iemisc: Engineering Survey Examples

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Contents

Replicate the R code **1**

Midpoint **2**
Examples . . . 2

Engineering Survey 1 (engr_survey) **3**
Example 1 . . . 3
Example 2 . . . 4

Engineering Survey 1 Batch Mode (engr_survey_batch) **5**
Examples . . . 5

Engineering Survey 2 (engr_survey2) **6**
Examples . . . 6

Engineering Survey 3 (engr_survey3) **6**
Example . . . 6

Engineering Survey 4 (engr_survey4) **7**
Example . . . 7

Conversion of Latitude/Longitude Coordinates to Engineering Survey Measurements (engr_survey_reverse) **7**

EcoC²S Links **8**

Copyright and License **8**

Replicate the R code

Note: If you wish to replicate the R code below, then you will need to copy and paste the following commands in R first (to make sure you have the package and its dependencies):

```
install.packages("iemisc", "pander")
# install the packages and their dependencies
```

```
# load the required packages
install.load::load_package("iemisc", "pander")
```

Midpoint

Examples

```
Northing_begin <- 283715.8495
Easting_begin <- 1292428.3999

Northing_end <- 303340.6977
Easting_end <- 1295973.7743

pander(project_midpoint(Northing_begin, Easting_begin, Northing_end, Easting_end,
    units = "survey_ft", location = "TN", output = "advanced"))
```

Parameters	Value
Begin Project (X = East, Y = North) [US survey foot]	Tennessee 4100 1292428.3999, 283715.8495
End Project (X = East, Y = North) [US survey foot]	Tennessee 4100 1295973.7743, 303340.6977
Begin Project (X = East, Y = North) [international foot]	Tennessee 4100 1292430.9848, 283716.4169
End Project (X = East, Y = North) [international foot]	Tennessee 4100 1295976.3663, 303341.3044
Begin Project (X = East, Y = North) [meters]	Tennessee 4100 393932.9642, 86476.7639
End Project (X = East, Y = North) [meters]	Tennessee 4100 395013.5964, 92458.4296
Begin Project Degrees (Latitude, Longitude)	35.0913, -88.2600
Midpoint Project Degrees (Latitude, Longitude)	35.1184, -88.2548
End Project Degrees (Latitude, Longitude)	35.1454, -88.2496

```
# Tennessee (TN) Northing and Easting in meters

Northing2 <- c(232489.48, 234732.431)

Easting2 <- c(942754.124, 903795.239)

dt4A <- project_midpoint(Northing2[1], Easting2[1], Northing2[2], Easting2[2], "meters",
    "TN", output = "advanced")
pander(dt4A)
```

Parameters	Value
Begin Project (X = East, Y = North) [US survey foot]	Tennessee 4100 3093019.1552, 762759.2356
End Project (X = East, Y = North) [US survey foot]	Tennessee 4100 2965201.5466, 770117.9840
Begin Project (X = East, Y = North) [international foot]	Tennessee 4100 3093025.3412, 762760.7612
End Project (X = East, Y = North) [international foot]	Tennessee 4100 2965207.4770, 770119.5243
Begin Project (X = East, Y = North) [meters]	Tennessee 4100 942754.1240, 232489.4800
End Project (X = East, Y = North) [meters]	Tennessee 4100 903795.2390, 234732.4310
Begin Project Degrees (Latitude, Longitude)	36.3685, -82.1797

Parameters	Value
Midpoint Project Degrees (Latitude, Longitude)	36.3852, -82.3961
End Project Degrees (Latitude, Longitude)	36.4016, -82.6127

Engineering Survey 1 (engr_survey)

Example 1

```
# Tennessee (TN) Northing and Easting in US Survey foot
Northing3 <- c("630817.6396", "502170.6065", "562,312.2349", "574,370.7178")

Easting3 <- c("2559599.9201", "1433851.6509", "1,843,018.4099", "1,854,896.0041")

dt3A <- engr_survey(Northing3[1], Easting3[1], "survey_ft", "TN", output = "basic",
    utm = 1)
pander(dt3A)  # first set of Northing, Easting points
```

- **data_check**:

X	Y
-84	36.05

- **utm**:

id	UTM Zone	UTM X = East [US survey foot]	UTM Y = North [US survey foot]
1	16S	2526981	13102431

Hemisphere
North

```
dt3B <- engr_survey(Northing3[2], Easting3[2], "survey_ft", "TN", output = "basic",
    utm = 0)
pander(dt3B)  # second set of Northing, Easting points
```

X	Y
-87.8	35.7

```
dt3C <- engr_survey(Northing3[3], Easting3[3], "survey_ft", "TN", output = "basic",
    utm = 1)
pander(dt3C)  # third set of Northing, Easting points
```

- **data_check**:

X	Y
-86.42	35.88

- **utm**:

id	UTM Zone	UTM X = East [US survey foot]	UTM Y = North [US survey foot]
1	16S	1811130	13026554

Hemisphere
North

```
dt3D <- engr_survey(Northing3[4], Easting3[4], "survey_ft", "TN", output = "basic",
    utm = 0)
pander(dt3D)  # fourth set of Northing, Easting points
```

X	Y
-86.38	35.91

Example 2

```
# Tennessee (TN) Northing and Easting in meters

Northing4 <- c(232489.48, 234732.431)

Easting4 <- c(942754.124, 903795.239)

dt4A <- engr_survey(Northing4[1], Easting4[1], "meters", "TN", output = "table",
    utm = 0)
pander(dt4A)
```

