Preface

A SUMMARY

This book examines and acknowledges the power existing beyond visual explanation and presentation of scientific and computational problems. An array of concepts, data, and information belonging to a number of disciplines has been discussed as possible resources useful for visual presentation, visualization, and finding visual solutions of science- and technology-related concepts. On the other hand, these resources may support our computational solutions for many of the cognition-, art-, and entertainment-related problems. For these reasons, this book may be of interest for those people who make a focus of their attention the integration of science, technology, computing, art, and mathematics.

This book discusses projects involving the readers’ cooperation. Text and images are of service to assist the readers in enhancing their solutions with explanatory visuals, and maybe finding joy in these tasks. With regard to teaching and learning, the visual approach to knowledge understanding, learning, and retaining grows in importance because of its pervasive use in network-based, shared, multisensory strategies applied in communication. The book offers discussion of issues related to interdisciplinary education, picturing processes and products, as well as the role of computing in advancing integrative visual education.

The topics introduced below are spread between the two books titled Perceptions of Knowledge Visualization: Explaining Concepts through Meaningful Images and Computational Solutions for Knowledge, Art, and Entertainment: Information Exchange Beyond Text.

NEEDS AND ISSUES THAT AMOUNTED TO SHAPE THIS BOOK

Visual Presentation of Knowledge

The aim of the book is to give support in presenting abstract concepts and data in a visual way. As information becomes more visual every day, many highly specialized individuals find themselves in need of not only understanding visual aspect of communication, but also they want to get rid of their inhibitions, patterns, and preconceptions related to art and design as a whole. In an increasing rate, visual literacy and feeling at ease with visuals becomes a crucial faculty; for this reason a workbook for investigating personal artistic and/or technological aspirations might become the most sought, compelling aid, useful in enhancing visual literacy of the science- and technology-oriented specialists.
This book explores connections and relationships between diverse disciplines, occurrences, processes, laws, products, and transformations. The author’s intent is in offering the reader both denotations and connotations of scientific concepts and terms. Denotations would provide their distinct meanings, while connotations would be closely tied to their heuristic, phenomenological, aesthetic, and intuitive sense, so the reader would connect and react to multi-faced perception of scientific themes. The aim of the book is to shift that attitude and give support in presenting data in a visual yet abstract way.

**Interactive Way of Reading this Book**

The mini-topics, presented as visual solutions of the reader, serve as a link between theory and the reader’s own practice, so the data would reveal a visual aspect of a discipline under discussion. Throwing light on the selected multi-subject topics, along with a collection of related data and author’s views on those trends, aims at the linking and connecting the conceptual with the depicted, and including the reader in an active, visual style of processing and outputting information. Projects offered in the text combine topics related to science, art, and computing; they encourage the reader to explain concepts in a visual way. Rather than following a textbook-like style, this book offers information about basic concepts and facts as inspiration for visual solutions coming from examples of both current and ancient visual applications of knowledge, as well as trends resulting from the developments in technologies.

Many figures in this book have the QR codes (quick response codes) for the URL of the author’s Website containing color pictures in order to bridge the offline text with online presentation of art by enabling the reader to access the Webpage and look at the color art works. A structure of QR code matrices is designed to be detected as a 2-dimensional digital image by a semiconductor image sensor and then digitally analyzed by a programmed processor. A QR code is a matrix barcode consisting of black modules (square dots) arranged in a square pattern on a white background that record information about an item.

**Combining Disciplines in Particular Topics**

This book is an array of concepts, data, and information, all belonging to a number of disciplines. This is caused by the fact that recent advances in knowledge result from cooperation of specialists in seemingly unrelated domains. What’s more, the progress often moves forward through networking, chatting, using Skype, or simply updating the school-based knowledge. Fields of research become interdisciplinary, interactive, and often integrated. One cannot discuss the cosmos without bringing up concepts derived from physics (often quantum physics), mechanics, mathematics, and philosophy; one cannot talk about living systems without touching biochemistry, physics, and electromagnetic phenomena. For this reason, many themes belonging to this book’s profile have been annotated with explanatory notes, some of them being obvious for readers focused on the issues under discussion, and many appearing to be unrelated for those concentrated on quite other fields of interest.

