

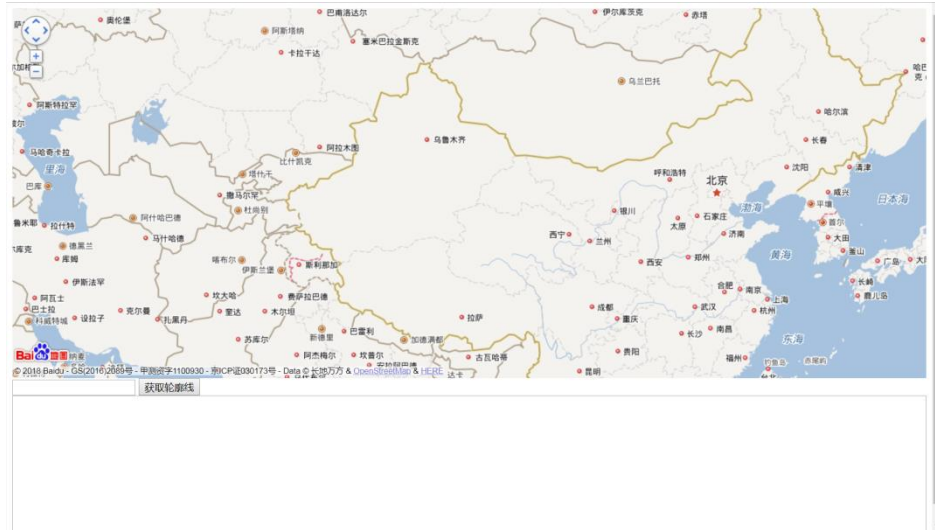
利用 R 语言绘制地图

1. 利用基本的绘图函数画图：

(1) 首先获得目标区域的轮廓坐标。参考网站：

<https://zhidao.baidu.com/question/489614574694756692.html>

将网站上的代码复制到记事本中，然后保存为 html 格式，使用浏览器打开（最好是谷歌或火狐），页面上会显示如下的网页：



在“获取轮廓线”按钮旁边的框内输入目标区域，比如“海淀区”，然后点击“获取轮廓线”按钮，就会得到海淀区轮廓的经纬度坐标点（可能反应时间较长，需要耐心等待或者多点几次），效果如下图：



	A	B	C	D	E	F	G
1	lon	lat	dis				
2	116.054	40.0918	海淀区				
3	116.060977	40.10234	海淀区				
4	116.075122	40.11075	海淀区				
5	116.079881	40.12108	海淀区				
6	116.090536	40.12562	海淀区				
7	116.102224	40.12675	海淀区				
8	116.107802	40.1214	海淀区				
9	116.112127	40.12337	海淀区				
10	116.119007	40.12075	海淀区				
11	116.135601	40.12045	海淀区				
12	116.138833	40.1274	海淀区				
13	116.176374	40.1301	海淀区				
14	116.172708	40.13414	海淀区				
15	116.177473	40.13408	海淀区				
16	116.176713	40.13839	海淀区				
17	116.169704	40.14551	海淀区				

(2) 使用 R 语言绘制轮廓。打开 RStudio，首先需要读入 Excel 中的坐标数据，比如：

```
> outline=read.xlsx("C:\\Users\\apple\\Desktop\\轮廓.xlsx", colNames = T)
```

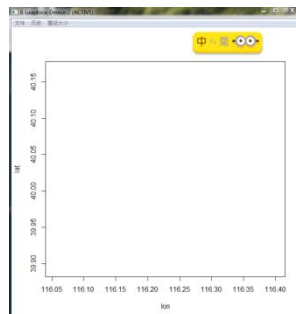
(read.xlsx 函数是 openxlsx 包里的，大家也可以通过其他方式读入，地址改成自己的就行)

其中 colNames=T 表示第一行的数据会被用作变量名。

然后使用 plot 函数绘制图层底板，这样相当于在底板上确定了一个区域的经纬度范围：

```
>plot(outline[,c(1,2)], type="n", pch=".")
```

