Jber. Biol. Stat. Lunz 4 (1981): 103 f. 1-5

Data analysis and display for the RITRODAT experimental area

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Zusammenfassung:

Analyse und Darstellung der im RITRODAT erhobenen Daten: Aufbau und Möglichkeiten des in Ausarbeitung befindlichen Computerprogrammes werden beschrieben.

Introduction: Based on a modified version of the grid system described in Bretschko (1979), a system of computer programs is developed to (a) organize data collected according to this grid system for computer storage and retrieval as well as further processing; (b) to analyze these data in order to:
- determine the geometric properties of the experimental area;
- investigate spatial relationships between the observed variables;
- and monitor dynamic patterns of the above;

(c) for the computerized graphical (3D) display of these data and their relationships in space and time.

Methods and Data: In a first step, the composed grid system is translated into a straightforward system of horizontal coordinates with arbitrary origin. Since in the original system only the 67 nodes have their coordinates determined, the positions of the remaining 412 regularly spaced intermediate measurement points have to be calculated. This results in a matrix of a total of 479 measurement points for further analysis. The program developed accepts the raw data in the sequence as adopted in the data record sheets, resorts their sequence according to the final grid system, and transforms the coordinates into metric units (m) after arbitrary user - defined rotation and translation.

Data collected so far at these points are:

(a) elevation of the upper edge of the gravel bed,
(b) water level,
(c) water velocities.

In a second step, the program system now determines the volume or extent of gravel relative to an arbitrary lower reference level and the volume of water within the experimental reach. These volume estimates can be made by using simple linear interpolation, with or without weighted moving average smoothing, or using cubic splines. These interpolated values can now be translated from the initially arbitrary into a regular orthogonal grid. Also, the velocity readings together with the estimates of crossectional areas can be used for discharge estimates in the individual sections of the reach, allowing for an approximate mass balance of water within the experimental reach. Obvious water surplus or deficit above the level of the measurement error can then be related to vertical exchange phenomena with the gravel bed.

Since all the above measurements and derived estimates are stored in the same format, their relationships or changes in time can easily be assessed. Examples are changes in gravel topography in time, e.g. after flood events, or the relationships of crossectional discharge to gravel morphology.

Finally, all the above features can be graphically displayed, using optionally either the original raw data on the arbitrary grid or the interpolated regular grid. A simple 3D plotting program is used, capable of arbitrary independent rotation around all three dimensional axes, individual scaling of the axes, optional perspective view, and arbitrary translation of the datablock. The plotting program produces meshgraphs, and several variables (or meshes) can be overlayed using either different line thickness or different colours, depending on the peripheral device.

Due to a high degree of modularization, the above described program system can be implemented on any 64 K minicomputer with a standard FORTRAN compiler. The plot program requires an appropriate plotter and software capable of vector generation.