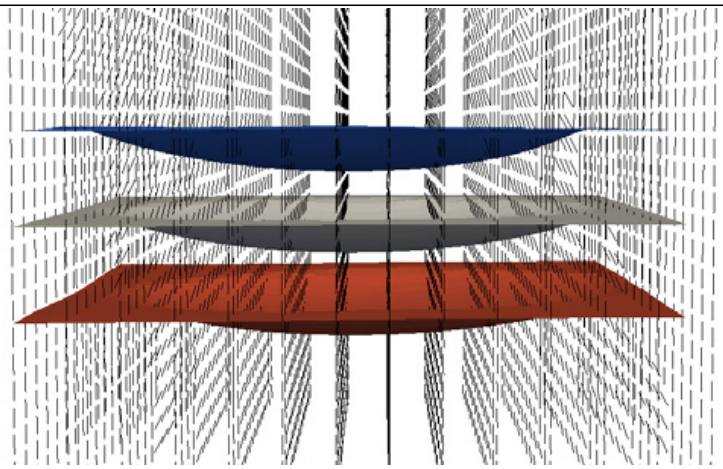

Figure 1: Normal field and several solutions to the integration problem.

Type Term Project or Bachelor Thesis

Title **Comparative Study of Computational Methods for Normal Integration**

Advisor PROF. PHILIPP GROHS

Description. Many sensing devices for determining the shape of an object do not return this shape but indirect information from which the shape can be reconstructed. Examples include microscopy or linear deflectometry. In these two specific application, the information given by the measurements constitutes one or more vector fields in $3d$ which are supposed to be normal to the shape, see Figure 1.

The reconstruction of a shape from its normal field is a well-studied problem and usually referred to as normal integration.

Several methods exist for the computational solution of normal integration problems (see e.g., (Balzer 2011)). Most of them are related to the finite element solution of an elliptic PDE, so knowledge of finite element methods (in particular their implementation) is a must.

The goal of this project is to implement various different methods for the integration of normal fields and to perform a comparative analysis.

Prerequisites. Finite element methods, programming skills (MATLAB and/or C++), (very basic) differential geometry.

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References

J. Balzer (2011), 'A Gauss-Newton method for the integration of spatial normal fields in shape space', *Journal of Mathematical Imaging and Vision*. in press.