

We are concerned with the reverse engineering problem of reconstructing physical surfaces from tangential data. These tangential data are provided by embedded sensors (micro-accelerometers and micro-magnetometers developed by the laboratory CEA/LETI) along a curve represented by a ribbon. Appropriate methods for the reconstruction of planar and spatial curves from such tangential informations have been developed and validated by a real-time demonstrator : the Morphosense ribbon.

Then by placing the Morphosense on a physical surface at regular intervals along different directions, the surface is divided into a system of rectangular and triangular patches.

Furthermore, it is shown that the Morphosense ribbon assumes the shape of a geodesic when laid on a smooth physical surface.

Thus, specific methods for the problem of constructing rectangular or triangular surface patches, when prescribed boundary curves are required to be geodesics of the resulting surface, are presented.

The possibility of constructing such surface patches is shown to depend on the given boundary curves satisfying two types of consistency constraints. The first constraint is global in nature, whereas the second constraint is a local differential condition, relating the curvatures and torsions of the curves meeting at each of the four patch corners to the angle between those curves.