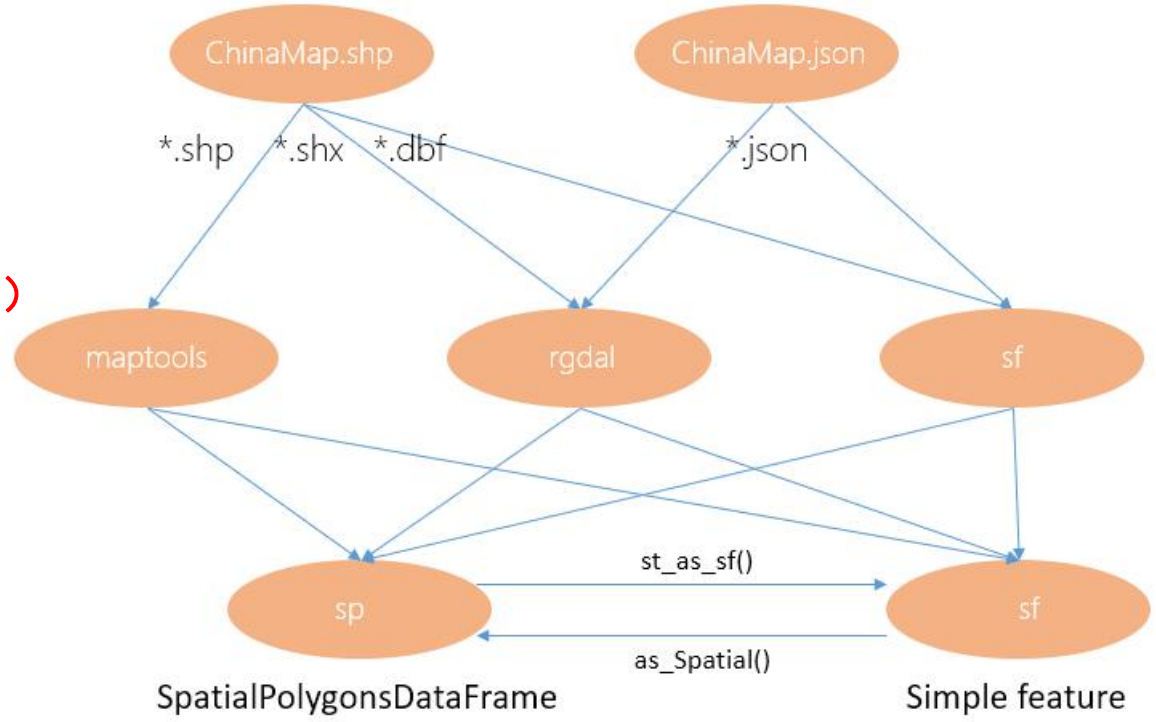
天善智能
TIANSHAN SOFT

《R语言商务图表与数据可视化》
第九章：空间可视化与数据地图基础

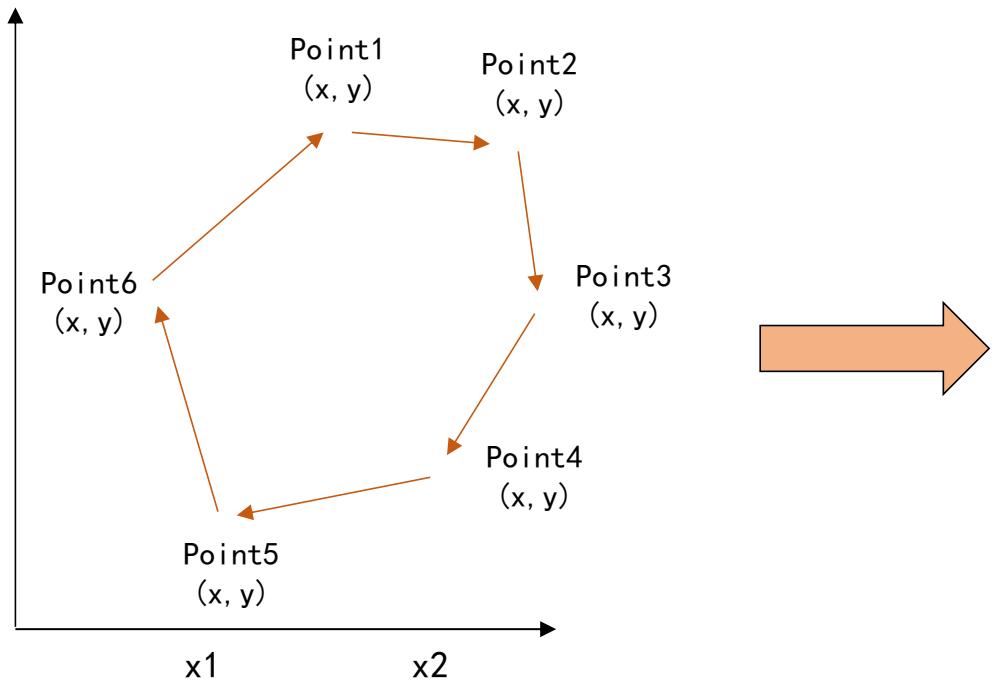
本章目录

