Preface

Computer-aided tolerancing (CAT) is an important topic in the field of mechanical design and production manufacturing.

Every two years, since 1981, the CIRP (International Institution for Production Engineering Research) has organized a seminar on "CAT". In 2009, this CAT seminar became the CAT Conference. Control of the geometric quality is essential in the whole product lifecycle management (PLM), from the expression of functional requirements to recycling. The necessity of optimizing design and manufacturing processes, saving materials and energy, guaranteeing safety, always respecting more numerous functional constraints, imposes an increased rigor in the control process of the product geometric quality.

Previous research in the field of tolerancing is particularly focused on the modeling for the calculation assessment of 3D specifications, or on the processes of production and inspection. We should not forget that these various aspects are connected and impose a global vision of the "chain of the geometric quality" in the PLM.

The previous conferences made it possible to show the advances in these various domains and their applications for systems of CAT. This 2009 CAT conference tried to extend those preoccupations to the entire global product life cycle.

The subject of the present book *Product Lifecycle Management* focuses on the importance of geometric product quality interconnected in design, production manufacturing and inspection processes. In any design project development, the cost of design change increases with project time quasi-exponentially. To reduce costs, design parameters that influence the geometric quality must be defined and their influence must be known.

Increasingly realistic simulation software must be used with the best parameters and coherent data for all the process stages of design, manufacturing, assembly and inspection.

This book is an excellent resource for anyone interested in CAT, and it is intended for a wide audience, including:

– researchers in the fields of product design, computer-aided process planning, precision engineering, inspection, quality, inspection and dimensional and geometric tolerancing;

– teachers, instructors and students of design courses that are offered either for degrees by universities and technical schools, or for professional development through commercial short-courses;

– practitioners of design, design engineers, manufacturing engineers, staff in R&D and production departments at industries that make mechanical components and machines;

– software developers for CAD/CAM/CAX and CAT application packages;

– technicians and engineers of standardization, who are interested in the evolving ISO standards for tolerancing in mechanical design, manufacturing, and inspection;

– individuals interested in design, assembly, manufacturing, precision engineering, inspection, and CAD/CAM.

Following the editor's preface, the book is organized into 4 parts:

– tolerance analysis and synthesis;

– simulation of assemblies;

– measurement;

– tolerancing in the PLM.

Although some chapters cover far more than one topic, due to the general theme of the conference, we have chosen the most representative topics to include in this book. These have been classified according to the most representative themes.

Part I focuses on the more general problems of tolerance analysis and synthesis, for tolerancing in mechanical design and manufacturing processes, including statistical tolerancing approaches, for the management of the quality connected to manufacturing. A large number of papers were presented on this important topic, only the most representative have been selected for this book.

Part II specifically highlights the simulation of assemblies with defects, and the influence of tolerances on the quality of the assembly. Several cases are considered such as the case of non-rigid parts or assemblies of parts taking into account the form defects.

Part III deals with measurement aspects, which are, of course, crucial to quality control throughout the lifecycle. Different measurement technologies and methods for estimating uncertainty are considered.

In Part IV, different aspects of tolerancing and their interactions are explored, from the definition of functional requirement to measurement processes in a PLM approach.

As editors, we wish to express our sincere gratitude to the authors for their contributions; the members of the international program committee and the organizing committee; the additional reviewers and our colleagues from the French Research Group in Tolerancing (GRT) for their efforts in getting this book published.

<div align="right">

Max GIORDANO
University of Savoy

François VILLENEUVE
Grenoble University

Luc MATHIEU
ENS Cachan, University of Paris XI

August 2010

</div>