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CONTENT

Poster section

THE EFFECT OF INPUT PARAMETERS IN THE MODELLING OF DMR

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Abstract

The aim of this paper is to create and compare digital elevation models, morphometric and hydrologic analyses which are made of contour lines and measured altitudinal points in the cadastral area Hajske. Next we compare paths of surface flow with terrain measures to verify the accuracy of data. The introduction contains a brief characteristic of the geographical information system, a digital elevation model, the intensity of water erosion, morphometric and hydrologic analysis. The next deals with the characteristics of the cadastral area Hajske and the method of creating maps in the computer program ArcGIS 10.

The results of this thesis contain comparisons of separate morphometric and hydrologic analyses, these analyses are compared to the measured data in the terrain. By field measurements we found out that the maps made of measured points are more accurate and copy the reality better than the maps of the elevation lines.

Keywords: geographical information system, digital elevation model, morphometric characteristics, hydrologic analysis

Introduction

Landscape is the visible part of Earth's surface, which consists of the following: relief, soil, waters, natural ingredients like fauna and vegetation and also like ingredients, which are created by humans. It is the space of our lives. The fact that we live in it and we shape it to our needs, means that we affect this landscape either positively or negatively. Besides the processes caused by humans itself, another internal and external processes have impact on the natural conditions of the landscape. Important part of the landscape is the georelief, which is the cortex of Earth. Landscape processes have significant impact on the georelief, because it is in contact with the pedosphere, lithosphere and atmosphere like hydrosphere.

Relief of the earth is the contact surface between the atmosphere (hydrosphere) and the pedosphere, it is the result of the exposure of exogenous and endogenous forces. Beside of

these forces, human acts also influence the relief, therefore it is necessary to know its geometrical attributes.

In general, we can say, that the digital elevation model (DEM) is the set of selected points on the terrain, their coordinates are saved in a specific system into the computer memory. This set of points is filled up with the help of additional programs, which are making possible to gain further information from the saved set of points (Bitterer, 2003).

The collection of spatial data is the most expensive part of the realisation of created product. The input data is the most important part of DEM, because they markedly affect the quality and thus additional analyses. In the case of incorrectly chosen input data, DEM does not meet qualitative requirements. In terms of obtaining method, input data can be divided to two categories: primary and secondary source (Hudec, 2009)

Primary sources include sources obtained from direct measurement on the terrain (geodetical, GNSS, photogrammetric) and those which are not edited.

Secondary data include those, which are necessary to convert, edit and vectorise before the creation of DEM. This method involves certain inaccuracy, what can negatively influence the quality of the digital terrain model.

The disunity of DEM created from different input data causes significant contrast in morphometrical and hydrological parameters. These parameters are derived from DEM and have effect on additional processes, models, analyses, measures, etc. (Halva, 2012).

Material and methods

Village Hájske is located in region Nitra, Šaľa district, cadastral area Hájske. Village lays 25 km from regional city Nitra and 18 km from district town Šaľa. Town residential area of the village lays in the Danube Lowland on the southwest edge of the Nitrian hillside.

For the creation of every maps and analyses, like the digital elevation model (DEM), the program ArcGis 10, version ArcMap 10.2.2 was used.

DEM was created from two starting data (fig.1)

- From elevation points – the net of detailed elevation points, like altimetry mapping for the needs of land adjustments. They were measured by GNSS methods and they meet the necessary requirements in achieved accuracy.
- From contour shapefiles - vectorised topographical map sheets 45-12-08, 45-12-09,45-12-13, 45-12-14,45-12-18 a 45-12-19 in scale 1:10 000.

For the creation of DEM, the Topo to Taster interpolation function was used, the raster resolution was set to 5 meters. The results are digital terrain models, which are going to be used for the creation of morphometrical and hydrological characteristics for result comparison.

