get(doubleScale).get(output.get(doubleScale).size()- 1); double
                    distance= Distance.getDistance3D(currenctHeart, position3D); if(distance<
                    distanceScale) {
                        //融入得到新的重心
                        Position3D newHeart
                            = Euclid.findCryptionPosition3D(currenctHeart, position3D);
                        //删除当前增加坐标集，更新坐标集
                        List<Position3D> list= distanceGroups.get(doubleScale);
                        list.add(position3D);
                        distanceGroups.put(doubleScale, list);
                        //删除当前重心数据，更新重心数据轨迹
                        List<Position3D> listHeartsTrace= output.get(doubleScale);
                        listHeartsTrace.add(newHeart);
                        output.put(doubleScale, listHeartsTrace);
                        // 找 到
                        isFind= true;
                        //如果预测 坐标适应状态 可以把 continue 省略。
                        continue Here;
                    }
                }
                //新存
                if(!isFind) {
                    List<Position3D> list= new ArrayList<>();
                    list.add(position3D); distanceGroups.put(++i,
                    list);
```

```
                        //加新 hearts
                        List<Position3D> listHeartsTrace= output.get(i);
                        listHeartsTrace.add(position3D);
                        output.put(i, listHeartsTrace);
                    }
                }
            }
        return output;
    }
}
*********************************************************
package org.tinos.deta.trace;
import java.util.ArrayList;
import java.util.Iterator;
import java.util.List;
import org.tinos.deta.basic.Euclid;
import org.tinos.deta.demension.Position2D;
import org.tinos.deta.demension.Position3D;
public class TracePositionHearts{
    //Source: 《2 维 3 维 坐标集 切裂 重心 轨迹 跟踪算法 JAVA 源码》
    //出版日期 2019 年 12 月 21 日      作品说明 Gitee, Github, DetaOSS
    //作品说明适用于 坐标团 动态分析，增量轨迹分析，熵增信息单元记录。
    //作者 罗瑶光
    public static List<Position2D> trackTracePosition2DHeartsWithSingerGroup(List<Position2D>
        coods){ List<Position2D> hearts= new ArrayList<>();
        Iterator<Position2D> iterator= coods.iterator();
        boolean isFirst=  true; while(iterator.hasNext()) {
            if(isFirst) {
                isFirst= !isFirst;
                hearts.add(iterator.next());
            }else {
                Position2D position2D= iterator.next();
                Position2D CryptHeart
                = Euclid.findCryptionPosition2D(hearts.get(hearts.size()- 1), position2D);
                hearts.add(CryptHeart);
            }
        }
        return hearts;
    }
    public static List<Position3D> trackTracePosition3DHeartsWithSingerGroup(List<Position3D>
        coods){ List<Position3D> hearts= new ArrayList<>();
        Iterator<Position3D> iterator= coods.iterator();
        boolean isFirst=  true; while(iterator.hasNext()) {
            if(isFirst) {
                isFirst= !isFirst;
                hearts.add(iterator.next());
            }else {
                Position3D position3D= iterator.next();
                Position3D CryptHeart
                = Euclid.findCryptionPosition3D(hearts.get(hearts.size()- 1), position3D);
                hearts.add(CryptHeart);
            }
        }
        return hearts;
    }
}
**********************************************************
package org.tinos.deta.tsp;
import java.util.ArrayList;
import java.util.HashMap;
import java.util.Iterator;
import java.util.List;
import  java.util.Map;
import org.tinos.deta.basic.Distance;
import  org.tinos.deta.demension.Line2D;
import  org.tinos.deta.demension.Line3D;
import  org.tinos.deta.demension.Position2D;
import  org.tinos.deta.demension.Position3D;
import org.tinos.deta.statistic.LYG4DWithDoubleQuickSort4D;
public class YaoguangLuoEulerRingTSP{
    //Before I left L.A and went to Folsom, I did a quick TSP version at that time
    //at rosemead, it seems not fast. but now will be the best around this real world.
    //This Algorithm Theory as a new year gift to my CHRISTINA.