Parameters	Value
Degrees (Latitude, Longitude)	36.36846, -82.17969
Degrees Minutes (Latitude, Longitude)	36 22.10732, -82 10.78127
Degrees Minutes Seconds (Latitude, Longitude)	36 22 6.43922, -82 10 46.87677
State Plane (X = East, Y = North) [meters]	Tennessee 4100 942754.12, 232489.48

Parameters	Value
State Plane (X = East, Y = North) [US survey foot]	Tennessee 4100 3093019.16, 762759.24
State Plane (X = East, Y = North) [international foot]	Tennessee 4100 3093025.34, 762760.76

```
dt4B <- engr_survey(Northing4[2], Easting4[2], "meters", "TN", output = "table",
    utm = 0)
pander(dt4B)
```

Parameters	Value
Degrees (Latitude, Longitude)	36.40158, -82.61269
Degrees Minutes (Latitude, Longitude)	36 24.09480, -82 36.76122
Degrees Minutes Seconds (Latitude, Longitude)	36 24 5.68834, -82 36 45.67356
State Plane (X = East, Y = North) [meters]	Tennessee 4100 903795.239, 234732.431
State Plane (X = East, Y = North) [US survey foot]	Tennessee 4100 2965201.547, 770117.984
State Plane (X = East, Y = North) [international foot]	Tennessee 4100 2965207.477, 770119.524

Engineering Survey 1 Batch Mode (engr_survey_batch)

Examples

```
# Tennessee (TN) Northing and Easting in meters

Northing2 <- c(232489.48, 234732.431)

Easting2 <- c(942754.124, 903795.239)

dt4 <- engr_survey_batch(Northing2, Easting2, "meters", "TN", output = "table")
pander(dt4)
```

Parameters	Value
Degrees (Latitude, Longitude)	36.36845, -82.17968
Degrees Minutes (Latitude, Longitude)	36 22.10732, -82 10.78127
Degrees Minutes Seconds (Latitude, Longitude)	36 22 6.43922, -82 10 46.87677
State Plane (X = East, Y = North) [meters]	Tennessee 4100 942754.12, 232489.48
State Plane (X = East, Y = North) [US survey foot]	Tennessee 4100 3093019.14, 762759.24
State Plane (X = East, Y = North) [international foot]	Tennessee 4100 3093025.33, 762760.76

Parameters	Value
Degrees (Latitude, Longitude)	36.40158, -82.61268
Degrees Minutes (Latitude, Longitude)	36 24.09480, -82 36.76122
Degrees Minutes Seconds (Latitude, Longitude)	36 24 5.68834, -82 36 45.67356
State Plane (X = East, Y = North) [meters]	Tennessee 4100 903795.239, 234732.431
State Plane (X = East, Y = North) [US survey foot]	Tennessee 4100 2965201.547, 770117.984
State Plane (X = East, Y = North) [international foot]	Tennessee 4100 2965207.477, 770119.524

Engineering Survey 2 (engr_survey2)

Examples

```
station5 <- "516+64.10"
station6 <- "511+29.10"

engr_survey2(station5, station6, units1 = "foot", units2 = "kilometers")

## 0.163068 [km]
station7 <- "303+91.00"
station8 <- "299+41.00"

engr_survey2(station7, station8, units1 = "meters", units2 = "foot")

## 450 [ft]
station9 <- "43+50.00"
station10 <- "52+00.00"

engr_survey2(station9, station10, units1 = "foot", units2 = "mile")

## 0.1609848 [international_mile]
```

Engineering Survey 3 (engr_survey3)

Example

```
engr_survey3(23, station_distance = 100, units = "survey_mile", output = "numeric")
```

```
## [1] 1214.402
```

Engineering Survey 4 (engr_survey4)

Example

```
engr_survey4(1394.32, "45+43.12", units = "kilometers")
```

```
## [1] "Sta. 50288+52.68"
```

Conversion of Latitude/Longitude Coordinates to Engineering Survey Measurements (engr_survey_reverse)

```
# Tennessee

lat <- 35.8466965

long <- -88.9206794

dt1A <- engr_survey_reverse(lat, long, units = "survey_ft", location = "TN", output = "table",
    utm = 0)
pander(dt1A)
```

Parameters	Value
Degrees (Latitude, Longitude)	35.8467, -88.92068
Degrees Minutes (Latitude, Longitude)	35 50.80178, -88 55.24076
Degrees Minutes Seconds (Latitude, Longitude)	35 50 48.10739, -88 55 14.44584
State Plane (X = East, Y = North) [meters]	Tennessee 4100 336204.8118, 171842.6309
State Plane (X = East, Y = North) [US survey foot]	Tennessee 4100 1103031.9533, 563787.0316
State Plane (X = East, Y = North) [international foot]	Tennessee 4100 1103034.1594, 563788.1592

```
# Kentucky

lats <- "37'50'21.5988''N"
longs <- "84'16'12.0720'W"

dt2B <- engr_survey_reverse(lats, longs, "foot", "KY", output = "table", utm = 0)
```

```
pander(dt2B)
```

Parameters	Value
Degrees (Latitude, Longitude)	37.83933, -84.27002
Degrees Minutes (Latitude, Longitude)	37 50.35998, -84 16.20119
Degrees Minutes Seconds (Latitude, Longitude)	37 50 21.59880, -84 16 12.07199
State Plane (X = East, Y = North) [meters]	Kentucky (Single Zone) 1600 1630255.5592, 1168172.2563
State Plane (X = East, Y = North) [US survey foot]	Kentucky (Single Zone) 1600 5348596.7804, 3832578.4776
State Plane (X = East, Y = North) [international foot]	Kentucky (Single Zone) 1600 5348607.4776, 3832586.1427

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