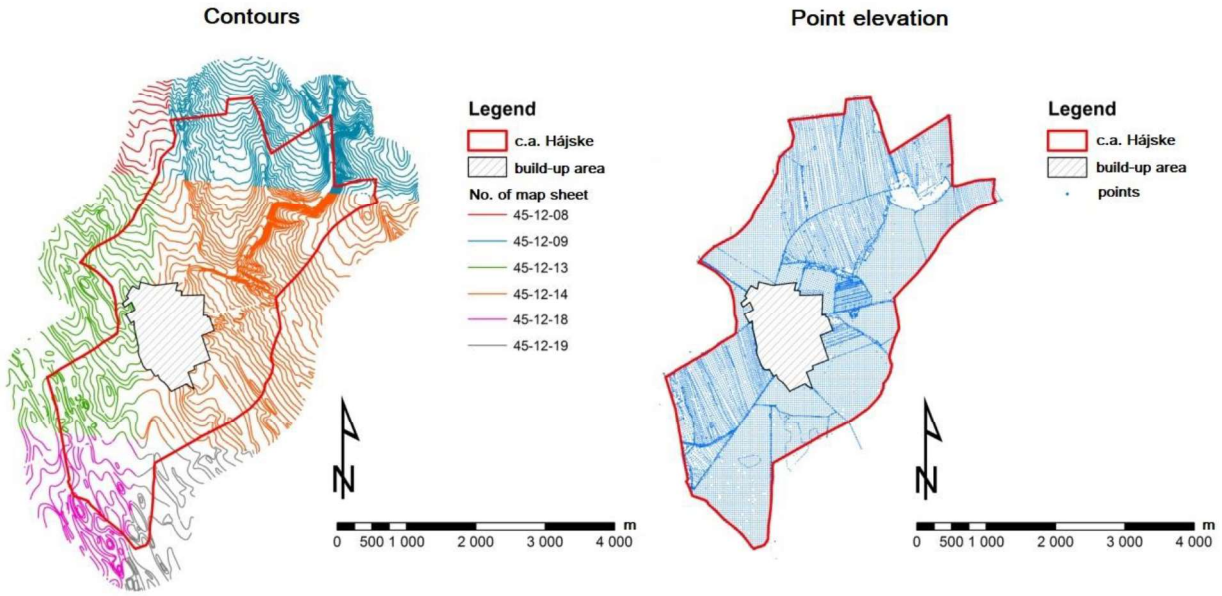

Figure 1 Maps Input data (Contour and Point elevation)

Results and discussion

First we have created the DEM map form the output data, since this is the map which serves as the input data for further analyses (fig.2).