    //Foundation: Euler
    //Theory: Yaoguang.Luo
    //Application: Yaoguang.Luo 20200112
    public List<Line2D> getYaoguangLuo2DEulerRingTSP(List<Position2D> positions){
        //1 annotations
        List<Position2D> position2DTag= new ArrayList<>();
        Iterator<Position2D> iterator= positions.iterator(); int
        i= 0;
        String tag= "tag";
        while(iterator.hasNext()) {
            Position2D position2D=    iterator.next();
            position2D.setTag(tag+ i++);
            position2DTag.add(position2D);
        }
        positions= position2DTag;
        //2 get all lines
        List<Line2D> linesMap= new ArrayList<>(); Iterator<Position2D>
        iteratorOuter= positions.iterator(); i= 0;
        while(iteratorOuter.hasNext()) {
            Position2D position2DOuter= iteratorOuter.next();
            Iterator<Position2D> iteratorInner= positions.iterator();
            while(iteratorInner.hasNext()) {
```

```
            Position2D position2DInner= iteratorOuter.next();
            Line2D line2D= new Line2D();
            line2D.setBegin(position2DOuter);
            line2D.setEnd(position2DInner); linesMap.add(line2D);
        }
    }
    //3 sort line2D
    double[] distance= new double[positions.size()];
    Iterator<Line2D> linesKeySets= linesMap.iterator();
    //4 get each distance of line. i=
    0;
    Map<Double, List<Line2D>> uniqueLines= new HashMap<>();
    while(linesKeySets.hasNext()) {
        Line2D line2D=   linesKeySets.next();
        double distanceDouble= Distance.getDistance2D(line2D.getBegin(), line2D.getEnd());
        List<Line2D> list;
        if(uniqueLines.containsKey(distanceDouble))
            { list= uniqueLines.get(distanceDouble);
        }else {
            list= new ArrayList<>();
            //5 normalization the unique key of the distance
            distance[i++]= distanceDouble;
        }
        list.add(line2D);
        uniqueLines.put(distanceDouble, list);
    }
    //6 Yaoguangluo's 4D Peak filter Theory Quick Sort the Distance Array
    int sortRangeScale= 4; //my default is 4. you should change it as your want.
    distance= new LYG4DWithDoubleQuickSort4D().sort(distance, sortRangeScale);
    //7 From small to big loop the distance and make a condition tree.
    List<Line2D> outputLine2D= new ArrayList<>();
    Map<String, Double> outputDouble2D= new HashMap<>();
    for(i= 0; i< distance.length; i++) {
        List<Line2D>   list=   uniqueLines.get(distance[i]);
        Iterator<Line2D> iteratorLines= list.iterator(); Here:
            while(iteratorLines.hasNext()) {
                Line2D   line2D=   iteratorLines.next();
                Position2D   begin=   line2D.getBegin();
                Position2D end= line2D.getEnd();
                //8     decision     tree     add     rights     line
                if(outputDouble2D.containsKey(begin.getTag())) {
                    double     beginTimes=     outputDouble2D.get(begin.getTag()).doubleValue();
                    if(outputDouble2D.containsKey(end.getTag())) {
                        double     endTimes=     outputDouble2D.get(end.getTag()).doubleValue();
                        if(beginTimes> 1|| endTimes> 1) {
                            continue Here;
                        }
                        outputDouble2D.put(begin.getTag(), beginTimes+ 1);
                        outputDouble2D.put(end.getTag(), endTimes+ 1);
                    }else {
                        if(beginTimes> 1)
                            { continue Here;
                        }
                        outputDouble2D.put(begin.getTag(), beginTimes+ 1);
                        outputDouble2D.put(end.getTag(), 1.0);
                    }
                }else {
                    if(outputDouble2D.containsKey(end.getTag())) {
                        double endTimes= outputDouble2D.get(end.getTag()).doubleValue();
                        if(endTimes> 1) {
                            continue Here;
                        }
                        outputDouble2D.put(begin.getTag(), 1.0);
                        outputDouble2D.put(end.getTag(), endTimes+ 1);
                    }else {
                        outputDouble2D.put(begin.getTag(), 1.0);
                        outputDouble2D.put(end.getTag(), 1.0);
                    }
                }
                outputLine2D.add(line2D);