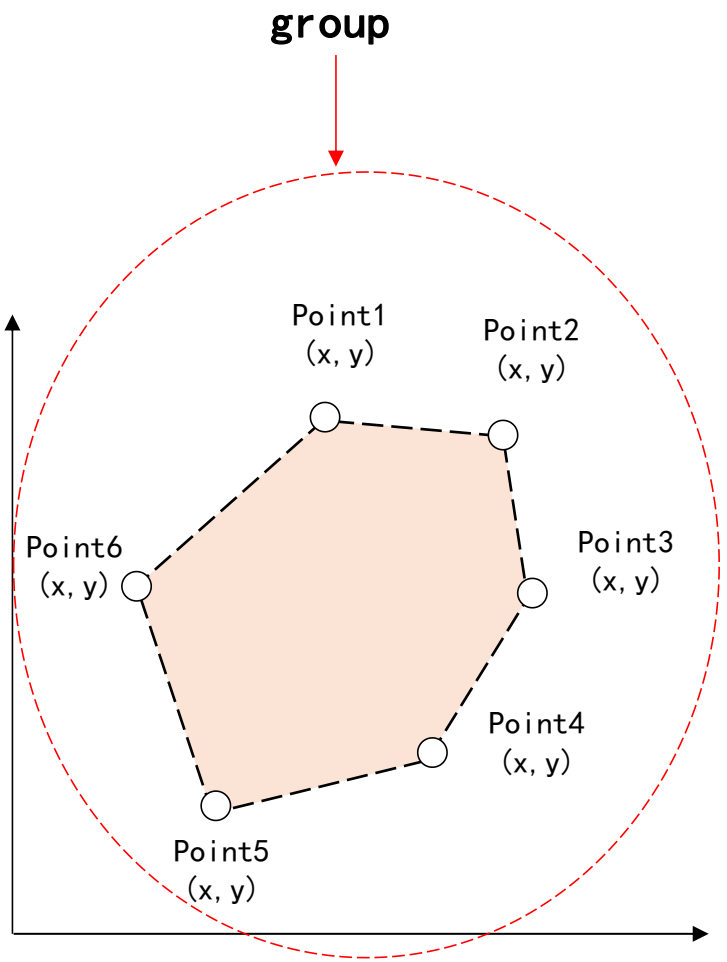


9.1 sp空间数据映射原理

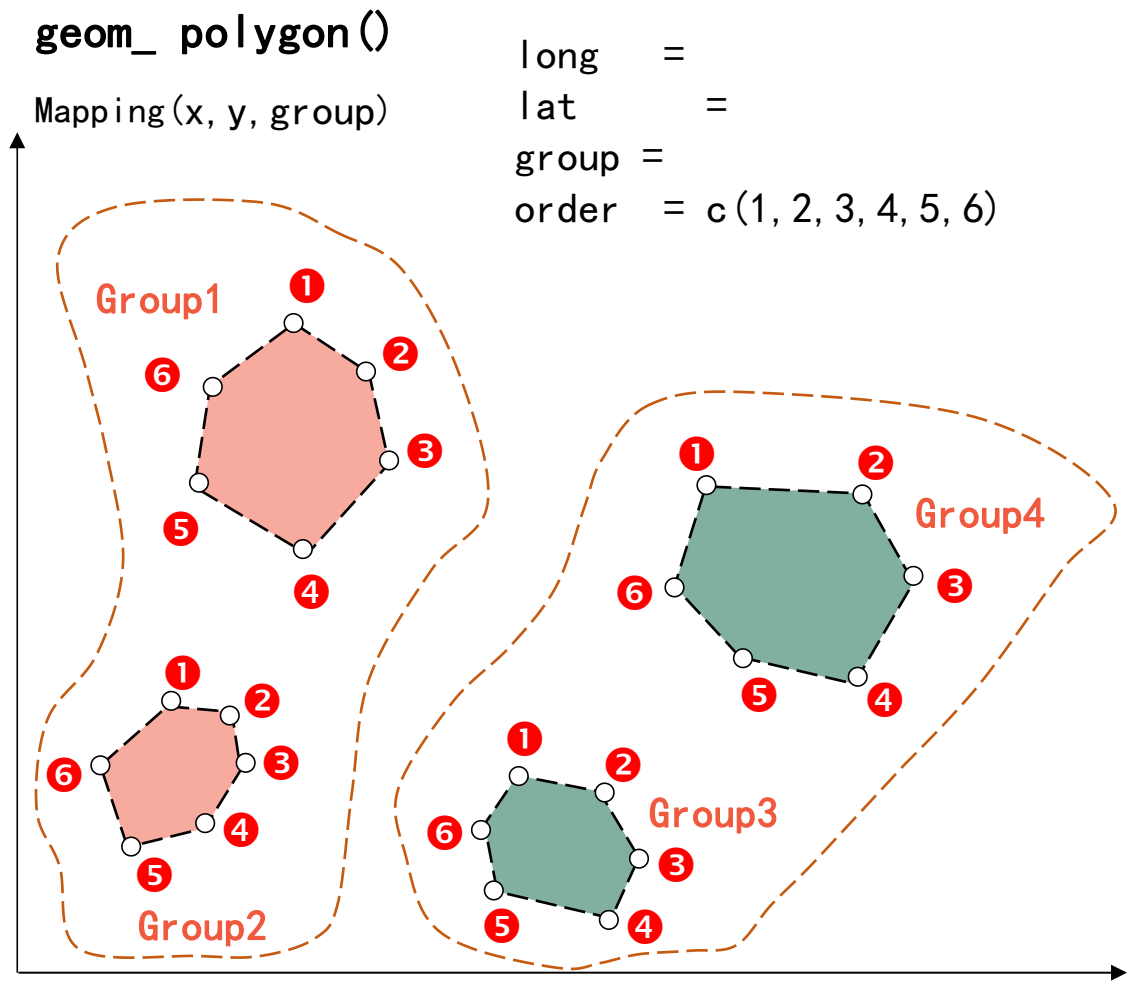
geom_ ploygon()

Mapping(x, y, group)



