Haversine formula

Distance between two points

```
custom_hav_dist <- function(lat1, lon1, lat2, lon2) {
    R <- 6371
    Radian_factor <- 0.0174533
    lat_1 <- (90 - lat1) * Radian_factor
    lat_2 <- (90 - lat2) * Radian_factor
    diff_long <- (lon1 - lon2) * Radian_factor

    distance_in_km <- 6356.137 * acos((cos(lat_1) * cos(lat_2)) + (sin(lat_1) * sin(lat_2) * cos(diff_l
    rm(lat1, lon1, lat2, lon2)
    return(distance_in_km * 10^3)
}
```

Conversion

To convert latitudinal and longitudinal coordinates into Kilo-meters first you must convert those coordinates into radians. Then we compute the x and y in meters.

```
convq <- function(lat, long) {
    # Convert Lat Long to Radians
    lat1rad = lat/180 * 3.14159
    long1rad = long/180 * 3.14159
    # Convert (R,T,r) (Rho, Theta, radius) Polar coordinates
    # into standard (x,y) coordinates
    x = sin(lat1rad) * cos(long1rad) * 6356.137 * 10^3 # Rad is 6356.752 at poles
    y = sin(lat1rad) * sin(long1rad) * 6356.137 * 10^3
    return(list(x, y))
    # Calc straight line distance between 2 points
    # straightLineDist = sqrt((x2 - x1) ^ 2 + (y2 - y1) ^ 2)
    # Use law of cosines to calculate arc distance
    # arcDist = acos(1 - (straightLineDist ^ 2 / (2 * 6356.137 * 10^3 ^ 2))) * 6356.137 * 10^3
    # return arc distance
    # return(arcDist)
}
```

```
qq1 <- convq(46.07151828435007, 11.12053317266584)
qq1<- unlist(qq1)
```

```
qq2 <- convq(46.071618166286214, 11.120960037103822)
qq2<- unlist(qq2)
```

```
(qq <- qq2-qq1)
```

```
## [1]  0.9647629 34.9472237
```

```
custom_hav_dist(46.07151828435007, 11.12053317266584,46.071618166286214, 11.120960037103822 )
```

```
## [1] 34.67082
```