            }
        }
        return outputLine2D;
    }
    public List<Line3D> getYaoguangLuo3DEulerRingTSP(List<Position3D> positions){
        //1 annotations
        List<Position3D> position3DTag= new ArrayList<>();
        Iterator<Position3D> iterator= positions.iterator(); int
        i= 0;
        String tag= "tag";
        while(iterator.hasNext()) {
            Position3D position3D=     iterator.next();
            position3D.setTag(tag+ i++);
            position3DTag.add(position3D);
        }
        positions= position3DTag;
        //2 get all lines
        List<Line3D> linesMap= new ArrayList<>(); Iterator<Position3D>
        iteratorOuter= positions.iterator(); i= 0;
        while(iteratorOuter.hasNext()) {
            Position3D position3DOuter= iteratorOuter.next();
            Iterator<Position3D> iteratorInner= positions.iterator();
            while(iteratorInner.hasNext()) {
                Position3D position3DInner= iteratorOuter.next();
                Line3D line3D= new Line3D();
                line3D.setBegin(position3DOuter);
                line3D.setEnd(position3DInner);
                linesMap.add(line3D);
            }
        }
        //3 sort line3D
        double[] distance= new double[positions.size()];
        Iterator<Line3D> linesKeySets= linesMap.iterator();
        //4 get each distance of line. i=
        0;
        Map<Double, List<Line3D>> uniqueLines= new HashMap<>();
        while(linesKeySets.hasNext()) {
            Line3D line3D=    linesKeySets.next();
            double distanceDouble= Distance.getDistance3D(line3D.getBegin(), line3D.getEnd());
            List<Line3D> list;
            if(uniqueLines.containsKey(distanceDouble))
                { list= uniqueLines.get(distanceDouble);
            }else {
                list= new ArrayList<>();
                //5 normalization the unique key of the distance
                distance[i++]= distanceDouble;
            }
            list.add(line3D);
            uniqueLines.put(distanceDouble, list);
        }
        //6 Yaoguangluo's 4D Peak filter Theory Quick Sort the Distance Array
        int sortRangeScale= 4; //my default is 4. you should change it as your want.
        distance= new LYG4DWithDoubleQuickSort4D().sort(distance, sortRangeScale);
        //7 From small to big loop the distance and make a condition tree.
        List<Line3D> outputLine3D= new ArrayList<>();
        Map<String, Double> outputDouble3D= new HashMap<>();
        for(i= 0; i< distance.length; i++) {
            List<Line3D>    list=    uniqueLines.get(distance[i]);
            Iterator<Line3D> iteratorLines= list.iterator(); Here:
                while(iteratorLines.hasNext()) {
                Line3D   line3D=   iteratorLines.next();
                Position3D   begin=   line3D.getBegin();
                Position3D end= line3D.getEnd();
                //8     decision     tree     add     rights     line
                if(outputDouble3D.containsKey(begin.getTag())) {
                    double     beginTimes=     outputDouble3D.get(begin.getTag()).doubleValue();
                    if(outputDouble3D.containsKey(end.getTag())) {
                        double     endTimes=     outputDouble3D.get(end.getTag()).doubleValue();
                        if(beginTimes> 1|| endTimes> 1) {
                            continue Here;
                        }
                        outputDouble3D.put(begin.getTag(), beginTimes+ 1);
                        outputDouble3D.put(end.getTag(), endTimes+ 1);
                    }else {
                        if(beginTimes> 1)
                            { continue Here;
                        }
                        outputDouble3D.put(begin.getTag(), beginTimes+ 1);
                        outputDouble3D.put(end.getTag(), 1.0);
                    }
                }else {
                    if(outputDouble3D.containsKey(end.getTag())) {
                        double endTimes= outputDouble3D.get(end.getTag()).doubleValue();
                        if(endTimes> 1) {
                            continue Here;
                        }
                        outputDouble3D.put(begin.getTag(), 1.0);
                        outputDouble3D.put(end.getTag(), endTimes+ 1);
                    }else {
                        outputDouble3D.put(begin.getTag(), 1.0);