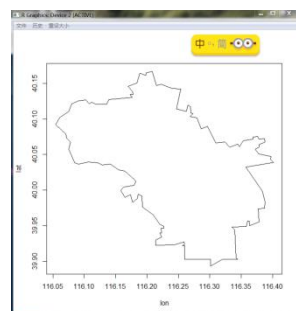
效果如下：



注意到坐标轴已经变成了经纬度。

然后使用多边形绘图函数 polygon 函数绘制轮廓。

```
>polygon(outline$lon,outline$lat)
```



于是我们就得到了海淀区的轮廓。配合 points 等函数可以在地图轮廓的基础上做更多地可视化操作。

2. 使用 ggmap 包里的函数来绘制地图

(参考 github 说明 <https://github.com/dkahle/ggmap>)

ggmap 可以轻松地从流行的在线地图服务如 Google Maps, OpenStreetMaps, Stamen Maps 中检索栅格地图标题, 并且在 ggplot2 的框架中将它们绘制出来。由于 ggmap 是在 ggplot2 的框架下进行绘图的, 而这有很多相似之处。使用时应同时安装这两个包。

(1) 安装 ggmap 包和 ggplot2 包

```
>install.packages("ggmap")
>library(ggmap)
>install.packages("ggplot2")
>library(ggplot2)
```

(2) 如果希望得到某个区域的地图而不做任何处理, 只需要输入经纬度坐标的范围就可以。需要注意的是, 南纬、西经需要用负号表示。比如美国地图:

```
>us <- c(left = -125, bottom = 25.75, right = -67, top = 49)
>map <- get_stamenmap(us, zoom = 5, maptype = "toner-lite")
>ggmap(map)
```

得到的效果:



(3) 使用 qmplot 函数就和 ggplot2 中的 qplot 函数一样, 只不过背景会自动加上地图而已。调用数据集 violent_crimes, 绘制犯罪分布散点图:

```
>qmplot(lon, lat, data = violent_crimes, maptype = "toner-lite", color = I("red"))
```

数据集是这个样子, 注意最后两列经纬度:

	time	date	hour	precinct	offense	beat	block	street	type	suffix	number	month	day	location	address	lon	lat
1	2010-01-01 10:00:00	1/1/2010	5	206	aggravated assault	2410	2500-2599	horne	-		1	january	friday	residence / house	2500 horne	-91.36188	29.77802
2	2010-01-01 20:00:00	1/1/2010	8	206	rape	2410	2500-2599	garfield	st	-	1	january	friday	residence / house	2500 garfield st	-91.36427	29.75905
3	2010-01-01 08:00:00	1/1/2010	18	187	robbery	1820	400-499	gray	W		1	january	saturday	strip business center parking lot	400 gray	-91.37056	29.75141
4	2010-01-04 04:00:00	1/5/2010	14	210	robbery	6820	5500-5599	north	flwy bar	E	1	january	sunday	restaurant / cafeteria	5500 north flwy bar	-91.36237	29.76228
5	2010-01-05 18:00:00	1/5/2010	4	20A	aggravated assault	2410	2500-2599	white oak	dr	-	1	january	tuesday	apartment	2500 white oak dr	-91.36237	29.78902
6	2010-01-06 04:00:00	1/5/2010	14	670	aggravated assault	10400	1000-1099	alabama	st	-	1	january	tuesday	convenience store	1000 alabama st	-91.37061	29.75166
7	2010-01-06 08:00:00	1/5/2010	18	118	aggravated assault	1820	500-599	pacific	-		1	january	tuesday	road / street / sidewalk	500 pacific	-91.36821	29.76800
8	2010-01-06 11:00:00	1/5/2010	21	210	robbery	2420	3700-3799	main	N		1	january	tuesday	restaurant / cafeteria	3700 main	-91.37880	29.73827
9	2010-01-07 07:00:00	1/6/2010	17	680	robbery	12020	6800-6899	gulf	W		1	january	wednesday	department / discount store	6800 gulf flwy bar	-91.36237	29.76228
10	2010-01-07 23:00:00	1/7/2010	9	120	robbery	2810	1000-1099	quintana	flwy bar	-	1	january	thursday	grocery / supermarket	1000 quintana	-91.36858	29.76202
11	2010-01-08 04:00:00	1/7/2010	14	660	robbery	1820	500-599	alabama	st	W	1	january	thursday	construction site	500 alabama st	-91.36936	29.73889
12	2010-01-08 07:00:00	1/7/2010	17	180	rape	25040	1200-1299	valle	st	-	1	january	thursday	field / woods	1200 valle st	-91.36936	29.76288
13	2010-01-10 09:00:00	1/9/2010	15	680	robbery	2810	2500-2599	fulham	st	-	1	january	saturday	department / discount store	2500 fulham st	-91.36936	29.76184
14	2010-01-10 09:00:00	1/9/2010	16	680	robbery	2810	2500-2599	chewen	st	-	1	january	saturday	department / discount store	2500 chewen st	-91.37050	29.75445
15	2010-01-10 12:00:00	1/9/2010	22	118	aggravated assault	1810	500-599	offerson	st	-	1	january	saturday	road / street / sidewalk	500 offerson st	-91.37094	29.75156
16	2010-01-10 16:00:00	1/9/2010	2	18C	robbery	20450	1200-1299	le branch	-		1	january	sunday	convenience store parking lot	1200 le branch	-91.36237	29.76223
17	2010-01-11 09:00:00	1/10/2010	15	694	aggravated assault	1810	1800-1899	le branch	-		1	january	sunday	hospital	1800 le branch	-91.36936	29.74786
18	2010-01-12 11:00:00	1/13/2010	21	18C	robbery	10450	2500-2599	magneson	st	-	1	january	monday	convenience store parking lot	2500 magneson st	-91.36231	29.73841
19	2010-01-12 12:00:00	1/13/2010	22	118	aggravated assault	1810	1800-1899	van justice	-		1	january	monday	bus station	1800 van justice	-91.36427	29.76957
20	2010-01-13 18:00:00	1/15/2010	5	20A	aggravated assault	2440	1700-1799	crockett	st	-	1	january	wednesday	apartment	1700 crockett st	-91.37037	29.75722
21	2010-01-14 00:00:00	1/15/2010	10	118	aggravated assault	10400	1500-1599	holman	-		1	january	wednesday	road / street / sidewalk	1500 holman	-91.37050	29.75609
22	2010-01-15 12:00:00	1/14/2010	22	618	aggravated assault	10400	2700-2799	holman	bar / night club	-	2	january	thursday	bar / night club	2700 holman	-91.37037	29.76227
23	2010-01-15 14:00:00	1/15/2010	0	210	robbery	18020	1800-1899	west 5th s	-		1	january	friday	restaurant / cafeteria	1800 west 5th s	-91.36427	29.76220
24	2010-01-15 15:00:00	1/15/2010	1	189	robbery	1820	2400-2499	branson	st	-	1	january	friday	bar / night club parking lot	2400 branson st	-91.36983	29.75880
25	2010-01-16 03:00:00	1/15/2010	13	206	aggravated assault	7C10	2300-2399	torrance	st	-	1	january	friday	residence / house	2300 torrance st	-91.36596	29.73953
26	2010-01-16 14:00:00	1/16/2010	6	118	robbery	2810	2400-2499	smith	st	-	1	january	saturday	road / street / sidewalk	2400 smith st	-91.36236	29.76223
27	2010-01-17 12:00:00	1/16/2010	22	118	robbery	1820	1400-1499	gray	W		1	january	saturday	bus stop	1400 gray	-91.36749	29.76452
28	2010-01-17 14:00:00	1/17/2010	0	118	robbery	10400	2300-2399	axelrod	st	-	1	january	sunday	road / street / sidewalk	2300 axelrod st	-91.36936	29.74529
29	2010-01-17 20:00:00	1/17/2010	6	118	robbery	10400	1000-1099	gray	st	-	1	january	sunday	road / street / sidewalk	1000 gray	-91.37061	29.76884
30	2010-01-18 10:00:00	1/17/2010	20	20A	robbery	1820	200-299	alabama	st	W	1	january	sunday	apartment	200 alabama st	-91.36936	29.73882
31	2010-01-18 15:00:00	1/18/2010	1	680	robbery	1820	400-499	gray	-		1	january	monday	drug store / medical supply	400 gray	-91.37056	29.75141
32	2010-01-19 11:00:00	1/18/2010	21	118	robbery	1810	200-299	holman	st	W	1	january	monday	road / street / sidewalk	200 holman st	-91.37037	29.75953
33	2010-01-19 11:00:00	1/18/2010	21	210	aggravated assault	10400	2000-2099	deadling	st	-	1	january	monday	other / unknown	2000 deadling st	-91.36936	29.76166
34	2010-01-19 18:00:00	1/19/2010	4	118	robbery	10400	1800-1899	magneson	st	-	1	january	tuesday	road / street / sidewalk	1800 magneson st	-91.36858	29.74908
35	2010-01-20 16:00:00	1/20/2010	2	118	robbery	1810	1900-1999	le jagath	phwy	-	1	january	wednesday	park & recreation, zoo, swimming pool	1900 le jagath phwy	-91.36175	29.74510