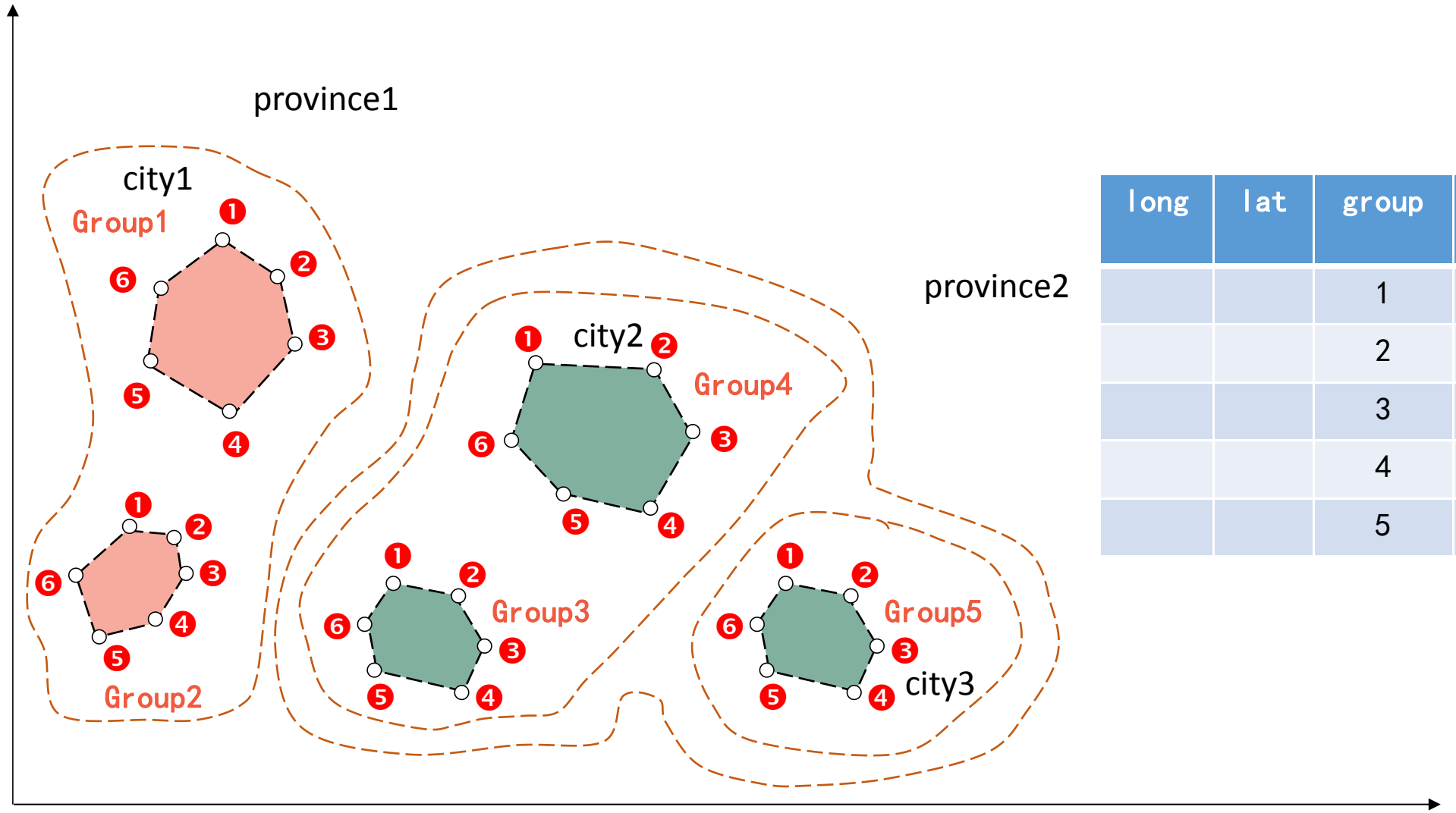


9.1 sp空间数据映射原理



long	lat	group	order	long	lat	group	order
15.4	38.1	1	1	22.4	8.4	3	1
17.2	36.2	1	2	25.6	7.6	3	2
19.7	33.1	1	3	27.8	5.7	3	3
15.9	24.6	1	4	25.1	3.9	3	4
7.4	29.0	1	5	16.7	4.3	3	5
8.9	33.6	1	6	15.9	5.9	3	6
8.5	12.1	2	1	29.9	32.6	4	1
10.4	11.7	2	2	38.7	31.8	4	2
11.3	8.9	2	3	43.2	27.6	4	3
9.7	6.1	2	4	40.2	22.3	4	4
4.8	5.7	2	5	35.6	24.5	4	5
3.7	9.1	2	6	29.4	29.6	4	6

9.1 sp空间数据映射原理



long	lat	group	order	city	province
		1		1	1
		2		1	1
		3		2	2
		4		2	2
		5		3	2

9.2 shp、json格式地理信息数据结构——格式

shp数据结构：

1、分文件存储信息：

name.dbf
name.shp
name.shx

2、获取渠道

https://gadm.org/download_country_v3.html

3、导入工具

maptools
rgdal
sf

json数据结构：

1、key-value形式的键值对结构

name.json

2、获取渠道

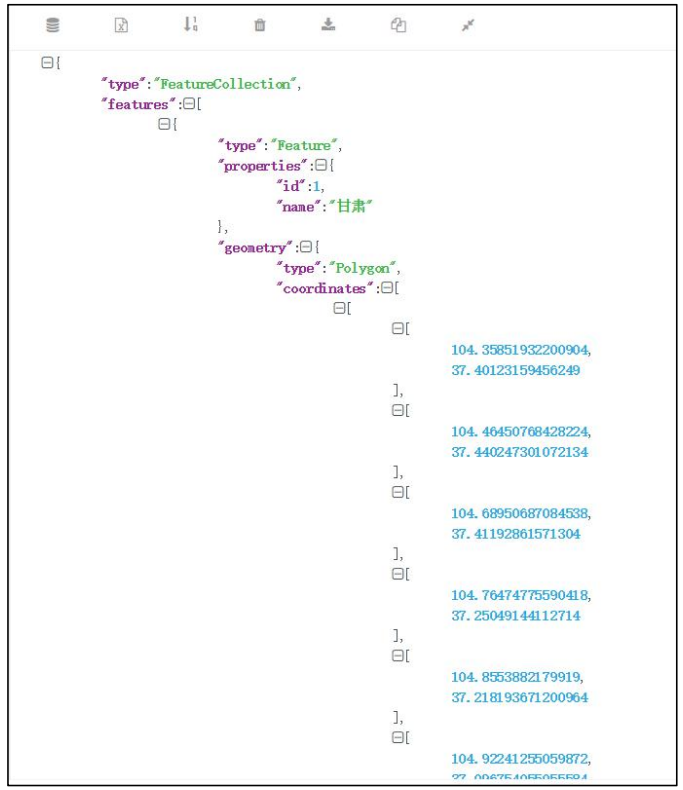
http://datav.aliyun.com/static/tools/atlas/

