Preface

Stop and think for a moment about some of your recent ideas. Many times these ideas (and projects) fail to fit nicely in the arts box or in the computing one. They fall *somewhere* in the *middle of* this spectrum. We need to think outside of our preconceived notions of "boxes" and what they are supposed to contain. Blurring the edges of both domains and joining them into a larger set allows for more flexibility and creativity. And, of course, this process helps us get out of disciplinary containers and think in new, innovative ways. This cross-disciplinary volume originated from our frustration in teaching computing disciplines in the "mainstream" way, lacking creative expression brought about by the very technology it so created. Trying to encourage students and other individuals to use technology in new meaningful ways that are outside the norm of mainstream thinking has been indeed a formidable challenge. *The Handbook of Research on Computational Arts and Creative Informatics* attempts to push limits and blur boundaries within these domains.

The arts and the computer sciences are traditionally not seen as having a significant intersection. Despite the fact that many of our colleagues would call programming an art, the cross-disciplinary tangents do not seems to go further than that. Arts and computing, therefore, are commonly seen as two disciplines that do not have much in common, apart from the fact that artists use computing systems and applications as tools in fleshing out their creative ideas. As software and computer systems have grown more powerful, so has their potential for performing tasks other than data analysis, spreadsheets and word processing. Even while surfing on the Internet we are faced with a barrage of images, multimedia and hyperlinked structures creating a unique new medium. Through technology we can create spaces that bypass the normal boundary of self concept, time, physics and space. These technological artifacts become extensions to our creative minds, allowing us abilities of expression that are not always possible through traditional means. It is important to understand the underlying foundation of technology in order to grasp the creative potential of these systems. The importance of technology in our everyday lives is often trivialized and taken for granted since it has become meshed into daily routine. We fail to realize the totality of its impact on how we think and interact with the world around us.

We often ask our students at the beginning of the semester to characterize what it means to be "creative". After a brief discussion of the various and very different answers (many of which are often conflicting), they are asked to characterize the "Sciences" and the "Arts". They interject with different lists of the typical stereotypes that seem mainstream. Generally they say that Art is more expressive, free and emotional while science is colder, factual and restrictive. It is when we tell the class to list the similarities between these areas that things become interesting. We have had many debates over the apparent differences and the possible existence of many similarities. Some have even argued (not only the students) that the purpose of a particular project is what should be considered either as artistic or scientifically based; they feel no middle ground can exist. We clearly feel that this is not the case. An artifact can fall into a gray area, in the middle, not defined by either side of the coin as it were. A piece

can exhibit great artistic quality and still boast great scientific and computational achievements. Often, when very different ideas come together very great things occur.

We decided to launch the initial call for chapters for this book within forums accessible to a majority of computer scientists, and then to forums accessed by a majority of artists. Being on the computing side of the coin, our colleagues in the art world helped us spread the word around. The most interesting observation about the initial stages of this project was the amount of emails and phone calls we received. Colleagues were coming back to us with many questions regarding the scope of the book. We heard and read a lot of "wow's", as colleagues were challenging themselves to get out of their disciplinary boundaries. Many were apprehensive in submitting their particular proposals in fear of rejection due to their topic. Many were appreciative however to be able to explore their unique projects and ideas in an open medium. We wanted a book which allowed authors to express themselves in an open and friendly atmosphere where new ideas were abound. Closing the lid on certain "boxes" of ideas by limiting the book's scope and range would be a tragedy to both fields. The volume that you have before you targets the creative nature of technology itself. As you will see through the chapters composing this book, the collaboration of ideas yields both fascinating and thought-provoking concepts.

Technology is here to stay. It has shaped events in the past and will clearly continue to shape the future. Through this handbook we are addressing novel concepts from creation, interaction, communication, to the interpretation and emergence of art through various technological means and media. The book itself is divided into four main categories. Section one focuses on the overlap of these domains where the discussion of collaboration and intersection remains the overall theme. Section two presents a plethora of current creative projects spanning multiple disciplines, artists and researchers from many diverse backgrounds. The third section focuses on the impact of various aspects of culture and society as influenced by technology and art. This section also deals with our interpretation of these artifacts and how we are shaped by certain concepts and philosophies. In section four we take a look at the creativity offered through MMORPGs, online environments and virtual worlds. We hope that these chapters will serve to inspire new ideas and shed light on topics previously unknown to many readers.

Section I: Intersections of Art, Science and Technology, highlights how these areas overlap. One of the most obvious intersections that many envision as the concepts of "Computers" and "Arts" are mentioned is the idea of visual representations of mathematical concepts. The masses are often exposed to films created with the help of computer experts, with special effects that corroborate the importance of catastrophic repercussion of a series of events the story's main character seems to run into. Or the more fantastic stories that are quickly replacing classic-style cartoons, heavily relying on ray-tracing engines that produce funny ogres or families of superheroes. There are other applications that instigate one's artistic side more, as we review the visual representation of Mandelbrot and Julia sets. But this is exactly what those are, visual representations. These are not art. The art lays in the perception of the human who explored a particular area of a mathematical universe, or created an animation character. Artists are mathematicians, musicians, painters, tailors, and writers. Sometimes such artist can also be an artificial agent capable of producing a medium that is perceived as art.

