

# Application of the Monte Carlo Method to Reduce Data Storage in SHM

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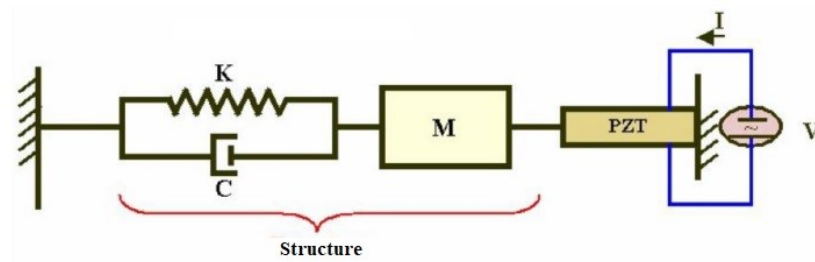
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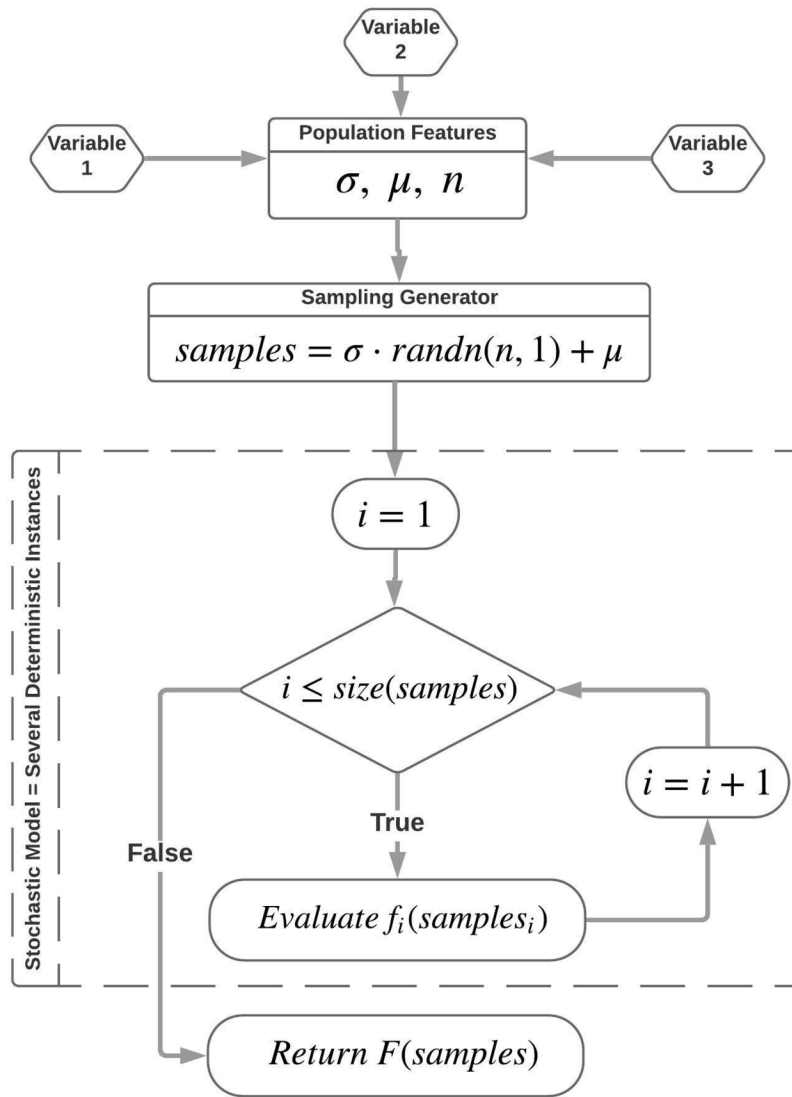
## Abstract

In general, the electromechanical impedance-based SHM method uses a piezoelectric transducer as a sensor/actuator to excite/measure the dynamic response of a mechanical structure under investigation in order to find incipient damage. The SHM method requires many samples of impedance signatures to analyze the behavior of the system and draw a diagnostic. This contribution proposes a method to generate new impedance signatures as based on a number of measured signatures. The signature generator operates through the Monte Carlo method. Thus, this approach proposes to drastically reduce the number of measured/recorded samples that are normally used in the impedance-based SHM. This reduction can be as large as 93%. For this aim, a case study is proposed, namely, an “I” profile structure with four levels of damage (mass addition). Moreover, 33 impedance signatures for each level of damage were measured. Then, the Monte Carlo method was used to generate 400 virtual signatures. Finally, the generated signatures were compared with the experimentally acquired ones in order to measure the error associated with the generated signatures. In conclusion, this contribution presents a method that uses the properties of the impedance signatures to store them and, if necessary, to use these signatures to generate numerical ones, thus reducing the need for storing a large amount of data and lessen the number of experimental impedance signatures acquired over time.