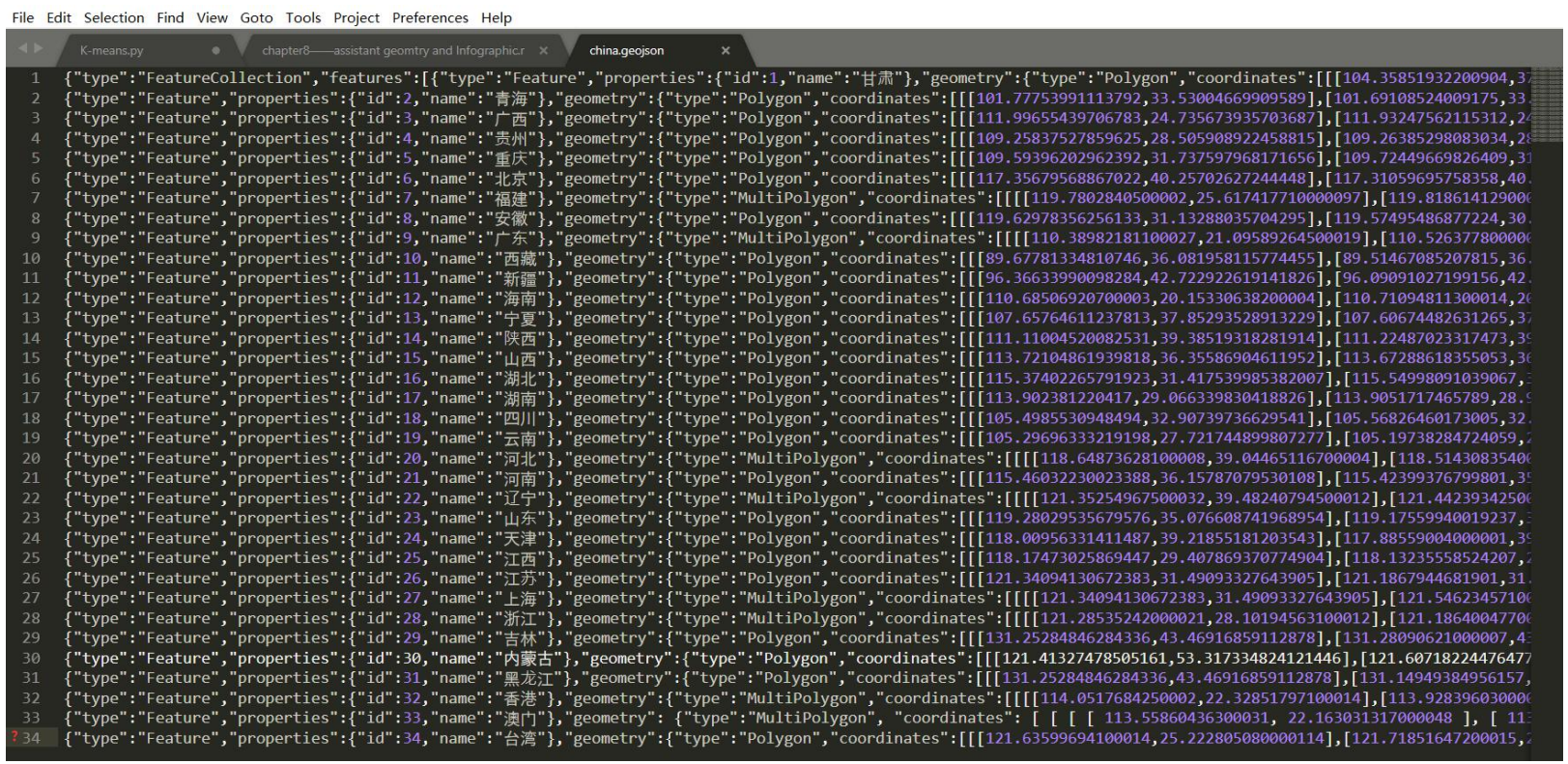
3、导入工具

rgdal
sf

9.2 shp、json格式地理信息数据结构——解析

json数据结构： http://www.json.cn/#





9.2 shp、json格式地理信息数据结构——获取

shp数据结构：

GADM Maps Data About

Download GADM data (version 3.6)

Country

China

Geopackage

Shapefile

R (sp): level-0, level1, level2, level3

R (sf): level-0, level1, level2, level3

KMZ: level-0, level1, level2, level3

The coordinate reference system is longitude/latitude and the WGS84 datum.

Description of file formats.