绘图效果:



(4) 在上图的基础上, 绘制犯罪的等高线, 更直观地感受不同街区的犯罪密集程度:

```
>qmplot(lon, lat, data=violent_crimes, maptype="toner-lite", geom="density2d",  
color = I("red"))
```



与 (3) 中的程序区别是多了 geom 参数。

(5) 如果想得到谷歌地图可以使用函数 get_googlemap, 国内使用好像需要 vpn

```
>get_googlemap("waco texas", zoom = 12, maptype = "satellite") %>% ggmap()
```

可以得到卫星图。使用谷歌地图也可以得到两点之间的路线、得到地点的经纬度坐标等等, 这些在最开始给出的 github 网站上都有详细说明。需要注意的是, github 网站上似乎有几个程序无法正常运行, 会提示错误。

3. 使用 REmap 包和百度地图 API

参考网站:

<https://github.com/Lchiffon/REmap>

<https://www.jianshu.com/p/31c9194c95f3>

<https://blog.csdn.net/fairewell/article/details/72461191>

(1) REmap 是一个基于 Echarts 的一个 R 包，提供了一个简便的、可交互的地图数据可视化工具，目前托管在 Github 上。安装过程：

```
>install.packages("devtools")
>library(devtools)
>install_github('lchiffon/REmap')
>library(REmap)
```

(2) 基本函数介绍

>get_city_coord("Shanghai") 获取单个城市的经纬度坐标

```
> get_city_coord("Shanghai")
[1] 121.55880 31.23115
```

```
>city_vec = c("北京","Shanghai","广州")
```

>get_geo_position (city_vec) 获取城市向量的坐标

```
> get_geo_position (city_vec)
      lon      lat  city
1 121.558802 31.231151 Shanghai
12 116.413554 39.911013 北京
21 113.270793 23.135308 广州
```

(3) 绘制迁徙地图 remap

```
>origin = rep("北京",10)
```

```
>destination = c('上海','广州','大连','南宁','南昌',
                  '拉萨','长春','包头','重庆','常州')
```

```
>dat = data.frame(origin,destination)
```

```
>remap(dat,title = "REmap 实例数据",subtitle = "theme:Dark")
```

dat 是一个数据框，第一列为出发地点，第二列为到达地点
结果是动态可交互的画面，截图如下：



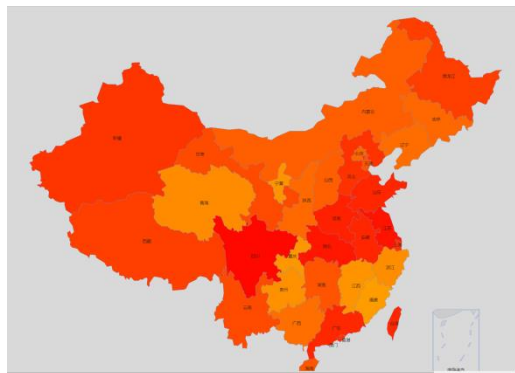
get_theme 函数提供了迁徙地图中常用的颜色调整，包括风格、线的颜色、背景颜色等等。
查看帮助文档?get_theme 了解详细参数信息。

