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AWARDS

Wellington Prize honors writing team

6/23/2022 | 1 MIN READ

ASCE has honored **Sunyong Kim**, Ph.D., M.ASCE; **Baixue Ge**; and **Dan M. Frangopol**, Sc.D., F.SEI, F.EMI, Dist.M.ASCE, with the 2022 **Arthur M. Wellington Prize** for the paper "Optimum Target Reliability Determination for Efficient Service Life Management of Bridge Networks," *Journal of Bridge Engineering*, October 2020.

The nominated paper presents a novel procedure for the determination of target reliability of bridge networks by optimizing it for efficient service life management of transportation within bridge networks. It also clearly indicates, by providing a detailed example consisting of an existing large bridge network, how the research proposed can be used in practice by Departments of Transportation.

The comprehensive approach put forth for finding the optimum target reliability of bridge networks is based on probabilistic multiobjective optimization involving four objectives: maximizing the reliability, minimizing the expected maintenance cost, minimizing the expected user costs, and maximizing the redundancy of the bridge network. The proposed methodology combines importance indicators of individual bridges, bridge network reliability, bridge network redundancy, maintenance cost and user cost of bridge network, and optimization.

This paper makes a very significant and definitive contribution to transportation engineering by proposing a rational approach to the service life management of bridge networks. Until now, target reliabilities were established for individual bridges neglecting the fact that they are part of bridge networks. As the authors of the nominated paper show, establishing target reliabilities for individual bridges without considering their part in bridge networks, as is done in the current bridge engineering codes and specifications, leads to a severe inefficiency in the life-cycle management of our bridge infrastructure.

The authors' proposed approach overcomes this severe inefficiency incurring unnecessary costs by determining target reliability of bridges as part of the network, considering the expected reliability during their service life, the available financial resources for their maintenance, and the importance of the individual bridges in the bridge network under uncertainty. This target reliability is optimized using multiple objectives based on the integration of the structural performance and life-cycle costs of individual bridges into the performance and life-cycle costs of the overall network considering *all costs* incurred during their service life.

The Arthur M. Wellington Prize is awarded to the author or authors of a paper on transportation on land, on the water, in the air, or on foundations, as well as closely related subjects.

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