json数据结构：

DATAV.GeoAtlas

中华人民共和国

地名: 中国 adcode: 100000

包含子区域

{"type":"FeatureCollection","features":[

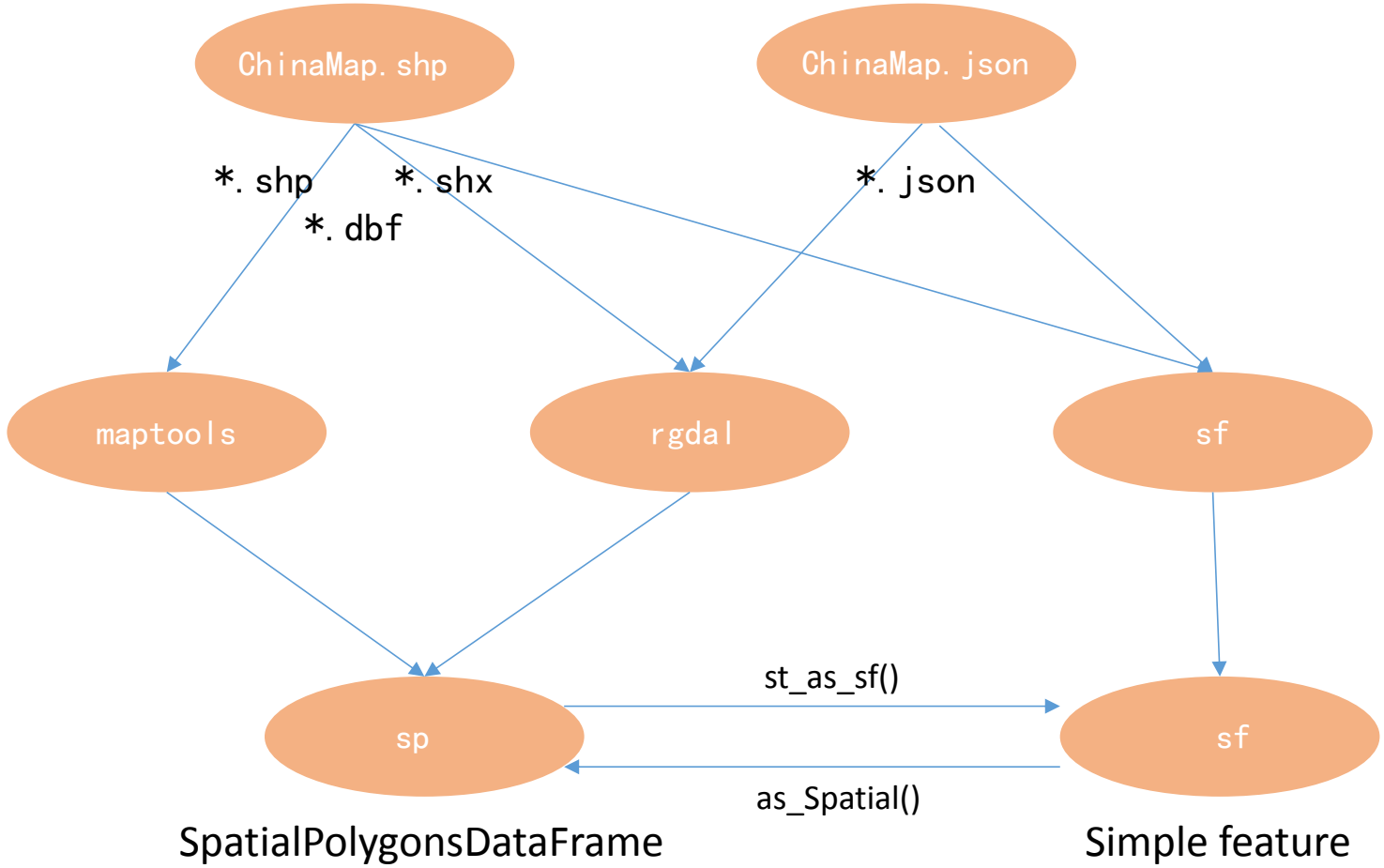
geojson: svg: excel:

9.3 地理信息应用包简介：（sp、maptools、rgdal、sf）

两种地图素材数据源

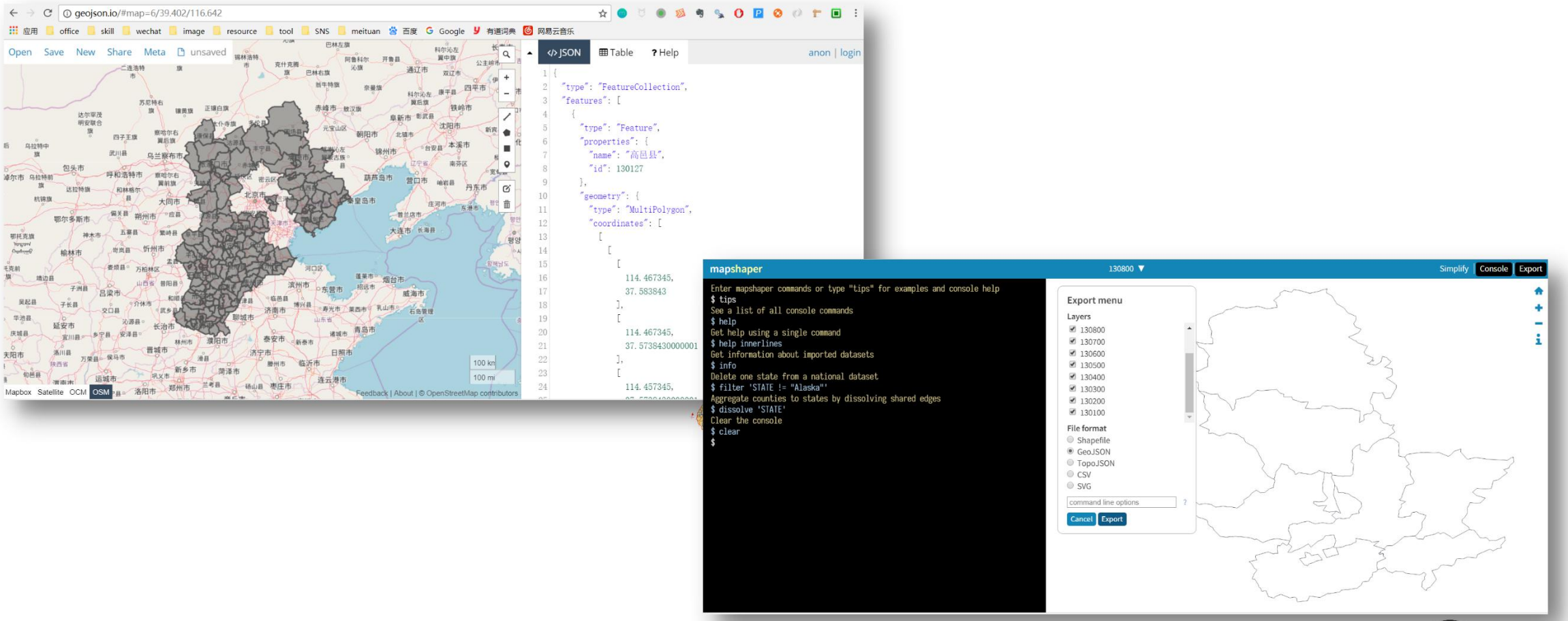
三种读取工具

两种地理数据模型



9.3 shp、json格式地理信息数据结构——shp to/from json

http://geojson.io/#map=7/36.421/118.751
http://mapshaper.org/



9.4 sp空间数据结构操纵与业务数据合并

地理信息边界点数据（含id）

```
> head(polygons_data,10)
       long      lat group order id
1  104.3585 37.40123   1.1     1  1
2  104.4645 37.44025   1.1     2  1
3  104.6895 37.41193   1.1     3  1
4  104.7647 37.25049   1.1     4  1
5  104.8554 37.21819   1.1     5  1
6  104.9224 37.09675   1.1     6  1
7  105.1802 36.97214   1.1     7  1
8  105.3217 36.78073   1.1     8  1
9  105.2205 36.69295   1.1     9  1
10 105.2687 36.55022   1.1    10  1
```

