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Computer-Aided Visualization of Bridges

Visualisation des ponts assistée par ordinateur

Rechnerunterstützte graphische Darstellung von Brücken

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1. INTRODUCTION

When a new bridge is to be constructed, it will always have some effects on the environment and the landscape. Whether these effects are positive or negative, depends mainly on the designer, who usually proposes a few alternative plans for criticism. Besides the the appearance of the bridge itself should be aesthetically well designed, it should also be in harmony with the environment. In order to make possible to judge whether a proposed bridge is suitable for a particular building site, three-dimensional visualization of the plans should be used, at least, in all more important projects. The applicability of CAD programs for visualizing bridges was the aim of this study. The main interest was attached to interactive 3D modelling programs. Using modelling programs it is easy to produce perspective drawings from the object from any desired viewing point to any direction.

2. VISUALIZATION WITH THE AID OF 3D MODELLING PROGRAM

The plans of Luukkaansalmi bridge were used as an application for visualizing. This bridge will be situated near the city of Lappeenranta in southeastern Finland and it will replace the ferry between an island and the mainland. Several alternative bridge designs including surroundings were modelled using CATIA program [1] installed in the IBM 4341 computer of Helsinki University of Technology.

The geometry of the bridge, road and the environment was modelled using solid and surface elements. The most laborious part in constructing the model was the topography of the ground (Fig.1). The background of the landscape was modelled using more simple plane elements (Fig.2).

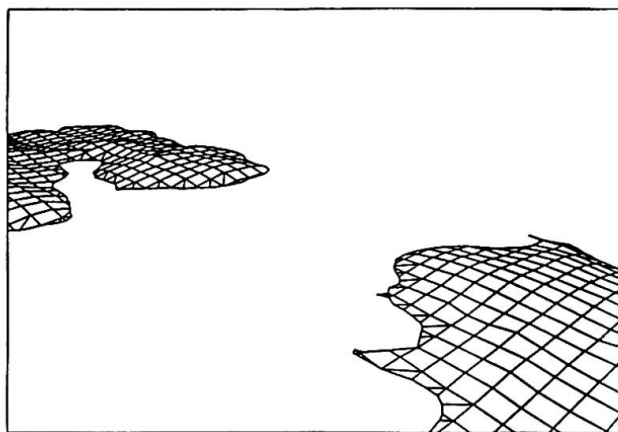


Fig. 1 Topography of the two capes.

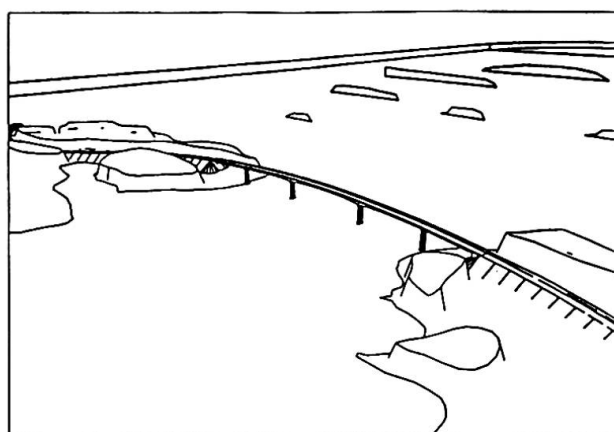


Fig.2 Over-all view of the designed bridge.

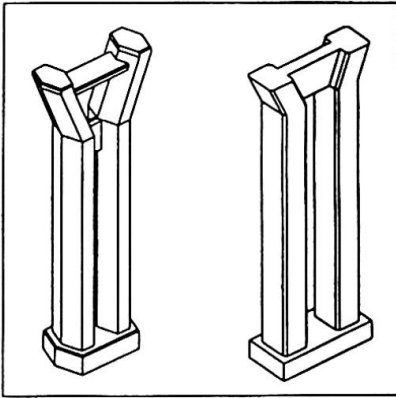


Fig. 3 Two types of piers.

