Package 'shapefiles'

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Title Read and Write ESRI Shapefiles

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Description Functions to read and write ESRI shapefiles

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R topics documented:

`shapefiles` *Read and write ESRI shapefiles*

Description

This package includes functions to read and write ESRI shapefiles.

Usage

```
read.shapefile(shape.name)
read.shp(shp.name)
read.shx(shx.name)
read.dbf(dbf.name, header=FALSE)
write.shapefile(shapefile, out.name, arcgis=FALSE)
write.shp(shp, out.name)
write.shx(shx, out.name)
write.dbf(dbf, out.name, arcgis=FALSE)
calc.header(shapefile)
add.xy(shapefile)
scaleXY(shapefile, scale.factor)
convert.to.shapefile(shpTable, attTable, field, type)
convert.to.simple(shp)
change.id(shpTable, newFieldAsVector)
dp(points, tolerance)
```

Arguments

`shape.name`	String of the shapefile file name without an extension
`shp.name`	String of the shp file name with an extension
`shx.name`	String of the shx file name with an extension
`dbf.name`	String of the dbf file name with an extension
`shapefile`	The shapefile object of lists created by read.shapefile
`out.name`	Filename to write the data to
`shp`	shp portion (list) of the shapefile object of lists
`shx`	shx portion (list) of the shapefile object of lists
`dbf`	dbf portion (list) of the shapefile object of lists
`scale.factor`	Number to divide the shapefile geography by
`arcgis`	Replace "." with "_" in column names for ArcGIS
`shpTable`	data.frame with columns in order Id, X, and Y
`attTable`	data.frame with first column names "Id" - polygon id (key)
`type`	ESRI Shape type 1=point, 3=polyLine, 5=polygon
`field`	A field name in the attTable
`newFieldAsVector`	A vector of Ids to replace to the Ids in the shpTable
`points`	A named list of two vectors (x and y) representing points
`tolerance`	A tolerance setting for the DP polyLine simplification algorithm
`header`	Should read.dbf return the header?

Details

ESRI shapefiles consist of three files. The first file (*.shp) contains the geography of each shape. The second file (*.shx) is an index file which contains record offsets. The third file (*.dbf) contains feature attributes with one record per feature.

`read.shapefile` calls `read.shp, read.shx`, and `read.dbf` to read in an entire shapefile. The result of `read.shapefile` is a list of many more lists. The sublists are `shp`, `shx`, and `dbf`. Each sublist contains a header list and some sort of data list. The shp list is a list of `$shp$header` and `$shp$shp`. The shx list is a list of `$shx$header` and `$shx$index`. The dbf list is a list of `$dbf$header` and `$dbf$dbf`.

The write functions write out a shp, shx, and dbf file from the shapefile list structure. To write out a shapefile from simple R data, you need to run `convert.to.shapefile`. The inputs to this function are a simple data frame of points (for points, polyLines, or polygons) and a data frame representing the dbf file. Examples are below.

The package reads shape types 1 (point), 3 (polyLine), 5 (polygon), 13 (polyLineZ), and 15 (polygonZ). Reading of shape type 13 and 15 from Don MacQueen, ⟨macq@llnl.gov⟩

The package writes shape types 1 (point), 3 (polyLine), 5 (polygon), 13 (polyLineZ), and 15 (polygonZ). Conversion of simple polygons to shapefile format from Manuel Chirouze, ⟨Manuel.Chirouze@benfieldgroup.com⟩

For simple features, the only difference between polyLines and polygons is that the first and last point is the same for a polygon. The `convert.to.simple` function can be used to simplify the shp file to a simple data.frame. The `change.id` function can then be used to change the Id field for the simple shp data.frame to a field from a data.frame (dbf).

For details about the ESRI shapefile structure refer to http://www.esri.com/library/whitepapers/pdfs/shapefile.pdf. A detailed description of DBF files can be found at http://www.e-bachmann.dk/docs/xbase.htm. The `arcgis` argument to `write.dbf` replaces "." with "_" in field names since ArcGIS does not allow the former. Note that the `read.dbf` and `write.dbf` functions in the foreign package are now used for reading and writing dbfs, which greatly improves the speed of reading/writing dbfs.