A question arises about the ways the teaching about art and design could be combined with programming and computing. Both are aimed at enhancing higher-level thinking skills, abstract thinking, creativity, and novelty. Many artists apply programming to create art works or visualizations, and many computing scientists and programmers do the same. The content of these programs becomes a question
belonging to the art domain, while inquiries what can be done to make these programs aesthetic become the problems belonging to the usability territory. After pursuing a study of the arts, a programmer may gain a viewpoint about the purposes for programming the individual projects and making sense of it in further phases, and thus achieve more ontological attitude relative to the essence of being.

While constantly immersed in the mind puzzling natural phenomena, objects, and processes explored by sciences, we gain knowledge and experience, a good deal of it ensuing from our school education. However, educational assessment involves multiple-choice tests as a typical form of testing. In order to prepare ourselves to tests, we have often memorized particular facts, laws, and formulas, each and every one with the test questions in mind. This kind of knowledge interweaves with a whole landscape of knowledge we acquire later. Our knowledge constantly changes along with the developments in technology. At the same time, the school tests are the same for all students, disregarding the diversity of the intelligence types described by Howard Gardner (1983, 2006, 2007): visual/spatial intelligence, verbal/linguistic, logical/mathematical, bodily/kinesthetic, musical/rhythmic, interpersonal, intrapersonal, naturalistic, and existential intelligence. We may feel our own visual or verbal preferences in dealing with our tasks. The projects presented in this book are designed to inspect selected themes from a totally different perspective.

**A Place for the Arts in the Multimedia-Oriented Social Environment**

One may say art is an interpretation of human perception saved accordingly. This book focuses on visual approach to natural events rather than on their detailed analyses. It encourages the readers to perform some mental activities in a visual way. Many agree that our ways of communication are drifting toward visual media; our efficiency in sharing knowledge and emotions may depend on our adaptability and ability to convey them in an up-to-date way. It may have something in common with a Barbara Smaller’s wish that was pictured in the June 4, 2012 issue of *The New Yorker* (p. 114): “I’m looking for a career that won’t be obsolete before my student loan is paid off.” This book attempts to respond to the changing role of art and promotes including the learning of art into the technology-oriented world.

Viewers used to appreciate art they considered beautiful, which often was meant as the lifelike art works that resembled real-life objects. At the present time, due to the pervasive presence of social networking sites, groups of interconnected people exchange information and cooperate applying computing. Their creative activities involve higher-level thinking processes aimed at approaching multisensory, interactive actions. We may notice art-related schools, which were traditionally named the Art and Design departments, now introduce themselves as the Art and Media or the Art and Technology schools, with computing and programming described as a requisite both for the studies and future work.

**This Book as a Form of Entertainment**

Many agree that mental exercises make the best entertainment. Japanese prize-winning writer, Haruki Murakami (2011, p. 175), assumes that what may be called intellectual curiosity, a desire to obtain knowledge at the universal level, is a natural urge in people. Jean-Baptiste Dubos (1670-1742) wrote that man does nothing but what fulfills his needs; one of them is a need for keeping his own mind busy; otherwise, he becomes bored and unhappy:
The soul hath its wants no less than the body; and one of the greatest wants of man is to have his mind incessantly occupied. The heaviness which quickly attends the inactivity of the mind, is a situation so very disagreeable to man, that he frequently chooses to expose himself to the most painful exercises, rather than be troubled with it. (Dubos, 1717)

With Facebook becoming the most popular social networking site involving about a billion active users, Google being probably the Internet’s most visited Website, console gaming becoming a widely used instructional tool, and cinematic effects in motion pictures and games valued as motivational tools, we often consider play as a tool for learning, sharing, and entertainment. Within this template, learning can provide entertainment and amusement.

Dean Simonton (2003, 2004) points out that creativity of scientists is a constrained, stochastic, randomly determined behavior, as the new theories in all sciences are. When we realize that the results of our research are characterized by conjecture and accidental or unpredictable events (Simonton, 2004, p. 41), our curiosity may be enhanced. We cannot predict the results we can only know after computing them. Simonton reminds us of the Albert Einstein’s remark:

It is, in fact, nothing short of a miracle that the modern methods of instruction have not yet entirely strangled the holy curiosity of inquiry; for this delicate little plant, aside from stimulation, stands mostly in the need of freedom; without this it goes to wreck and ruin without fall. (Schlipp, 1951, p. 17)