Left jon by id

行政区划信息（含区划id）

```
> division_data
   id   name sale Scope
1   1   甘肃  189     A
2   2   青海  141     B
3   3   广西  126     C
4   4   贵州  126     D
5   5   重庆  198     E
6   6   北京  116     A
7   7   福建  175     B
8   8   安徽  130     C
9   9   广东  119     D
10 10   西藏  151     E
```

```
> head(final_mapdata,10)
       long      lat group order id name sale Scope
1  104.3585 37.40123   1.1     1  1 甘肃  189     A
2  104.4645 37.44025   1.1     2  1 甘肃  189     A
3  104.6895 37.41193   1.1     3  1 甘肃  189     A
4  104.7647 37.25049   1.1     4  1 甘肃  189     A
5  104.8554 37.21819   1.1     5  1 甘肃  189     A
6  104.9224 37.09675   1.1     6  1 甘肃  189     A
7  105.1802 36.97214   1.1     7  1 甘肃  189     A
8  105.3217 36.78073   1.1     8  1 甘肃  189     A
9  105.2205 36.69295   1.1     9  1 甘肃  189     A
10 105.2687 36.55022   1.1    10  1 甘肃  189     A
>
```

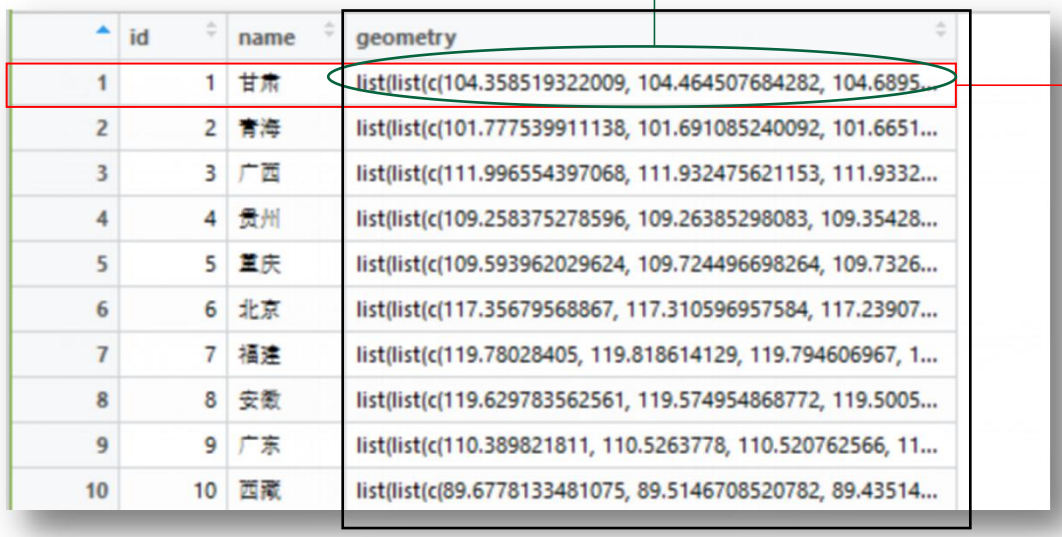
9.5 sf格式空间数据结构

行：　　Simple feature
sfg：　　Simple feature geometry (sfg)
Sfc:　　Simple feature geometry list-colum(sfc)

```
## Simple feature collection with 100 features and 6 fields
## geometry type:  MULTIPOLYGON
## dimension:      XY
## bbox:           xmin: -84.32385 ymin: 33.88199 xmax: -75.45698 ymax: 36.58965
## epsg (SRID):    4267
## proj4string:    +proj=longlat +datum=NAD27 +no_defs
## precision:      double (default; no precision model)
## First 3 features:
##   BIR74 SID74 NWBIR74 BIR79 SID79 NWBIR79                              geom
## 1  1091     1      10  1364     0      19 MULTIPOLYGON(((-81.47275543...
## 2   487     0      10   542     3      12 MULTIPOLYGON(((-81.23989105...
## 3  3188     5     208  3616     6     260 MULTIPOLYGON(((-80.45634460...
```

Simple feature　　Simple feature geometry list-colum (sfc)　　Simple feature geometry (sfg)

9.5 sf格式空间数据结构



	id	name	geometry
1	1	甘肃	list(list(c(104.358519322009, 104.464507684282, 104.6895...
2	2	青海	list(list(c(101.777539911138, 101.691085240092, 101.6651...
3	3	广西	list(list(c(111.996554397068, 111.932475621153, 111.9332...
4	4	贵州	list(list(c(109.258375278596, 109.26385298083, 109.35428...
5	5	重庆	list(list(c(109.593962029624, 109.724496698264, 109.7326...
6	6	北京	list(list(c(117.35679568867, 117.310596957584, 117.23907...
7	7	福建	list(list(c(119.78028405, 119.818614129, 119.794606967, 1...
8	8	安徽	list(list(c(119.629783562561, 119.574954868772, 119.5005...
9	9	广东	list(list(c(110.389821811, 110.5263778, 110.520762566, 11...
10	10	西藏	list(list(c(89.6778133481075, 89.5146708520782, 89.43514...

