

SORAWIT NARUPITI : COMPUTER AIDED OPTIMAL DESIGN OF HIGHWAY  
VERTICAL ALIGNMENT. THESIS ADVISOR : PROF. DIREK LAVANSIRI, Ph.D.  
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The vertical alignment design needs to minimize the alignment-related costs. The vertical alignment designed by engineers may not be the optimum. The objective of this research is to develop the design process and a computer program that assist the optimal vertical alignment design.

The design process developed on the heuristic solution method is divided into 3 steps. The design problem in each step is represented by a mathematical model. The first step is to find the preliminary vertical alignment that minimizes cost while satisfying all relevant constraints. The second deals with the determination of the geometric configuration given by the preliminary alignment. The last step is to find the geometric configuration that yields the optimal alignment.

The preliminary vertical alignment model is formulated by simplifying the optimal vertical alignment model and uses the linear programming to find the solution. The first geometric configuration is found from the mathematical method that is the engineer's design simulation process and gives the initial points of vertical intersection and lengths of curve. The optimal geometric configuration model is formulated as nonlinear programming model for determining the lowest earthwork-volume alignment. The model is solved using the direct search method.

The resulting design process is computerized and applied to a case study involving a 4.2-kilometer road. The result shows that the alignment can substantially reduce the earthwork-related cost and gives the appropriate alignment.