Many would agree our thinking often depends on the tools we use; more areas are available for thought experiments by reason of the developments in technology. Tools may enhance our imagination. Thought activities are often shared, and thus become more entertaining, because almost everything we examine can be visualized. This allows creating technology-based entertainment such as films based on scientific books, worlds populated by avatars and beings existing in the past, the future, or in fictitious environments. Charles Jencks, an architect and writer questioning postulates expressed by the Modern architecture and describing its successors – the Late, Neo, and Post-Modern architecture, wrote:

Whatever the reasons, contemporary science has not yet transformed the cultural landscape not led to a renaissance in thought. … In any case, I believe that the ideas of contemporary science do provide the basis for a cultural reawakening and that a new iconography must be made more tangible through art if it is to be assimilated. (Jencks, 2003, p. 20)

Nathan Yau (Lima, 2011, p. 248) describes the citizen science that is based on social data collection, “Although not everyone who ‘analyzes’ this data will have a background in the proper techniques, a certain level of data literacy must be developed. Visualization will be essential in making the data more accessible.” Yau (2011) emphasizes the engaging quality of interactive, flying data that he finds not only explanatory but also compelling and entertaining. Non-professionals become involved in visualization and analysis when they take on microblogging and engage with social applications like Twitter and Facebook. The task is to add structure and tools that take advantage of these open applications, to see the undiscovered relationships, and to interact with our surrounding.
The Power of Visualization and Visualizing Thoughts

According to the pioneer in the field of data visualization Edward Tufte (1983/2001), vision is the only universal language. Gyorgy Kepes (1906-2001), who published an influential book about design and design education *Language of Vision* (1944/1995, p. 13) wrote, “Visual communication is universal and international; it knows no limits of tongue, vocabulary, or grammar, and it can be perceived by the illiterate as well as by the literate.”

The Voyager, which is conveying the data about the heliosphere and the interstellar space, had sent into the deep space a gold-plated copper disk containing visual descriptions as a record of our civilization (Figure 1). A committee chaired by Carl Sagan of Cornell University selected the content of the record for NASA. The spacecraft may approach another planetary system in at least 40,000 years (NASA Jet Propulsion Laboratory, 2012).

Available at http://www.jpl.nasa.gov/images/voyager/gold_record-browse.jpg

Projects for the Reader

Themes for particular chapters in this book have been selected with several objectives in mind. First of all, descriptions of natural and technological processes are focused on visual ways of explanation. Second, the readers are invited to look at the underlying physical and natural laws and actively react to the nature- and science-derived facts and processes. Translation into the art and visualization oriented frames of thinking supports current methods of communication going through networked, linked, and shared media. Developments in science, technology, and art created with the use of a computer come in a
great part from biology-inspired sources. As Gérard Battail (2009, p. 323) wrote, “Life is an outstanding expert in solving engineering problems.” The selected nature- and science-inspired themes are intended to encourage the reader to respond in one’s own way, by creating, designing, writing, and programming individual reactions to these themes.

Many of us scan and copy items or use Internet resources, and then apply filters to transform them into line drawings; many do not draw at all. We can see this trend in animations and feature films. Perhaps the meaning of drawing is different in electronic media, where images are interactive, linked, and open-ended. Paul Fishwick (2008, p. 4) defines aesthetic computing as “the application of the theory and practice of art to the field of computing.” For him, it is the study of artistic, personalized, formal model structures in computing that go beyond representation and events in technology.

The book tells about a number of nature-inspired projects, applications, and technologies, selected with a focus on visual way of communicating solutions. Readers will find framed spaces for their visual and verbal responses. The spaces left for reader’s thought and action are the decisive parts of this book; it is a place for novel, personal interaction in the form of drawing and writing. Combining selected fields of knowledge with practical applications in terms of the visual and verbal expression serves as a tool used to show the way of applying one’s visual way of solving particular tasks and to work on one’s ability to do this. For these reasons, I see the tables with a space for the reader’s input as an inherent part of the book. This serves as a link between theoretical and practical application of visual literacy seen from a new perspective. The central aim of this book should not thus be misunderstood, neither as a research source suggesting new themes for other researchers nor as a collection of exercises for particular groups of people.