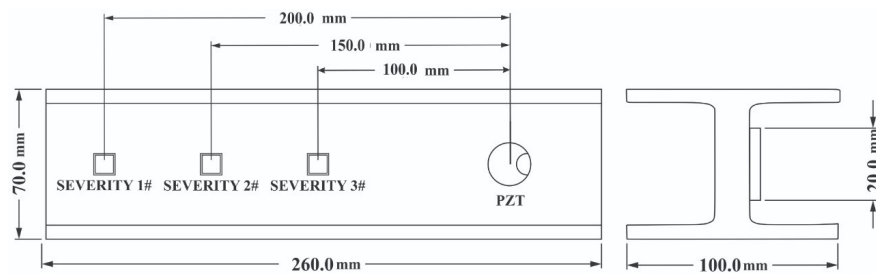
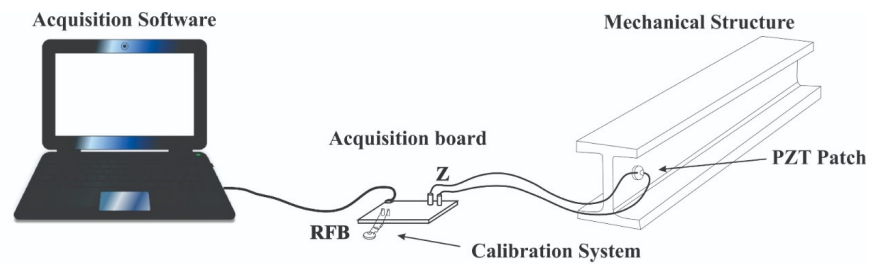
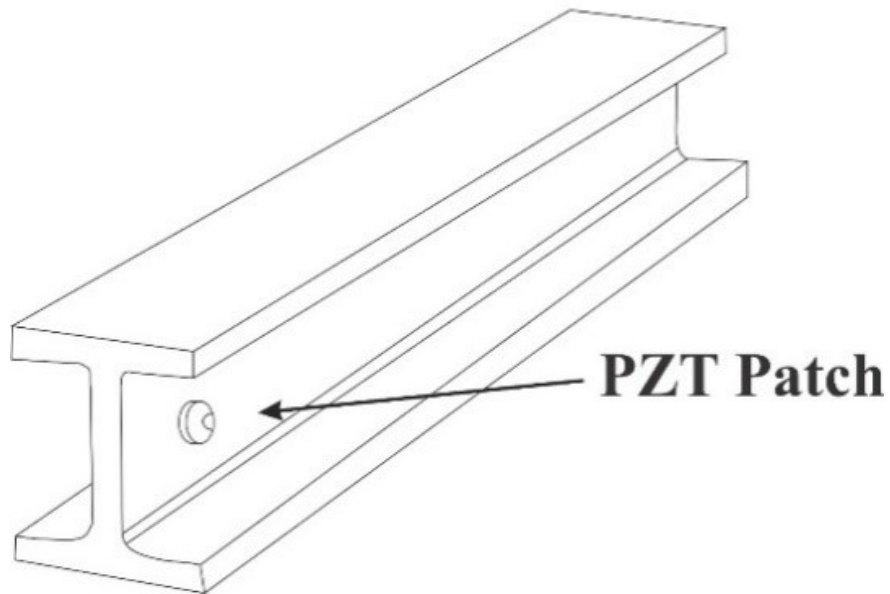
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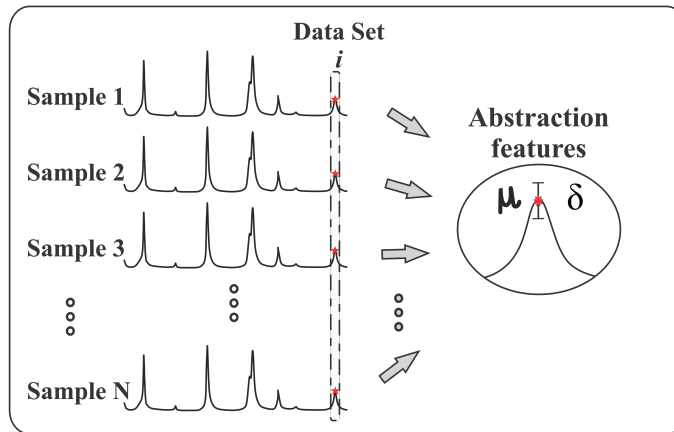


# I Profile Structure



## MONTE CARLO METHOD

### Sampling



### Generating Samples

