

CALCULATING RISK OF COST USING MONTE CARLO SIMULATION WITH FUZZY PARAMETERS IN CIVIL ENGINEERING

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Risk is a part of almost all civil engineering projects. Usually there is a difference between the real and the estimated cost of the civil engineering projects. This uncertainty is an integral part of civil engineering activity. The process of cost calculation can be shown in Figure 1.

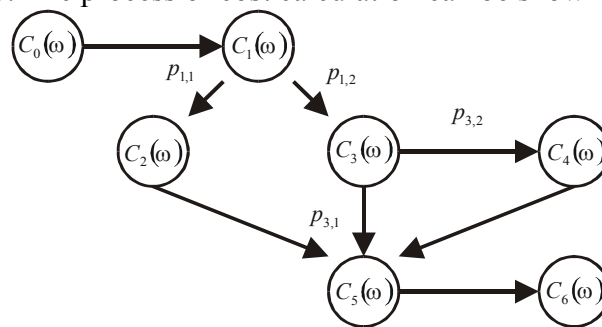


Fig. 1 – Graphical representation of the process of calculating cost

$C_0 = C_0(\omega), \dots, C_6 = C_6(\omega)$ are random costs and $p_{i,j}$ are probabilities of changing the path. Unfortunately, in civil engineering applications usually we do not have enough data to calculate probabilistic characteristics [1, 3]. There are also different methods of modeling of uncertainty [2]. Very often probabilistic characteristics can be defined using intuitive assessment. In this paper probabilistic characteristics are modeled by fuzzy numbers, which are defined by some expert. The resulting cost is described by probability density functions with fuzzy characteristics. The k -th experts supply upper and lower bounds of i -th costs $[C_{i,k}^-, C_{i,k}^+]$ and most probable cost $C_{i,k}^0$. Using assessment from different (or even one) experts we can estimate the uncertainty of the probability density function. Then using modified Monte-Carlo simulation and the alpha cut method we can calculate the results.

References

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