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Engineering Cyber Physical Systems: Applying Theory to Practice Preface

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Engineering Cyber Physical Systems: Applying Theory to Practice

Preface

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Multi-faceted systems of the future will entail complex logic and reasoning with many levels of reasoning in intricate arrangement. The organization of these systems involves a web of connections and demonstrates self-driven adaptability. They are designed for autonomy and may exhibit emergent behavior that can be visualized. Our quest continues to handle complexities to design and operate these systems. The challenge in Complex Adaptive Systems design is to create an organized complexity that will allow a system to achieve its goals.

Complex Adaptive Systems have dynamically changing meta-architectures. Finding an optimal architecture for these systems is a multi-criteria decision making problem often involving many objectives in the order of 20 or more. This creates “Pareto Breakdown“ which prevents ordinary multi-objective optimization approaches from effectively searching for an optimal solution; saturating the decision maker with large set of solutions that may not be representative for a compromise architecture selection from the solution space.

These systems will impact the manufacturing industry, defense, healthcare, energy, transportation, emergency response, agriculture and society overall. The success will come based on how the current challenges related to cybersecurity, interoperability, privacy, safety and socio-technical aspects, mainly interaction of human behavior, and Complex Adaptive Systems are handled. Researchers from academia, industry and government met in Los Angeles, California, in November 2016, to share their findings and expand the boundaries of research in Complex Adaptive Systems. This year we are concentered on the current state of practice in applying the theory of Engineering Cyber Physical Systems in real life.

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