(4) 分级统计图 remapC。分级统计图就是根据区域数值的多少进行深浅不同的颜色填充的地图形式。下面使用自带数据集 chinaIphone，部分数据集如下：

	V1	V2
1	北京	629
2	天津	516
3	上海	280
4	重庆	933
5	河北	296
6	河南	172
7	云南	443
8	辽宁	656
9	黑龙江	371
10	湖南	508
11	安徽	205
12	山东	203
13	新疆	298
14	江苏	94

```
>remapC(chinaIphone,color = c('orange','red'))
```

效果如图所示，由低到高是红色到橙色



也可以绘制世界地图，只要把 maptype 改成“world”就可以了。

(5) mapNames() 函数可以得到某个地图下的子图信息

```
>mapNames("beijing")
```

```
> mapNames("beijing")
[1] "密云县" "怀柔区" "房山区" "延庆县" "门头沟区" "昌平区" "大兴区" "顺义区" "平谷区"
[10] "通州区" "朝阳区" "海淀区" "丰台区" "石景山区" "西城区" "东城区" "宣武区" "崇文区"
```

(6) remapB 函数标记点或线，remapH 生成热力图

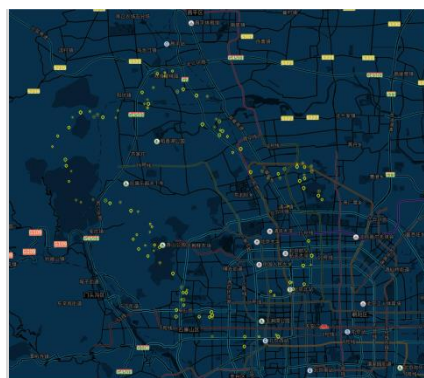
下面我们用 remapB 画出海淀区的轮廓

```
>haidian=read.xlsx("C:\\Users\\apple\\Desktop\\轮廓.xlsx")
```

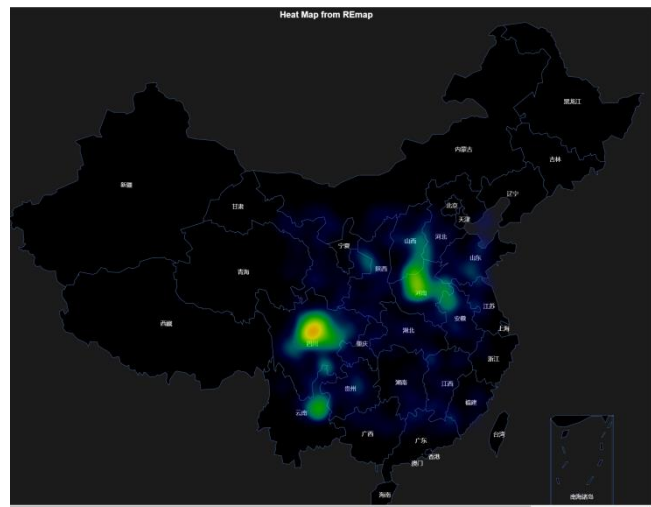
```
>number=c(1:nrow(haidian))
```

```
>data=data.frame(haidian,number)
```

```
>remapB(center = get_city_coord("beijing"),zoom=12,color =
"midnight",markPointData = data[3],markPointTheme = markPointControl(symbol =
'pin',symbolSize = 3,effect = T,color = "yellow"),geoData = data)
```



```
>heatmap = sampleData()
>remapH(heatmap,minAlpha = 0.1,title = "Heat Map from REmap")
```