Simple feature geometry（sfg）

Simple feature

Simple feature geometry list-colum(sfc)

9.6 sf格式空间数据映射原理

行政区划信息（含区划id）

left jon by id

地理信息边界点数据（含id）

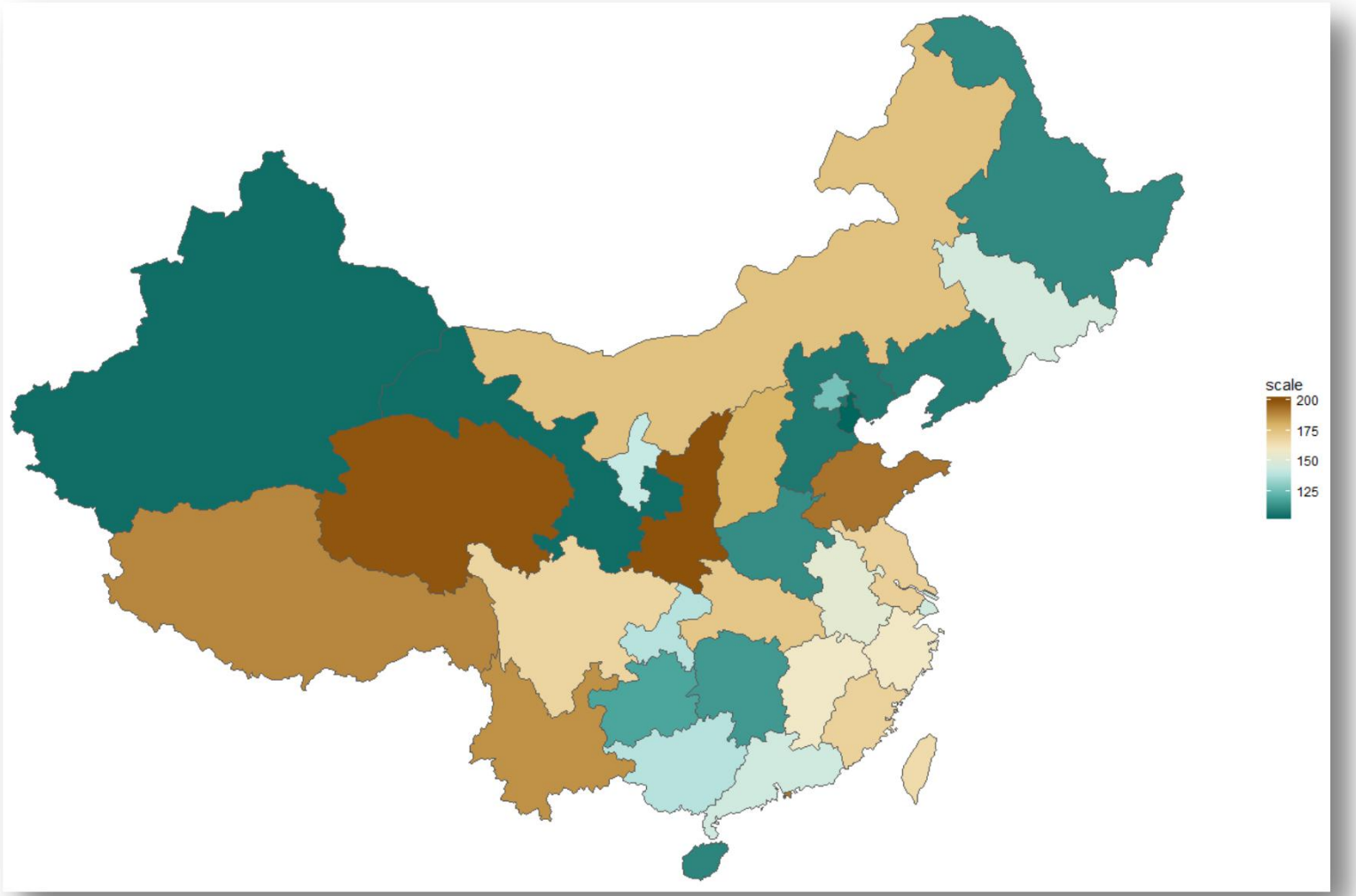
```
> mydata
   id   name scale Scope
1   1   甘肃   105     A
2   2   青海   199     B
3   3   广西   139     C
4   4   贵州   119     D
5   5   重庆   139     E
6   6   北京   127     A
7   7   福建   169     B
8   8   安徽   153     C
9   9   广东   145     D
10 10   西藏   189     E
```

```
   id name                                geometry
1   1 甘肃 MULTIPOLYGON (((104.3585 37...
2   2 青海 MULTIPOLYGON (((101.7775 33...
3   3 广西 MULTIPOLYGON (((111.9966 24...
4   4 贵州 MULTIPOLYGON (((109.2584 28...
5   5 重庆 MULTIPOLYGON (((109.594 31....
6   6 北京 MULTIPOLYGON (((117.3568 40...
7   7 福建 MULTIPOLYGON (((119.7803 25...
8   8 安徽 MULTIPOLYGON (((119.6298 31...
9   9 广东 MULTIPOLYGON (((110.3898 21...
10 10 西藏 MULTIPOLYGON (((89.67781 36...
```

```
   id name scale Scope                                geometry
1   1 甘肃   105     A MULTIPOLYGON (((11617137 44...
2   2 青海   199     B MULTIPOLYGON (((11329824 39...
3   3 广西   139     C MULTIPOLYGON (((12467399 28...
4   4 贵州   119     D MULTIPOLYGON (((12162587 33...
5   5 重庆   139     E MULTIPOLYGON (((12199944 37...
6   6 北京   127     A MULTIPOLYGON (((13064099 49...
7   7 福建   169     B MULTIPOLYGON (((13333880 29...
8   8 安徽   153     C MULTIPOLYGON (((13317127 36...
9   9 广东   145     D MULTIPOLYGON (((12288539 24...
10 10 西藏   189     E MULTIPOLYGON (((9982889 431...
>
```