The goal of art therapists lies in helping people with problems at the cognitive, motor, emotional, and psychomotor levels, to name just a few. It is not necessary that “patients” fully comprehend this material, with its scope spanning from science, engineering, and computing to art concepts. This book is meant for those thinking at the higher, abstract thinking level, who grew to the point of opening themselves to current venues and experiences. Thus, the main thesis of the book is in proclaiming a need for shifting the readers’ thinking and acting towards creating visual explanations and solutions based on a selected knowledge base. Filling out by the reader each framed space adheres to the book’s intention.

Projects suggested in this book are meant to support visual way of thinking and developing visual communication with the use of visual semiotics by constructing signs, symbols, iconic objects, analogies, and metaphorical connotations, thus conveying some meaning in a visual way. The text is interlaced with projects to be solved by the reader within the boxes designated to their visual/verbal answer to the project. The empty boxes in the text are for sketches; the reader can sketch or can choose to continue working further on the computer. Projects are open-ended in nature and integrative. The sources for inspiration are contained within the background information provided, rather than in a description of an expected outcome. The reader may go any direction one would choose, look for answers on the Internet, or try to create something totally new. My students’ solutions accompany the text, along with the author’s visual solutions, which are printed black-and-white here.

Each project challenges you to react to a theme under discussion, add your input or modify the content, visualize the concept, and then complete your visual/verbal answer. Each empty space is a place intended for your planned idea for a project. First, you may want to describe it, to sketch, draw, design a concept map, or draw some key frames. Then you may feel ready for writing a program, designing a software application or an app for mobile devices, use graphic software, and create a picture or a sculpture (for example from wooden blocks or the found objects). Finally, you may want to make a photo or
a short video of your project, post it online, thus adding your active, creative, independent solution or interpretation and explaining it to others. Your projects may take form of an artwork, a verse, a story, a concept map, animation, comics or manga, or a smart phone app.

The purpose behind these activities lies in their explanatory and motivational power to enhance one’s visual, graphical, and visualization literacy (both of the readers and of those who would look at their projects). Our environment and its changes influence our thinking and our acting, which we do mostly with the use of computing. For this reason, the following text tells about the connectivity between our daily life, knowledge, art, and entertainment. In a quest for things that last longer, people work on making materials indestructible and designing intelligent applications. This connectivity becomes even stronger because of the changes we experience when our knowledge about the world we live in becomes bio-inspired, nano-oriented, and progressively shared because:

1. The impact of biology-inspired knowledge, technology, and art is growing
2. The focus on nanotechnology drives the advances in many domains and brings changes in materials, technologies, and applications, influencing each other
3. The Web-based networking results in changing the way we now solve our problems (with the immediate help coming from often unidentified sources), entertain (we can enjoy gaming with people from far away), and develop in social media, new media art, or networked art (existing in real time and/or in virtual spaces)
4. Programming became accessible and easier due to the visual way of instruction such as processing, with free online instruction (such as HTML, free courses, Apple Developers’ kits, SDK – Software Development Kits, etc.), so the art creating often fuses with the manufacture, while the designing of games becomes an art medium.

In a quest for objects that would last longer, people work on making materials indestructible and designing intelligent applications. Projects interweaving the text are intended to associate knowledge with practical applications, facilitate the integration of particular facets of science that have been routinely segregated into special fields, and to follow the current advances in various areas. Our thinking may probably change not only with the technical progress but also with the experienced reality changing along with the advancements in technology and everyday life. Projects are aimed to hopefully engage the readers in practicing visual communication and visual organization of data and knowledge, with a focus on the meaning, not exclusively on data or numbers. When working on these projects, you may hesitate to look at or copy the ready examples, because copying may influence a person who copies and may have an impact on one’s personal visual statement. As a summary, the projects offered in this book will most likely prompt inspiration to find progressive solutions based on the informed way of thinking.

As a conclusive remark, with the advent of pervasive computing, with computer-mediated way of thinking and living at many fronts, one might ponder about a need for a talent search and support for all talents that could further advance our ways of living. Three issues come to mind:

1. A need for a free access to the Internet for everyone, disregarding all differences and levels, so every idea-driven and motivated individual could explore, learn, produce, and share knowledge and achievements. This issue seems to face similar obstacles as a free access to water.
2. A need for solving the image- and video-related copyright problems, so every author could freely illustrate one’s writings with visual examples, rather than provide complex, lengthy, and often
short-living links. For that, an international agreement would be needed to address profit-based issues.

