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The use of GRASS QGIS in detailed mapping of slopes in the Greater Tzaneen Local Municipality, Limpopo Province, South Africa

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Digital elevation models and field measurements can be integrated in a GIS to enable rapid mapping of slopes for use in geomorphological studies. For example, computation of slope angles can be used in forecasting and estimating environmental phenomena, such as landslides, sediment deposition and soil erosion. Digital elevation models are an efficient data source for deriving slope within a GIS environment.

This study assesses the suitability of GRASS GIS running under QGIS, in accurately delineating slope classes within the Greater Tzaneen Local Municipality. The primary objective of this study was to evaluate the suitability of GRASS GIS in mapping of slopes. To meet this objective a slope map was generated from a 90 by 90 meters resolution Shuttle Radar Topography Mission (SRTM) DEM using the open source GRASS GIS software, and the results compared with field based measurements in order to assess the accuracy of generated slope classes by the open source software.

A slope map was generated using a GRASS GIS plugin within QGIS and the slope values were then compared with field measured slope values to assess the performance of GRASS. The generated slope map was reclassified into a range of slope classes. Field measurements were taken using a GPS and a Brunton compass clinometer, whereby the GPS was used to locate the position of preselected sample points and the compass clinometer to measure slope angle.

The correlation between GRASS generated slope classes and field measured slope values gave an r-value of 0.73, suggesting a strong correlation between the two data sets. However, a confusion matrix gave an overall accuracy of the software classification of 57%. The variation could be attributed to factors such as the resolution of the DEM and inherent instrumental errors during field measurements. It is evident that variations in slope measurements derived from digital elevation models can result in erroneous slope estimates of environmental phenomena that are dependent on slope. This therefore necessitates further testing in order to affirm the suitability of the software in detailed slope mapping.

References

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