Program to Determine the Terrain Roughness Index using Path Profile Data Sampled at Different Moving Window Sizes

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Abstract

In this paper development of a program to determine the terrain roughness index using path profile data sampled at different moving window sizes is presented. Relevant mathematical expressions and algorithm to determine terrain roughness index from elevation data captured at different moving window sizes are presented. The desktop program is written in Visual Basic for Application. The program enables users to sample the elevation data at a given window size and then determine the terrain roughness parameters at any other window size that is multiple of the original sampling window size. Sample 58.5523249 Km study path location that started at a latitude of 5.48717 and longitude of 7.04193 and ended at a latitude of 5.82096 and a longitude of 7.45042 was used to demonstrate the effectiveness of the software. Specifically, Geocontext online elevation profile software is used on the study path to capture \( N = 512 \) path profile data at an initial window size of 3.75 seconds which is equivalent to a distance of 114.5838061 m. The roughness index is computed at four (4) other sampling window sizes of 30 seconds, 1 minute (60 seconds), 5 minutes (300 seconds) and 10 minutes (600 seconds).
Among other things the program showed the window sizes and their corresponding terrain roughness index along with the elevation profile table and graph for each of the sampling window size. The results show that as the widows size increases the total number of sample data points decreases. Also, the largest terrain roughness index value of 52.89 m is observed with window size of 300 seconds whereas the lowest largest terrain roughness index value of 33.55 m is observed with window size of 600 seconds. The idea presented in this paper is useful for wireless network designer who relies on terrain roughness value for the determination of the multipath fade depth for detailed link design.

References

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Index Terms

Computer Science

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Keywords

Multipath, Fading Depth, Terrain Roughness Index, Elevation Profile, Geographic Reference System, Sampling Window