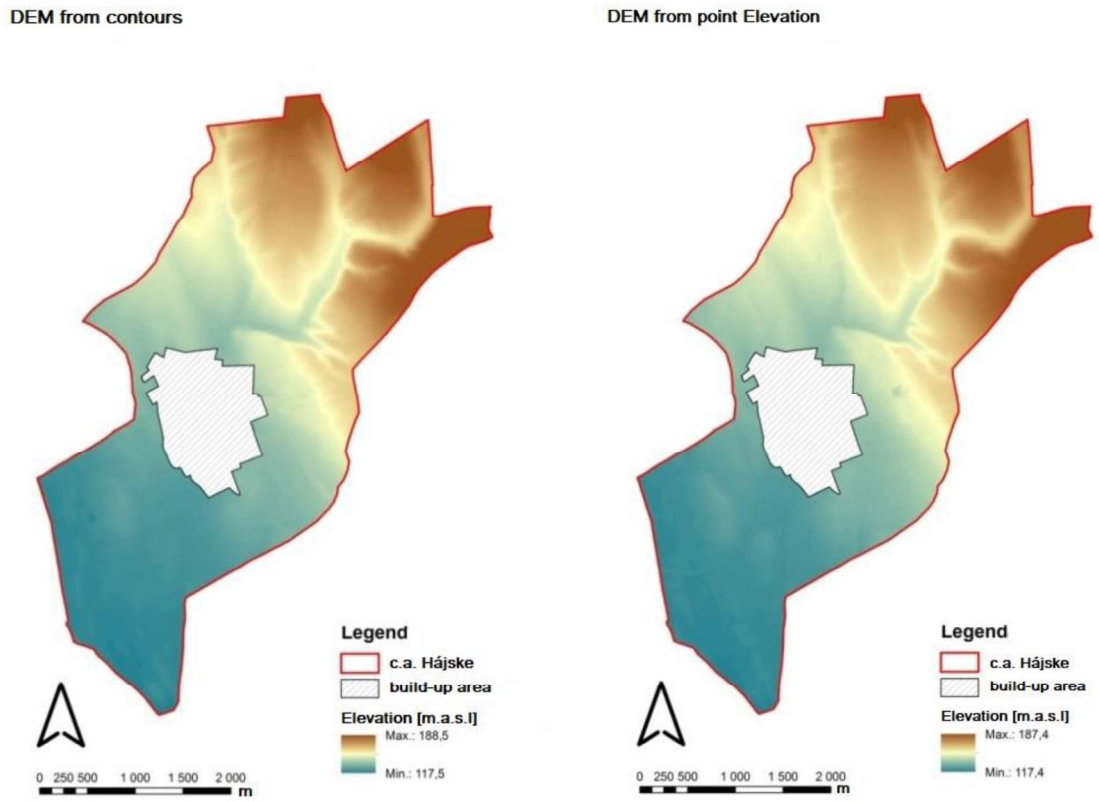

Figure 2 Maps of Digital Elevation Model from Countour and Point elevation

On the first look, it is obvious that there is a difference between the maximal value of elevations above sea level. On the map of elevation points, this value is 187,4 m a. s. l. and on the map of contours 188,5 m a. s. l, so the absolute difference between values is 1,1 m.

The difference in the results of following analyses (slope, exposition, watershed) derived from these DTM models may have different, mostly negative impact for their use in practice, because they cause inaccuracies.

Map of slopes were generated from DEM maps, based on elevation points and contours. For the comparison of differences, we used the map of slopes in degrees, which was reclassified on the basis of criteria for delimitation of the soil fund. The sections is shown in Fig. 3.

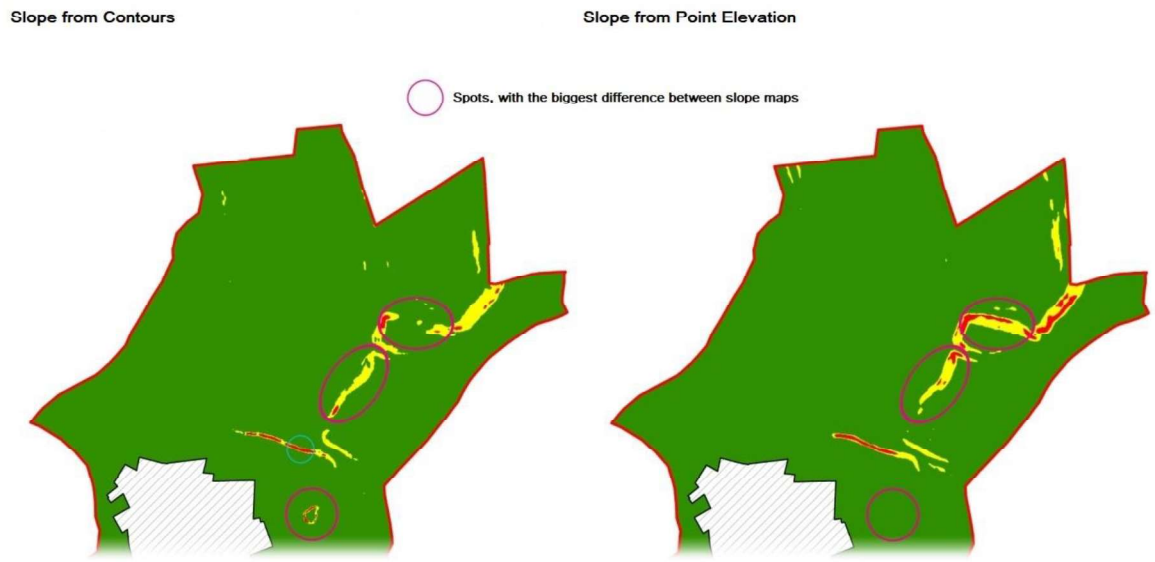

Figure 3 Detail Maps of Slope (from Contour and Point elevation)

The amount of incident radiation of solar energy can be determined from the map of exposures, i.e. obscuration and flare, which affect erosion as well on microclimate conditions and humidification processes. From the analysis results, it is clear that the contour model is smoother than the measured data model (Fig. 4).