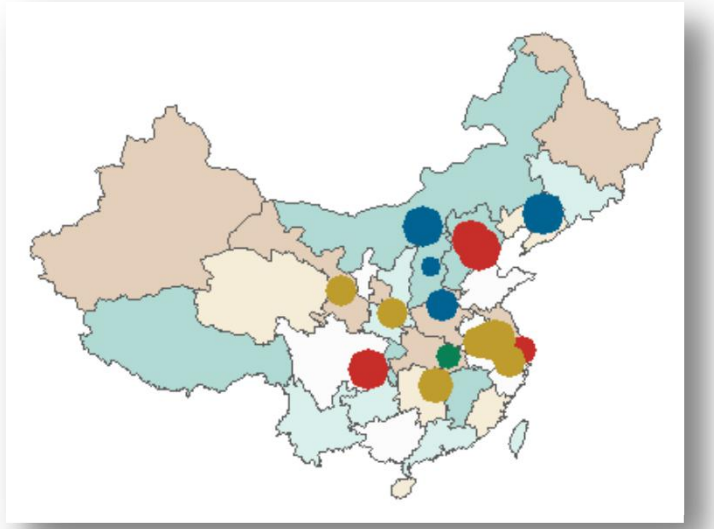
9.6 sf格式空间数据映射原理——polygon

	id	name	scale	Scope	geometry
1	1	甘肃	105	A	MULTIPOLYGON (((11617137 44...
2	2	青海	199	B	MULTIPOLYGON (((11329824 39...
3	3	广西	139	C	MULTIPOLYGON (((12467399 28...
4	4	贵州	119	D	MULTIPOLYGON (((12162587 33...
5	5	重庆	139	E	MULTIPOLYGON (((12199944 37...
6	6	北京	127	A	MULTIPOLYGON (((13064099 49...
7	7	福建	169	B	MULTIPOLYGON (((13333880 29...
8	8	安徽	153	C	MULTIPOLYGON (((13317127 36...
9	9	广东	145	D	MULTIPOLYGON (((12288539 24...
10	10	西藏	189	E	MULTIPOLYGON (((9982889 431...

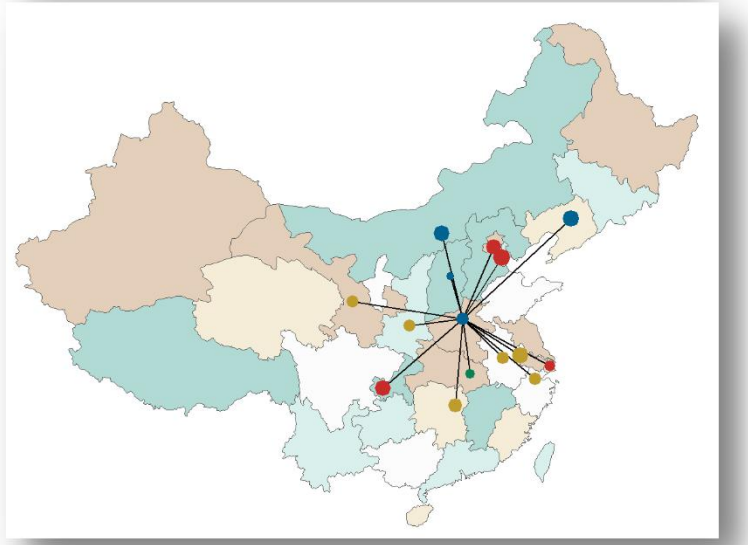


9.6 sf格式空间数据映射原理——line/point

```
Simple feature collection with 15 features and 4 fields
geometry type:  POINT
dimension:      XY
bbox:           xmin: 103.82 ymin: 28.18 xmax: 123.4 ymax: 41.83
epsg (SRID):    4326
proj4string:    +proj=longlat +datum=WGS84 +no_defs
First 10 features:
       province     city zhibiao class             geometry
1        北京市      北京      67     A  POINT (116.47 39.9)
2        上海市      上海      19     A POINT (121.48 31.23)
3        天津市      天津      99     A POINT (117.18 39.15)
4        重庆市      重庆      82     A POINT (106.53 29.53)
5        辽宁省      沈阳      97     B  POINT (123.4 41.83)
6  内蒙古自治区 呼和浩特      81     B  POINT (111.8 40.82)
7        山西省      太原      10     B POINT (112.57 37.87)
8        河南省      郑州      39     B   POINT (113.7 34.8)
9        陕西省      西安      29     C  POINT (108.9 34.27)
10       甘肃省      兰州      29     C POINT (103.82 36.05)
>
```



```
Simple feature collection with 14 features and 1 field
geometry type:  LINESTRING
dimension:      XY
bbox:           xmin: 103.82 ymin: 28.18 xmax: 123.4 ymax: 41.83
epsg (SRID):    4326
proj4string:    +proj=longlat +datum=WGS84 +no_defs
First 10 features:
   group                       geometry
1      1 LINESTRING (113.7 34.8, 116...
2      2 LINESTRING (113.7 34.8, 121...
3      3 LINESTRING (113.7 34.8, 117...
4      4 LINESTRING (106.53 29.53, 1...
5      5 LINESTRING (113.7 34.8, 123...
6      6 LINESTRING (111.8 40.82, 11...
7      7 LINESTRING (112.57 37.87, 1...
8      8 LINESTRING (108.9 34.27, 11...
9      9 LINESTRING (103.82 36.05, 1...
10    10 LINESTRING (113.7 34.8, 117...
>
```



9.6 sf格式空间数据映射原理——line/point

如何使用sf对象实现以下两种图形？

9.6 sf格式空间数据映射原理——参考资料

https://r-spatial.github.io/sf/
https://r-spatial.github.io/sf/articles/sf1.html
https://r-spatial.github.io/sf/articles/sf2.html
https://r-spatial.github.io/sf/articles/sf3.html
https://r-spatial.github.io/sf/articles/sf4.html
https://r-spatial.github.io/sf/articles/sf5.html
https://r-spatial.github.io/sf/articles/sf6.html

https://www.r-spatial.org/r/2016/02/15/simple-features-for-r.html
https://www.r-spatial.org/r/2016/07/18/sf2.html
https://www.r-spatial.org/r/2016/11/02/sfcran.html
https://www.r-spatial.org/r/2017/01/12/newssf.html
https://github.com/r-spatial/sf/wiki/Migrating

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