Function `dp` is an implementation of the Douglas-Peucker polyLine simplification algorithm. Douglas, D. and Peucker, T. (1973). "Algorithms for the reduction of the number of points required to represent a digitized line or its caricature." The Canadian Cartographer 10(2). 112-122. `dp` currently uses the line, not the line segment to determine the distance of the points from the line. This can result in the omission of extreme "outlier-like" points. See http://www.lgc.com/resources/Doug_Peucker.pdf for more information.

Value

`read.shapefile`	list	shapefile list object
`read.shp`	list	shp list object
`read.shx`	list	shx list object
`read.dbf`	list	DBF list object
`write.shapefile`	NA	Nothing returned

write.shp	NA	Nothing returned
write.shx	NA	Nothing returned
write.dbf	NA	Nothing returned
calc.header	list	shapefile list object
add.xy	list	shapefile list object
scaleXY	list	shapefile list object
convert.to.shapefile	list	shapefile list object
convert.to.simple	list	data.frame list data.frame
change.id	list	data.frame list data.frame
dp	list	data.frame list data.frame

Author(s)

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Examples

```
## Not run:
#Read entire shapefile
shapefile <- read.shapefile("links")

#Write entire shapefile
write.shapefile(shapefile, "temp", T)

#Read shp, shx, or dbf file
dbf <- read.dbf("links.dbf")

#Write shp, shx, or dbf file
write.dbf(dbf, "links.dbf", T)

#Calculate header (to clean up GeoMedia shapefile exports)
shapefile <- calc.header(shapefile)

#Add the X and Y coordinates to the dbf list of the shapefile list object
shapefile <- add.xy(shapefile)

#Scale the shapefile by scale.factor
shapefile <- scaleXY(shapefile, scale.factor)

#Samples of using the convert.to.shapefile function to write out simple shapefiles
#from basic R data.frames

#Point
dd <- data.frame(Id=c(1,2),X=c(3,5),Y=c(9,6))
ddTable <- data.frame(Id=c(1,2),Name=c("Item1","Item2"))
ddShapefile <- convert.to.shapefile(dd, ddTable, "Id", 1)
write.shapefile(ddShapefile, "c:/test", arcgis=T)
```

```
#PolyLine
dd <- data.frame(Id=c(1,1,1,2,2,2),X=c(3,5,8,6,7,8),Y=c(9,8,3,6,7,4))
ddTable <- data.frame(Id=c(1,2),Name=c("Item1","Item2"))
ddShapefile <- convert.to.shapefile(dd, ddTable, "Id", 3)
write.shapefile(ddShapefile, "c:/test", arcgis=T)

#Polygon
dd <- data.frame(Id=c(1,1,1,1,2,2,2,2),X=c(3,5,8,3,6,7,8,6),Y=c(9,8,3,9,6,7,4,6))
ddTable <- data.frame(Id=c(1,2),Name=c("Item1","Item2"))
ddShapefile <- convert.to.shapefile(dd, ddTable, "Id", 5)
write.shapefile(ddShapefile, "c:/test", arcgis=T)

#Convert to list of shapes
ddAsList <- by(dd,dd$Id, function(x) x)

#Convert to data.frame
dd <- do.call(rbind, ddAsList)

#Read in shp file and convert to simple format
shpTest <- read.shp("c:/test.shp")
simpleShpFormat <- convert.to.simple(shpTest)
simpleShpFormat <- change.id(simpleShpFormat, c("a","b"))
simpleAsList <- by(simpleShpFormat, simpleShpFormat[,1], function(x) x)
backToShape <- convert.to.shapefile(simpleShpFormat,
        data.frame(index=c("a","b")), "index", 5)
write.shapefile(backToShape, "c:/test", arcgis=T)

#Polyline simplification with dp algorithm
x <- c(5,3,4,1,8,9,10,11)
y <- c(6,4,2,1,1,5,2,3)
points <- list(x=x,y=y)
plot(points, type="l")
simpleLine <- dp(points, 2)
lines(simpleLine, type="l", col="blue")

## End(Not run)
```

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