3. In regard to mining and supporting talents, training and education of children should be focused on recognizing and supporting the innate abilities of children. This would allow starting a holistic training of young minds by providing knowledge visualization early, that means from kindergarten (Figure 2). Knowledge visualization has a power to introduce an outline of major ideas and connections between science, mathematics, and programming.

Figure 2 conveys an opinion that before a child learns typical attitudes, misconceptions, and classifications, we can introduce a big picture as inspiration to finding their own interest, focus, and future path. Ongoing developments in computer graphics and visualization techniques may make us to reconsider the needs of education. With a shortage of programmers combined with usual fear of mathematics, programming, and science, one may consider knowledge visualization as a tool for showing the world at the time when attitudes are open and children’ brains are curious.

With the use of visualization techniques, themes related to science, nature, math, art, and how they mutually influence each other might be presented to young children as a big holistic spectrum of knowledge. We may instill abstract thinking in young children by supporting an understanding of the surrounding world, which would allow making connections. On the basis of openness to a wider picture, they may have a chance to shape their own, individual focus on what stirs their curiosity, in relation to other levels of knowledge. To enhance instruction with knowledge visualization component, early childhood specialists and departments would need to welcome knowledge visualization specialists on the board.
CONTENT

Section 1: Making a Visual Statement

Chapter 1: “Looking and Seeing: Communication through Art: Creating, Conveying, and Responding to Art”

Projects described in this chapter are aimed at enhancing our thinking with pictures. After examining the artistic process, the text encourages the readers to engage in visual projects. The following text comprises a comparative inquiry about the ways of designing, conveying, and receiving images. Three basic processes in communication in the arts appear to be decisive for both the traditional and digital artwork: articulation of a visual message through creation of an electronic picture and its transitions, communication with a viewer, and reception of the artwork by a viewer. Thus, the three levels in a creative process comprise an artist as a sender of a message (an idea), media of art (a process), and the viewer as the receiver (rethinking of an idea, interactive response by reshaping a work, new interpretation, or a new idea). Many hold that the artistic process requires a cognitive, psychological, and emotional involvement from the artist that remains similar in whichever medium one actually creates – computing, paint, or chisel. In this study, language of an artwork as the expression of a message is discussed both in the traditional and electronic media framework of art.

Chapter 2: “Thinking with Pictures: Art as an Instrument of Acquiring Knowledge”

Visual presentation through art is considered an effective instrument for acquiring knowledge. Projects aimed at developing visual literacy and skills include: 1) timed sketching of one’s own shoe – intended to enhance self-confidence about one’s ability to depict things, and build a feeling of being prepared to make quick drawings on a board or a tablet. This project will encourage the reader to make sketches that strengthen one’s own argumentation, show what one wants to be seen, and convey one’s own solution in a visual way. 2) Creating a composition with a crowd – drawing a manikin and then a group of people by applying visual reasoning and showing background scenery that has an explanatory power, which serves as first exercise toward information visualization related thinking. 3) Collage – one may say without exaggeration that in the digital times most artists apply the form of a collage in their work. The Internet is flooded with ready images, clipart, art and design samples, and intriguing specimens. More importantly, ideas cannot be copyrighted. Further text discusses how, before the advent of computers, artists applied techniques of cutting and pasting readymade material, thus making collages (two dimensional) and assemblages (three dimensional) of different forms.

Chapter 3: “Art Resulting from Computing”

This chapter examines many types of new media art that are being created with computing. One may point to a parallel between theories about art production and scientific theories and technologies. Displaying art becomes a tool for exchanging information and ideas that also creates channels for the viewers’ input through digital art interactive events. Biology-inspired computing applied for artistic tasks has a mutual relationship with scientific research involving evolutionary computing. Net art, along with other
electronic art media, may be seen as closely related to the semantic networks and social networking media. Many times these media provide computational solutions for entertainment.

Chapter 4: “Aesthetics in the Context of New Media Art and Knowledge Visualization”

This chapter discusses aesthetic values in mathematics, science, and computing, including aesthetic computing and aesthetic issues related to digital environment. A study of aesthetics has always been related to the arts, philosophy of art, and our judgments about sensory or emotional values of specific art works; they are in the focus of neuroaesthetics. The objectives of aesthetic studies have been changing following the developments in computing technology, shifting the stress on usability and efficiency of projects and visualizations. Challenges and demands in aesthetics and art are then discussed, starting from an essential question what is an artwork and what is not an artwork, art definitions, art manifestos, opinions on the role of art, beauty, and aesthetic perception of art. Aesthetic education and ways of looking at art complete the chapter.