Art is a concept that is often relative and misinterpreted. It is usually personal. Beauty is in the eye of the beholder, many popular folks sayings state through the world. This is particularly true for innovative streams of artists that push the envelope in order to progress in a particular niche, shifting ever so slightly, or sometimes significantly, the rules that govern it. This is the spirit behind the works that are reported in this handbook. We are not trying to describe works of art like the David or the Sistine Chapel. We are also not trying to illustrate how such impressive masterpieces can be digitized in one form or another. We are not applying computer science as a tool available to artists or computer scientists. We want to project the true intersection of computers and arts, scientists and artists, pixels and canvases.

Section II: Creativity Unleashed. The diversity and depth contained in this section presented a challenge to classify by one unifying theme. This difficulty is a direct consequence of the vast overlap between the domains of computing and arts. It is in the eclectic collection of projects reported here that we truly visualize the blurred boundary. We want to give room to projects that are truly innovative in their nature.

Vision is one sense that most people associate directly with arts. Hearing is a close second. Monet, Michelangelo, Beethoven and Brahms are all masters at their crafts, focusing on the direct communication of their visions and feelings to us through one sense. The innovation lies in exploring the indirect communication, the blending of the senses where the full effect can be achieved only by interpolating our feelings with our senses, and, at last, with the intellect. This section illustrates many projects just as worthy that explore the breaking of generally static physical and conceptual boundaries.

Section III: Implications of Technology, Social Dynamics and Culture focuses on slightly different aspects. Art is often an individual experience, but it can be rarely isolated from a social and cultural perspective. This section analyzes these very aspects, where social and individual factors can be visited and revisited with an innovative magnifying lens.

We often become so self-involved that we think of computing and sometimes even arts as an individual process. Although this idea is many times true, these two domains create social and cultural waves that cannot be underestimated. And especially, as we look beneath the surface of routine actions and reactions, we can identify underlying causes and mechanisms that offer a brand new viewpoint to the usual set of notions and parameters that we use to evaluate certain actions and situations.

Section IV: Creativity in Virtual Worlds and Artificial Spaces focuses on the creative side of computer-mediated environments. Virtual worlds provide a unique medium for both personal and collaborative expression. This is especially true in some of the newer persistent virtual worlds were we can share our virtual lives and identities with others around the globe. Some of us even spend much time and energy (and sometimes even money) in creating an alternative self that inhabits these worlds. Not only can we shape "physical" objects here, but we use our virtual identity as a creative medium for expression and self representation. Many are realizing the creative power locked in this technology, where we are no longer bound to sharing information, text, images and files like the flat 2D Internet. In these three-dimensional spaces we can view informational artifacts as visual or "physical" manifestations. In their own right, we could also consider many of these virtual worlds as four-dimensional; their dynamics changing over time, affected by the various visits and interactions of users, evolving into its own emergent society.

By exploring the relationship between "worlds" we have evolved our concepts of reality that extends creativity into spaces that are merely represented by pixels on a screen while a human audience perceives them as real. One needs not be a machinimator or avid game player to realize the potential of these spaces once you are immersed inside any of these environments, meeting the people that "live" there. As higher education, artists, researchers and social scientists (to name a few) are embracing these technologies, we are starting to see just how interesting and creative these environments can be made to be. These synthetic environments are a unique medium ready for exploration.

It is to be expected that the number of questions you might have after reading this Handbook significantly surpasses the amount of solutions and answers given across the chapters. But that happens in cross-disciplinary efforts like this anyway. If we managed to challenge you to think outside your disciplinary bounds and boxes that you are comfortable in, we would declare we had reached the goal of this project. We hope that through this book we can reach a broad range of individuals and blur boundaries.

The domains of arts and computing have never been closer than now. We hope that our readers realize that such interaction goes well beyond the simple diffusion of art through Information Technology solutions. Arts involve you, make you feel alive, and let you express yourself. Computers are perhaps

one of the best allies. Do not be afraid of exploring new frontiers, break beyond them and become aware of how it feels.

Only as we stand on the shoulders of giants we can look forward and see what is ahead. This concept is particularly important in this work. And it is for this reason that we would like to shift the focus from this handbook to the people who were giants and on whose shoulders our friends and contributing authors stand. It is their tireless efforts that brought us to this handbook. Without visionaries we would still have to adapt to what nature gives us. Such visionaries, added over time, lead us to today, and to the ones who contributed to this book, more than the ones who humbly assembled it. In turn, it is the visionaries who made this book possible that will become the platform onto which others will stand and dare to build.

James Braman, Towson University, USA
Giovanni Vincenti, Gruppo Vincenti, S.r.l., Italy
Goran Trajkovski, Laureate Higher Education Group, USA