In designing details, like the shape of the piers, the use of 3D program is very effective because of the fast response time (Fig.3). It was found that very realistic images can be achieved with computer graphics, however, the hidden line removal can take several minutes in large models. The main advantage of the 3D modelling compared to photo- or videomontages is that perspective drawings can easily be produced from any desired viewing point. Images can be completed by adding some details like trees, cars and ships etc. (Fig.4). Different colours, shading and shining effects of the surfaces can also be used to improve the visual realism.

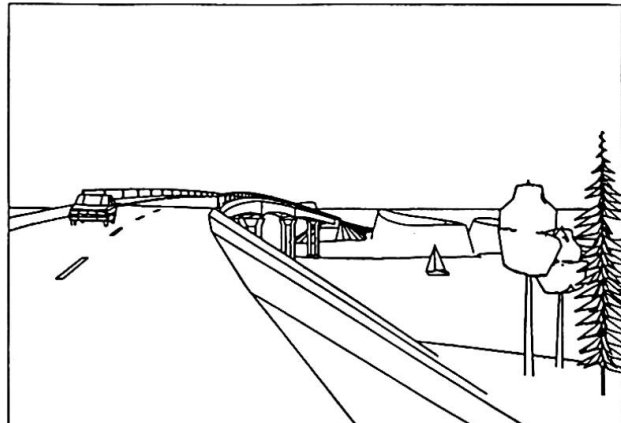
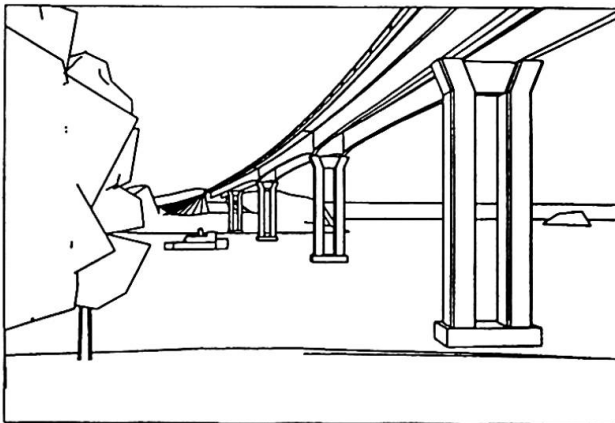


Fig. 4 Perspective view of a bridge. **Fig. 5** Perspective when approaching the bridge.

Perspective views of the bridge, produced from the model can be used as a part in other visualizing methods like photo- and videomontage and animation to show the user's perspective when driving over (or under) the bridge (Fig.5). Examples of different visualization techniques were saved on a videotape.

From the experiences of this study, it can be concluded that 3D modelling program is applicable for visualizing the bridge and its environment. Perspective views, obtained from the model, form a good basis for judging the aesthetics of a bridge design (Fig.6).

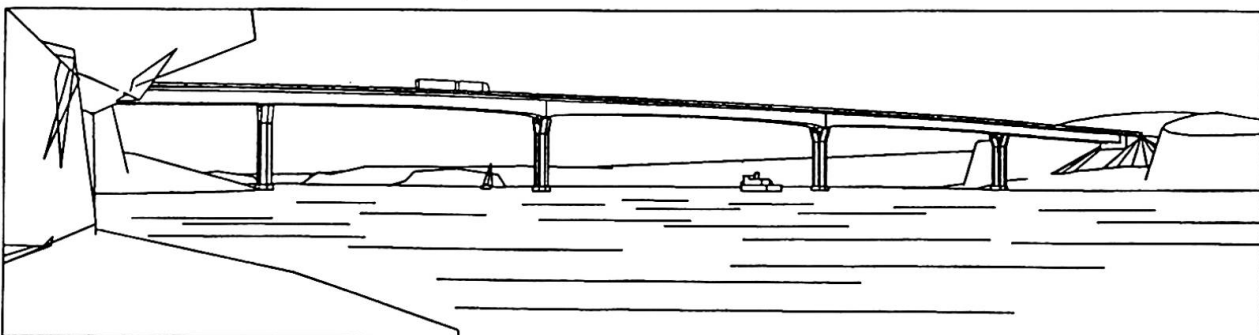


Fig. 6 Side-view of the bridge to be constructed.

REFERENCE

1. CATIA-Version 2, Rel. 2.0, Users Manual. Dassault Systemes.1986.