Research on Quantitative Intelligent Systems and Their Applications to Design, Planning and Manufacturing

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Past and Present Research

Design Automation and CAD

- Quantitative Concurrent Engineering Design
- Computer-Automated Tolerancing
- Virtual Prototyping Based Design Optimization

Advanced Manufacturing

- Planning and Programming of Sculptured Part Machining
- Dynamic Traffic Control Using a Fuzzy Intelligent System and Optimization

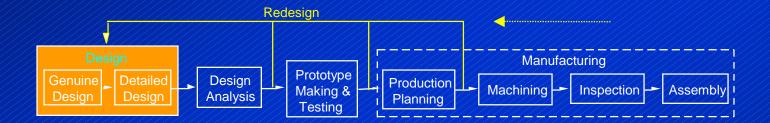
Next Generation Fuel Cells

- Optimal Design of Fuel Cell Components, Stack and System
- Development of Innovative, Radiator Stack Fuel Cell Architectures
- Rapid Prototyping of Fuel Cell Gas Delivery Plates

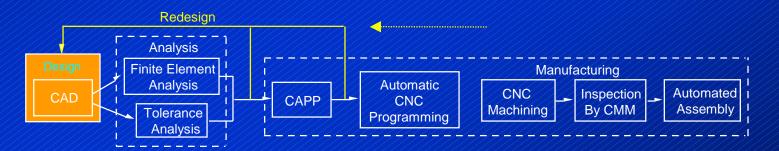
Applications of CAD, Optimization and Intelligent Systems



Sequential Product Development Activities (high costs and long lead times)



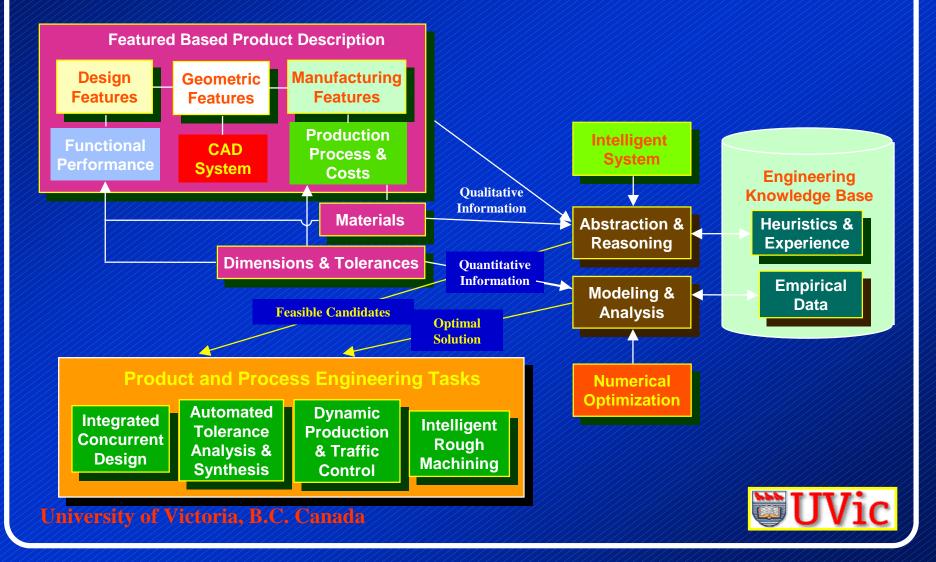
(a) Traditional Practice



(b) Present Approach



Concurrent Product and Process Engineering in CAD/CAE/CAM Applications



Two Different Implementations of QIS

Off-Line Applications Intelligent System Optimization Program Knowledge All Feasible Plans Representation Knowledge **Optimal** Performance Plan Base Feasible Plan 1 Evaluation Knowledge - Heuristics Reasoning Feasible Plan 2 & Codes Numerical - Empirical **Mathematical** Data Optimization Modelina Feasible Plan n **On-Line Applications Optimal Plan Optimal Plan 1** Dynamic Performance **Optimal Plan 2** Evaluation 4 **Optimal Plan c** Cluster/Model 1 Numerical Cluster/Model 2 Optimization **Best-fit Model Identification** Optimal Cluster/Model c UVic