Data Model and Operators for a Vector Field

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GIS as software tool for spatial data processing has been continuously enhanced. Tomlin's (1990) map algebra provided a useful framework to organize the operations according to the scope of those operators. Several efforts had been made to improve this map algebra either by adding dynamic concepts or by extending it to 3D space. However, most those efforts assumed that the measurements at each cell are one of the four measurement scales advocated by Stevens (1946), i.e., nominal, ordinal, interval and ratio. This research follows the tradition of extending Tomlin's map algebra. Different from the previous efforts, this research focuses on the extension of map algebra to the measurement that is beyond Stevens' four measurement levels. Specifically, this research wants to extend the map algebra to vector measurements, i.e., the measurement at each cell is a vector quantity instead of a scalar quantity. The methodology adopted in this research involves the classification of vector field, identification of the operators appropriate on vector field, implementation of the vector filed data model and operators, and the application of this vector data model and operators.