                        outputDouble3D.put(end.getTag(), 1.0);
                    }
                }
                outputLine3D.add(line3D);
            }
        }
        return outputLine3D;
    }
}
*********************************************************
package org.tinos.deta.tsp;
import java.util.ArrayList;
import java.util.HashMap;
import java.util.Iterator;
import java.util.List;
import java.util.Map;
import org.tinos.deta.basic.Distance;
import org.tinos.deta.demension.Line2D;
import org.tinos.deta.demension.Line3D;
import org.tinos.deta.demension.Position2D;
import org.tinos.deta.demension.Position3D;
import org.tinos.deta.statistic.LYG4DWithDoubleQuickSort4D;
public class YaoguangLuoEulerRingTSP2D{
    //Foundation: Euler
    //Theory: Yaoguang.Luo
    //Application: Yaoguang.Luo 20200114
    public List<Line2D> getYaoguangLuo2DEulerRingTSP2D(List<Position2D> positions){
        //1 annotations
        List<Position2D> position2DTag= new ArrayList<>();
        Iterator<Position2D> iterator= positions.iterator();
        int i= 0;
        String tag= "tag";
```

```
while(iterator.hasNext()) {
    Position2D position2D=     iterator.next();
    position2D.setTag(tag+ i++);
    position2DTag.add(position2D);
}
positions= position2DTag;
//2 get all lines
List<Line2D> linesMap= new ArrayList<>(); Iterator<Position2D>
iteratorOuter= positions.iterator(); Map<String, Map<String,
String>> indexMap= new HashMap<>(); i= 0;
while(iteratorOuter.hasNext()) {
    Position2D position2DOuter= iteratorOuter.next();
    Iterator<Position2D> iteratorInner= positions.iterator(); Next:
    while(iteratorInner.hasNext()) {
        Position2D position2DInner= iteratorOuter.next();
        Line2D line2D= new Line2D();
        line2D.setBegin(position2DOuter);
        line2D.setEnd(position2DInner);
        //2.1 delete the De-reflection redundant lines
        if(indexMap.containsKey(position2DInner.getTag())) {
            continue Next;
        }
        //2.2 delete self positions lines
        if(!(position2DOuter.getX()!=position2DInner.getX()
                 || position2DOuter.getY()!=position2DInner.getY()))
            { continue Next;
        }
        Map<String, String> map= new HashMap<>();
        if(indexMap.containsKey(position2DOuter.getTag())) {
            map= indexMap.get(position2DOuter.getTag());
        }else {
            map= new HashMap<>();
        }
        map.put(position2DInner.getTag(), "");
        indexMap.put(position2DOuter.getTag(), map);
        linesMap.add(line2D);
    }
}
//3 sort line2D
double[] distance= new double[positions.size()];
Iterator<Line2D> linesKeySets= linesMap.iterator();
//4 get each distance of line. i=
0;
Map<Double, List<Line2D>> uniqueLines= new HashMap<>();
while(linesKeySets.hasNext()) {
    Line2D line2D= linesKeySets.next();
    double distanceDouble= Distance.getDistance2D(line2D.getBegin(), line2D.getEnd());
    List<Line2D> list;
    if(uniqueLines.containsKey(distanceDouble)) {
        list= uniqueLines.get(distanceDouble);
    }else {
        list= new ArrayList<>();
        //5 normalization the unique key of the distance
        distance[i++]= distanceDouble;
    }
    list.add(line2D);
    uniqueLines.put(distanceDouble, list);
}
//6 Yaoguangluo's 4D Peak filter Theory Quick Sort the Distance Array
int sortRangeScale= 4; //my default is 4. you should change it as your want.
distance= new LYG4DWithDoubleQuickSort4D().sort(distance, sortRangeScale);
//7 From small to big loop the distance and make a condition tree.
List<Line2D> outputLine2D= new ArrayList<>();
Map<String, Double> outputDouble2D= new HashMap<>();
for(i= 0; i< distance.length; i++) {
    List<Line2D>   list=   uniqueLines.get(distance[i]);
    Iterator<Line2D> iteratorLines= list.iterator(); Here:
        while(iteratorLines.hasNext()) {
            Line2D   line2D=   iteratorLines.next();
            Position2D   begin=   line2D.getBegin();
            Position2D end= line2D.getEnd();
            //8     decision     tree     add     rights     line
            if(outputDouble2D.containsKey(begin.getTag())) {
                double     beginTimes=     outputDouble2D.get(begin.getTag()).doubleValue();
                if(outputDouble2D.containsKey(end.getTag())) {
                    double     endTimes=     outputDouble2D.get(end.getTag()).doubleValue();
