

The Case for Software Health Management

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Abstract—Software Health Management (SWHM) is a new field that is concerned with the development of tools and technologies to enable automated detection, diagnosis, prediction, and mitigation of adverse events due to software anomalies. Significant effort has been expended in the last several decades in the development of verification and validation (V&V) methods for software intensive systems, but it is becoming increasingly more apparent that this is not enough to guarantee that a complex software system meets all safety and reliability requirements. Modern software systems can exhibit a variety of failure modes which can go undetected in a verification and validation process.

While standard techniques for error handling, fault detection and isolation can have significant benefits for many systems, it is becoming increasingly evident that new technologies and

methods are necessary for the development of techniques to detect, diagnose, predict, and then mitigate the adverse events due to software that has *already undergone* significant verification and validation procedures. These software faults often arise due to the interaction between the software and the operating environment. Unanticipated environmental changes lead to software anomalies that may have significant impact on the overall success of the mission. Because software is ubiquitous, it is not sufficient that errors are detected only after they occur. Rather, software must be instrumented and monitored for failures before they happen. This prognostic capability will yield safer and more dependable systems for the future. This paper addresses the motivation, needs, and requirements of software health management as a new discipline.