EE292K: Intelligent Energy Projects

Project Proposal

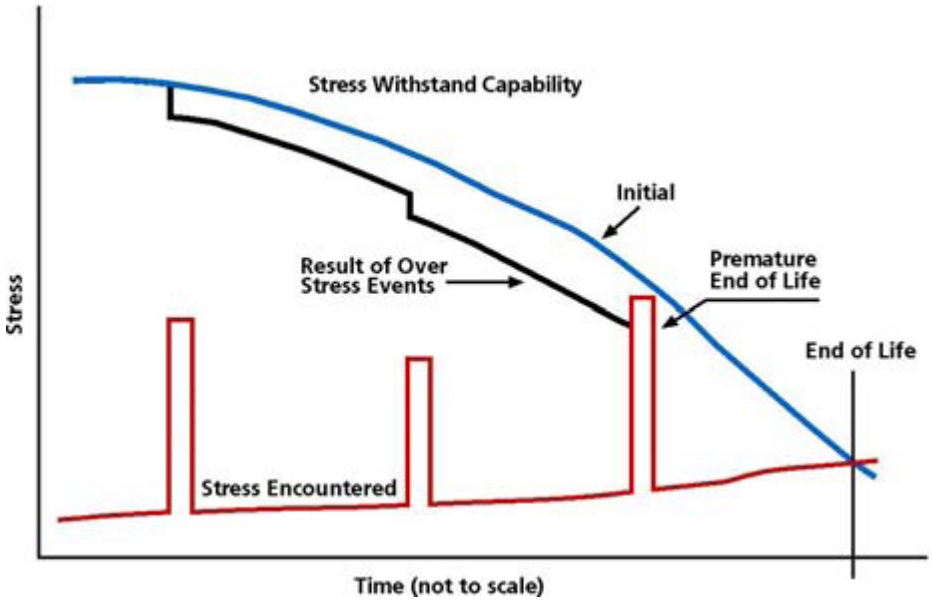
Christian Osorio, Nandan Sawant

Introduction

The costs of blackouts can be astronomical. The Department of Energy estimates the total cost of the August 2003 blackout of the Northeastern United States and Canada to be about $6 billion[1]. Because of this, improving the reliability of the electrical grid is of paramount economic concern. As our ability to monitor the state of the power grid and its components increases, important decisions arise on how to maintain grid components. Our focus will be on scheduling the maintenance of these components based on the probability of failure of individual components, and how these components affect the system as a whole.

Goal

In order to accomplish this goal, we will model the improbable extraneous events using extreme value theory[3][4]. We hope to be able to fit one of the extreme value distributions wiz. Frechet, Gumbel and Weibull to the historical data of improbable extreme scenarios. In addition, we assume that the current state of each component of the system is known. Such a model provides us a tool to compute the probability of failure of the device.



Future Work

The next step will be to model the expected financial cost of the failure of each component. Using these estimates, we can associate an expected cost of failure with the device, and use this to prioritize and schedule maintenance. In addition, the work will be expanded to quantify the expected costs of multiple device failures.

References

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3. Extreme Value Theory as a Risk Management Tool, Paul Embrechts, Sidney I. Resnick and Gennady Samorodnitsky, North American Actuarial Journal, Volume 3, Number 2, April 1999
4. The Peaks over Thresholds Method for Estimating High Quantiles of Loss Distributions, Alexander J. McNeil & Thomas Saladin
5. Anomaly Detection: A survey, Varun Chandola, Arindam Banerjee and Vipin Kumar, ACM Comput. Surv. 41,3, Article 15 (July 2009)
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