                    if(beginTimes> 1|| endTimes> 1) {
                        continue Here;
                    }
                    outputDouble2D.put(begin.getTag(), beginTimes+ 1);
                    outputDouble2D.put(end.getTag(), endTimes+ 1);
                }else {
                    if(beginTimes> 1)
                        { continue Here;
                    }
                    outputDouble2D.put(begin.getTag(), beginTimes+ 1);
                    outputDouble2D.put(end.getTag(), 1.0);
                }
            }else {
                if(outputDouble2D.containsKey(end.getTag())) {
                    double endTimes= outputDouble2D.get(end.getTag()).doubleValue();
                    if(endTimes> 1) {
                        continue Here;
                    }
                    outputDouble2D.put(begin.getTag(), 1.0);
```

```
                        outputDouble2D.put(end.getTag(), endTimes+ 1);
                    }else {
                        outputDouble2D.put(begin.getTag(), 1.0);
                        outputDouble2D.put(end.getTag(), 1.0);
                    }
                }
                outputLine2D.add(line2D);
            }
        }
        return outputLine2D;
    }
public List<Line3D> getYaoguangLuo3DEulerRingTSP2D(List<Position3D> positions){
        //1 annotations
        List<Position3D> position3DTag= new ArrayList<>();
        Iterator<Position3D> iterator= positions.iterator(); int
        i= 0;
        String tag= "tag";
        while(iterator.hasNext()) {
            Position3D position3D=    iterator.next();
            position3D.setTag(tag+ i++);
            position3DTag.add(position3D);
        }
        positions= position3DTag;
        //2 get all lines
        List<Line3D> linesMap= new ArrayList<>(); Iterator<Position3D>
        iteratorOuter= positions.iterator(); Map<String, Map<String,
        String>> indexMap= new HashMap<>(); i= 0;
        while(iteratorOuter.hasNext()) {
            Position3D position3DOuter= iteratorOuter.next();
            Iterator<Position3D> iteratorInner= positions.iterator(); Next:
            while(iteratorInner.hasNext()) {
                Position3D position3DInner= iteratorOuter.next();
                Line3D line3D= new Line3D();
                line3D.setBegin(position3DOuter);
                line3D.setEnd(position3DInner);
                //2.1 delete the De-reflection redundant lines
                if(indexMap.containsKey(position3DInner.getTag())) {
                    continue Next;
                }
                //2.2 delete self positions lines
                if(!(position3DOuter.getX()!= position3DInner.getX()
                        || position3DOuter.getY()!= position3DInner.getY()
                        || position3DOuter.getZ()!= position3DInner.getZ()))
                    { continue Next;
                }
                Map<String, String> map= new HashMap<>();
                if(indexMap.containsKey(position3DOuter.getTag())) {
```

```
                map= indexMap.get(position3DOuter.getTag());
            }else {
                map= new HashMap<>();
            }
            map.put(position3DInner.getTag(), "");
            indexMap.put(position3DOuter.getTag(), map);
            linesMap.add(line3D);
        }
    }
    //3 sort line3D
    double[] distance= new double[positions.size()];
    Iterator<Line3D> linesKeySets= linesMap.iterator();
    //4 get each distance of line. i=
    0;
    Map<Double, List<Line3D>> uniqueLines= new HashMap<>();
    while(linesKeySets.hasNext()) {
        Line3D line3D= linesKeySets.next();
        double distanceDouble= Distance.getDistance3D(line3D.getBegin(), line3D.getEnd());
        List<Line3D> list;
        if(uniqueLines.containsKey(distanceDouble))
            { list= uniqueLines.get(distanceDouble);
        }else {
            list= new ArrayList<>();
            //5 normalization the unique key of the distance
            distance[i++]= distanceDouble;
        }
        list.add(line3D);
        uniqueLines.put(distanceDouble, list);
    }
    //6 Yaoguangluo's 4D Peak filter Theory Quick Sort the Distance Array
    int sortRangeScale= 4; //my default is 4. you should change it as your want.
    distance= new LYG4DWithDoubleQuickSort4D().sort(distance, sortRangeScale);
    //7 From small to big loop the distance and make a condition tree.