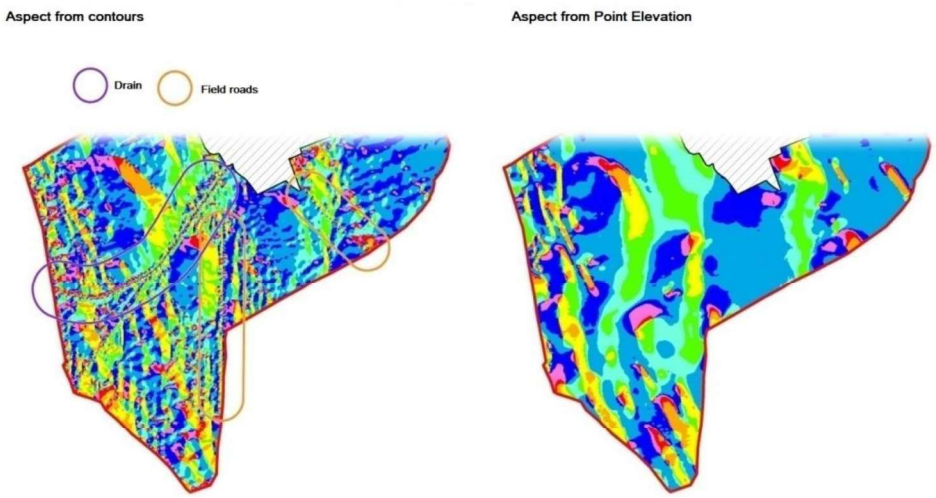

Figure 4 Detail Maps of Aspect (from Contour and Point elevation)

The following analysis of the comparison of input data at DEM modelling was the determination of watershed for final profile (optional point selected by us).

From the next figure (Fig. 5 – overlap of two map output) it is clear, that the surface of watershed defined from elevation points is larger (330,73 ha), than the surface of watershed defined from contours (304,22 ha). The difference between watershed is 26,51 ha.

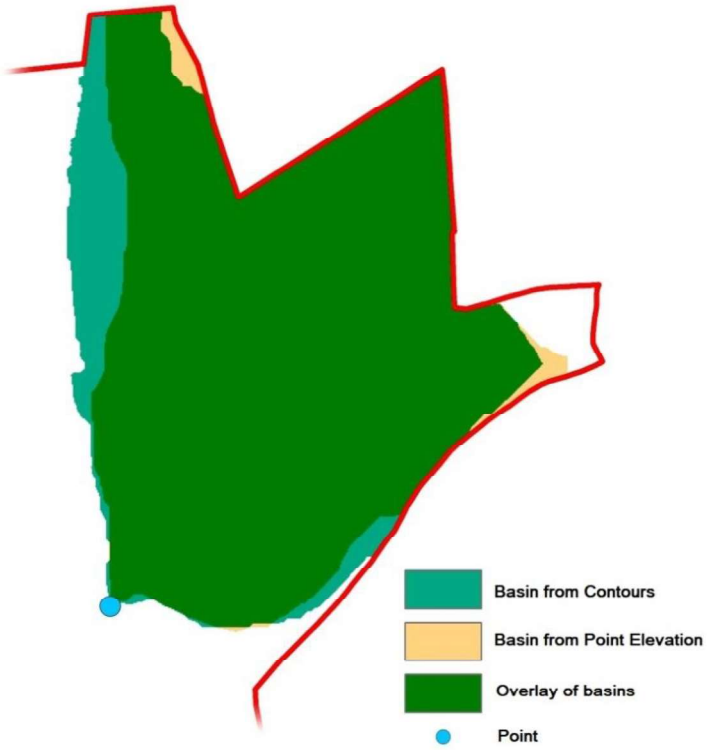

Figure 5 Overlay Basin from Contour and Point elevation

To verify the achieved results, at the end we have come to concrete comparison of achieved results with real area. Above the built-up territory of the village, there is a canal on which we have measured 8 points. At the comparison we have discovered, that from the actually measured points 4 are same with the flow accumulation from elevation points and 2 points are close to this path. On the contrary, at the flow accumulation from contours, only 1 point is the same and 4 are close to the reality. In conclusion, we can say that the map of surface map of surface drainage from elevation points is more accurate (Fig. 6).

