

## Program CENTROID User Instructions

Program CENTROID is used to test the hypothesis that two samples belong to the same bivariate distributions. This procedure is described in Mardia (1967:J. Roy. Stat. Soc., Ser. B, 29:320-342), and Batschelet (1972: Pages 61-91, in Animal Orientation and Navigation, NASA SP-262).

CENTROID will read either recovery records or X-Y coordinates. Recovery records, which include recovery latitude and longitude, of the two samples are read into the program. The program will print out the average latitude and longitude of each group, the average latitude and longitude of the combined sample, the number of duplicate recovery locations, Mardias test statistic, and the probability level.

In order to account for duplicate recovery locations the program prints out four test statistics. The first statistic is computed by breaking all "ties" in favor of group 1 (i.e. group 1 recovery location is ranked lower than group 2). The second statistic is computed by breaking all ties in favor of group 2. The third and fourth statistics are computed by averaging the ranks of all duplicate recovery locations.

Two input files are required by this program:

- 1) Recovery file for group 1.
- 2) Recovery file for group 2.

These recovery files contain the lat-long of recovery in columns 33-39 in the following format:

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    Cols 33-34 : Latitude degrees.  
          35 : Latitude ten-minute block.  
    Cols 36-38 : Longitude degrees.  
          39 : Longitude ten-minute block.
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If the data are in X-Y coordinate form, the coordinates are read in 'free' format (ie: x,y).

CENTROID will prompt the user for the names of the two input files and the output file and titles.

CENTROID Output:

The program computes the mean latitude and longitude of recovery of each group. For the calculations the longitude is transformed, since the length of a degree longitude varies with latitude.

Since the number of duplicate locations has an extreme effect on the test statistic, the program displays the number of ties when recovery locations were ranked. CENTROID also displays the highest order tie (MAX TIES COMPUTED), followed by a breakdown of all other ties (1 WAY TIES, 2 WAY TIES, ...). A "1 way tie" is a distinct location. A "2 way tie" is when two and only two observations occur in the same location. A "mixed tie" occurs when observations from both groups are involved in a tie.

The test statistic is computed four different ways and printed out with a short explanation of how ties were broken in each case.

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Program RUNCENT.BAS runs program centroid for all possible combinations
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data files (useful for comparing distributions from different reference
areas).
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