4. leaflet & leafletCN

<https://github.com/Lchiffon/leafletCN>

<http://rstudio.github.io/leaflet/>

leafletCN 是一个基于 leaflet 的中国拓展包，里面保存了一些适用于中国的区域划分数据和函数，行政区划细致到县级市。

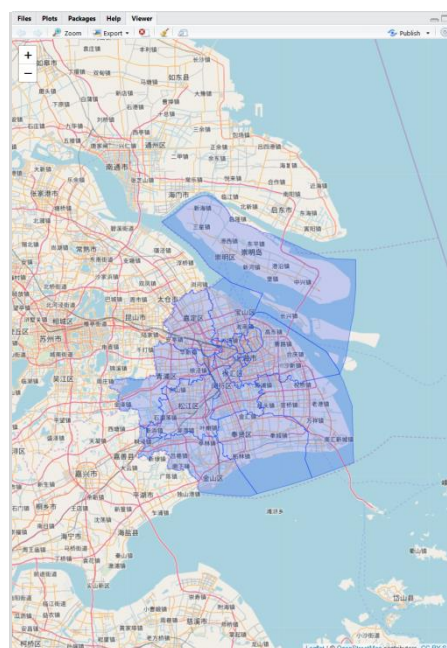
(1) regionNames 函数传入城市名，显示支持的区域信息

```
>regionNames("上海")
```

```
> regionNames("上海")
[1] "崇明县" "南汇区" "奉贤区" "浦东新区" "金山区" "青浦区" "松江区" "嘉定区" "宝山区"
[10] "闵行区" "杨浦区" "普陀区" "徐汇区" "长宁区" "闸北区" "虹口区" "黄浦区" "卢湾区"
[19] "静安区"
```

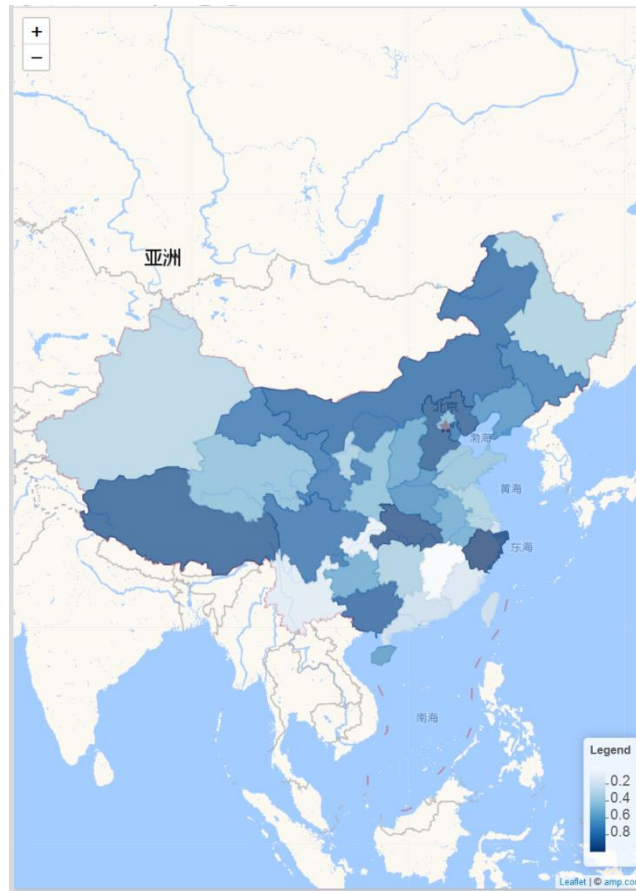
(2) demomap 传入城市名，显示这个地区的示例地图

```
>demomap("上海")
```



(3) geojsonmap 数据框操作，值得注意的是输入“上海”还是“上海市”并没有影响。

```
>dat = data.frame(name = regionNames("china"),
  value = runif(34))
>geojsonMap(dat,"china")
```



(4) amap 叠加高德地图

```
>leaflet() %>%
  amap() %>%
  addMarkers(lng=116.37, lat=39.96, popup="BNU")
```