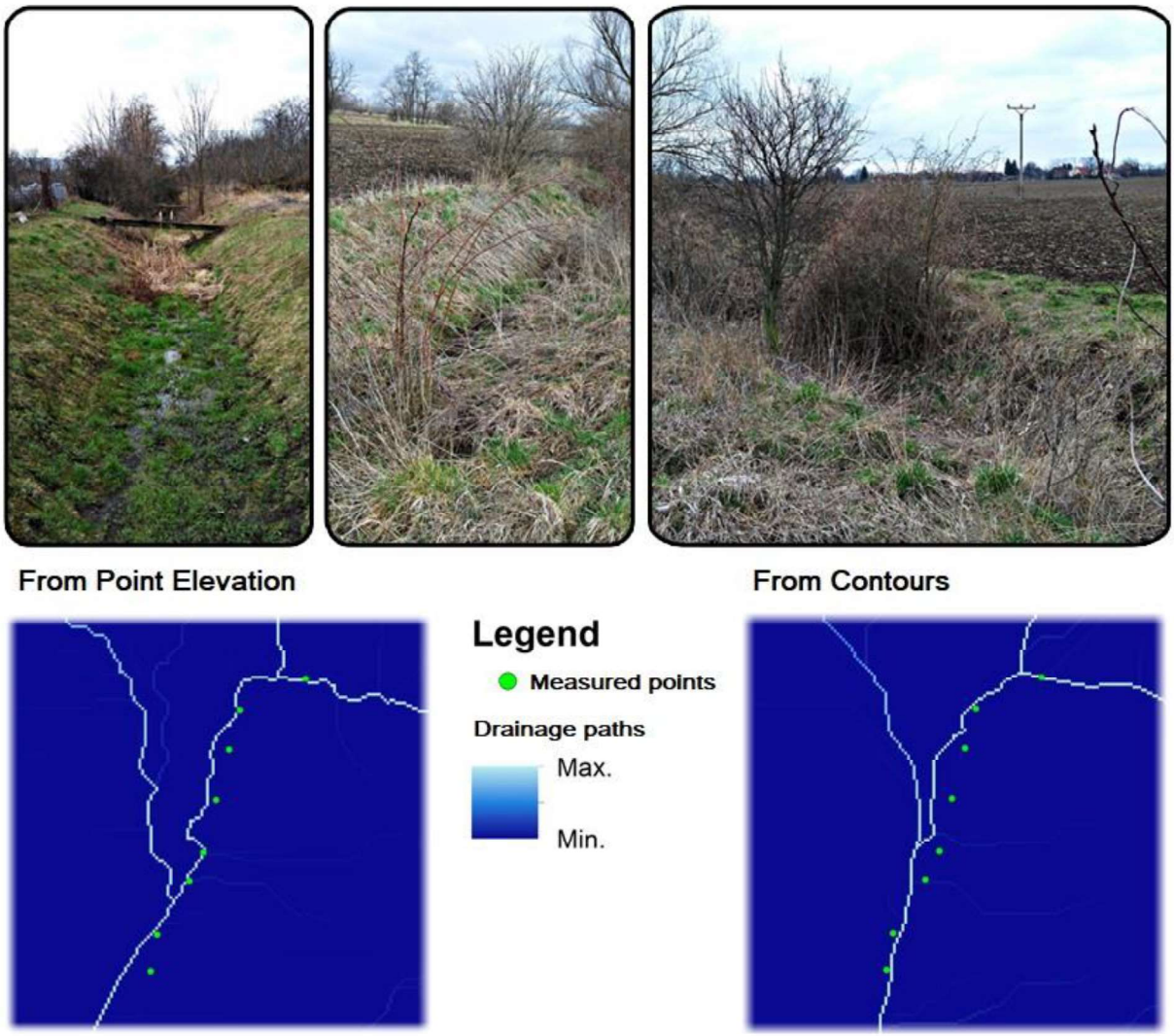

Figure 6 Comparasion DMR and Terain

Conclusion

By comparing these results, we have confirmed the hypothesis, that the input data have considerable influence on modelling. One must be aware about the measured elevation points used as input data, since they are much denser than contours in the resulted area, therefore the result from elevation points are going to be more accurate. This is also proved by the measurement of real points on the terrain. We can conclude that the most ideal solution would be to compare results with ratios and characteristics directly in the terrain of the area being solved.

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