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Conceptual Model of a Residential Waste Collection System Using ARENA Software

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Abstract : The collection of municipal solid waste at the curbside is a complex operation that is repeated daily under varying circumstances around the world. There have been several attempts to develop Monte Carlo simulation models of the waste collection process dating back almost 50 years. Despite this long history, the use of simulation modeling as a planning or optimization tool for waste collection is still extremely limited in practice. Historically, simulation modeling of waste collection systems has been hampered by the limitations of computer hardware and software and by the availability of representative input data. This paper outlines the development of a Monte Carlo simulation model that overcomes many of the limitations contained in previous models. The model uses a general purpose simulation software program that is easily capable of modeling an entire waste collection network. The model treats the stops on a waste collection route as a queue of work to be processed by a collection vehicle (or server). Input data can be collected from a variety of sources including municipal geographic information systems, global positioning system recorders on collection vehicles, and weigh scales at transfer stations or treatment facilities. The result is a flexible model that is sufficiently robust that it can model the collection activities in a large municipality, while providing the flexibility to adapt to changing conditions on the collection route.

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