

## Conclusion

The goal of this project is to study a stochastic approach called particle filter to solve the problem of failure diagnosis and prognosis. We chose the Gamma process to model degradation. After understanding how to construct a particle filter, we apply the algorithms to estimate the current level of degradation and then calculate the residual lifetime of the system of interest. Using simulation, we evaluate the performance of the particle filter when some important parameters are varied. In addition, the behavior of particle filter when dealing with two Gamma processes of different increments is also considered. To conclude the study, we give some important remarks by analyzing the simulation results.

In the literature, we notice that sophisticated extensions of particle filter are developed. Also, further work is in progress to improve the performance of particle filter. For example, it is desirable to increase significantly the quality of the estimation by using cleverly the collected data since too many uncertain measurement values can perturb the particle filter. In fact, the time at which we carry out the measurements could be periodic or following a certain probability law, i.e., the time of doing measurements is a random variable. This also helps us to reduce inspection cost.

Within this project, we verified the algorithms of particle filter with simulated data. It is, nevertheless, more convincing if we can have access to real monitoring data acquired from a real degradation process to examine the efficiency of these algorithms.