    List<Line3D> outputLine3D= new ArrayList<>();
    Map<String, Double> outputDouble3D= new HashMap<>();
    for(i= 0; i< distance.length; i++) {
        List<Line3D>    list=    uniqueLines.get(distance[i]);
        Iterator<Line3D> iteratorLines= list.iterator(); Here:
            while(iteratorLines.hasNext()) {
                Line3D   line3D=   iteratorLines.next();
                Position3D   begin=   line3D.getBegin();
                Position3D end= line3D.getEnd();
                //8     decision     tree     add     rights     line
                if(outputDouble3D.containsKey(begin.getTag())) {
                    double     beginTimes=     outputDouble3D.get(begin.getTag()).doubleValue();
                    if(outputDouble3D.containsKey(end.getTag())) {
                        double     endTimes=     outputDouble3D.get(end.getTag()).doubleValue();
                        if(beginTimes> 1|| endTimes> 1) {
```

```
                                        continue Here;
                                    }
                                    outputDouble3D.put(begin.getTag(), beginTimes+ 1);
                                    outputDouble3D.put(end.getTag(), endTimes+ 1);
                                }else {
                                    if(beginTimes> 1)
                                        { continue Here;
                                    }
                                    outputDouble3D.put(begin.getTag(), beginTimes+ 1);
                                    outputDouble3D.put(end.getTag(), 1.0);
                                }
                            }else {
                                if(outputDouble3D.containsKey(end.getTag())) {
                                    double endTimes= outputDouble3D.get(end.getTag()).doubleValue();
                                    if(endTimes> 1) {
                                        continue Here;
                                    }
                                    outputDouble3D.put(begin.getTag(), 1.0);
                                    outputDouble3D.put(end.getTag(), endTimes+ 1);
                                }else {
                                    outputDouble3D.put(begin.getTag(), 1.0);
                                    outputDouble3D.put(end.getTag(), 1.0);
                                }
                            }
                            outputLine3D.add(line3D);
                        }
                }
                return outputLine3D;
        }
}
```

```
package PCI.ASQ.trace;
import java.util.ArrayList;
import java.util.Iterator;
import java.util.List;

import PCI.ASQ.demension.AMV_MVS_VSQ_2D;
import PCI.ASQ.demension.AMV_MVS_VSQ_3D;

public class TraceFissile_AMV_MVS_VSQ_ByHearts{
        //Source: 《2维 3维 坐标集 切裂 重心 轨迹 跟踪算法JAVA源码》
        //创作日期2020 年 04 月 14 日 作品说明Gitee, Github, DetaOSS
        //这个算法之前个人软著申请有相关的根据坐标计算重心轨迹的算法
        //，这个函数是其反演函数，根据坐标的重心轨迹来求解其坐标集。
        //作品说明适用于 坐标团 动态分析，增量轨迹分析，熵增信息单元记录。
        //作者 罗瑶光
        public static List<AMV_MVS_VSQ_2D> trackTracePosition2DByHearts(List<AMV_MVS_VSQ_2D> hearts){
                List<AMV_MVS_VSQ_2D> trackTracePositions= new ArrayList<>();
                Iterator<AMV_MVS_VSQ_2D> iterator= hearts.iterator();
                AMV_MVS_VSQ_2D lastPosition2D= null;
                if(iterator.hasNext()) {
                        lastPosition2D= iterator.next();
                        trackTracePositions.add(lastPosition2D);
                }
                while(iterator.hasNext()) {
                        AMV_MVS_VSQ_2D heartPostion= iterator.next();
                        //position2D.setX((heart.getX()+ oneMore.getX())/ 2);
                        //newHeart= (lastHeart+ newp)/2    =>  newp= newHeart*2 -lastHeart
                        //add section 1234
                        AMV_MVS_VSQ_2D       newPosition2D=       new       AMV_MVS_VSQ_2D(heartPostion.getX()*2-
lastPosition2D.getX()
                                  , heartPostion.getY()*2- lastPosition2D.getY());
                        trackTracePositions.add(newPosition2D);
                        lastPosition2D= heartPostion;
                }
                return trackTracePositions;
        }

        public static List<AMV_MVS_VSQ_3D> trackTracePosition3DByHearts(List<AMV_MVS_VSQ_3D> hearts){
                List<AMV_MVS_VSQ_3D> trackTracePositions= new ArrayList<>();
                Iterator<AMV_MVS_VSQ_3D> iterator= hearts.iterator();
                AMV_MVS_VSQ_3D lastPosition3D= null;
                if(iterator.hasNext()) {
                        lastPosition3D= iterator.next();
                        trackTracePositions.add(lastPosition3D);
                }
                while(iterator.hasNext()) {
                        AMV_MVS_VSQ_3D heartPostion= iterator.next();
                        //position3D.setX((heart.getX()+ oneMore.getX())/ 2);
                        //newHeart= (lastHeart+ newp)/2    =>  newp= newHeart*2 -lastHeart
                        //add section 1234
                        AMV_MVS_VSQ_3D newPosition3D= new AMV_MVS_VSQ_3D(heartPostion.getX()
                                * 2- lastPosition3D.getX()
                                , heartPostion.getY()* 2- lastPosition3D.getY()
                                , heartPostion.getZ()* 2- lastPosition3D.getZ());
                        trackTracePositions.add(newPosition3D);
                        lastPosition3D= heartPostion;
                }
                return trackTracePositions;
        }
}
```