Chapter 5: “Criticism versus Objectives and Assessment for the New Media Art and Design”

This chapter examines some of the changes in views about art, criticism of art works, and art-related teaching objectives, as they evolve with the developments in the new media art, works created through the Web, social networking, art created on portable devices, as well as the information technologies. First, this chapter examines the changing meaning of the aesthetics notion in mathematics, science, information art, and information technology, as well as changes in the views about instruction in art criticism. Examination of these approaches is then contrasted with the models adopted in education. The four-part model used in instructional design, based on audience, outcome, environment, and usability, is adapted to suit the needs of art criticism. Materials based on a literature review provide the rationale for a four-part model to facilitate art critique. The next part is about the changing dimensions of criticism in the new media art and product design in respect to the product semantics analysis.

Section 2: Lessons from Science

Chapter 6: “The Journey to the Center of the Earth”

In the “Journey to the Center of the Earth” project, pictorial and verbal presentations are integrated with the physical geology-related concepts, events, and processes. Inspiration for this project comes from the theme of the interior of the Earth and some literary connotations. It is mental investigation about the interior of the Earth intended to encourage the reader to conduct an experiment in thinking and communicating with the use of visual language: an imaginary trip in a transparent, pressure, and temperature resistant elevator descending to the center of the Earth, visualizing its core, and making the visual and verbal notes from the trip. In this project graphic activities are integrated with physical geology-related concepts, events, and processes, language arts, and connotations pertaining to cellular biology. It is also about our awareness of the dynamics, forcefulness, and fragility of the matter under the ground we are living on.
Chapter 7: “Taking Inspiration from Astronomy for Visual and Verbal Projects”

The chapter comprises projects about some basic concepts related to astrophysics in a visual, verbal, or both ways, for example in the form of a comics medium: comic books, comic strips, or cartoons. The reader is encouraged to envision particular events, processes, and products and then transform the concepts into another level of understanding. Projects involve visualizing or describing the relationship between frequency, wavelength, and energy, and the energy of light as the electromagnetic wave. Themes for projects include the solar system, the Kepler’s explanation of the forces acting at the solar system’s motion and planetary movement, creating frames for animation about the expansion of the universe, a travel to the sun’s center to explore nuclear fusion, examination of light and electromagnetic spectrum, elementary particles and quantum mechanics, and visualizing and designing one’s own household goods with related devices, furniture, objects, and appliances, along with their arrangement and decoration.

Chapter 8: “Imaging and Picturing Volcanism”

This part of the book invites the reader to look closer at plate tectonics and volcanism and then draw inspiration from geological events, processes, and products for creating visual and/or verbal projects. The next part is about earthquakes, tsunami, explosive eruptions of volcanoes such as Mt. St. Helens, Yellowstone, and Mount Vesuvius, about the Japan 2011 earthquake, and the impact of volcanism on human fates. The chapter examines how the events such as the destruction of Pompeii and Herculaneum buried by an eruption of the Mount Vesuvius, which provide a new access to a frozen slice of life in an ancient civilization, change the way we view past events from the art historical, anthropological, and archeological point of view.

Chapter 9: “Picturing Minerals and Rocks”

In this chapter, we draw inspiration from the study of Earth structures and materials, as well as processes and forces that change these structures, which is the core of the domain of physical geology. We examine minerals, main types of rocks, gems, and other more mundane earth baubles, the rock cycle, and processes that change the structure of the minerals. Projects are aimed at linking these physical and chemical processes and events with our ambient surroundings and personal perceptions of our own experiences.

Chapter 10: “Energy and Environment”

The theme of this chapter is energy (such as kinetic, potential, mechanical, electrical, chemical, light, radiant, nuclear, and heat energy), energy conversion, and rules that must be obeyed when we perceive a need for its conservation. It also tells about the environmental concerns related to energy production and use. Visual and verbal solutions provide analogies and comparisons of some energy related processes and events to our everyday experiences.

Chapter 11: “Nano World”

This part of the book provides information and projects for the readers about the omnipresence of nanoscale objects – soft matter, colloids, liquid crystals, carbon nanotubes, nanoshells, and the develop-
ments in nanoscale and molecular-scale technologies involving these small structures. Nanotechnology concerns structures measuring between 1 and 100 nanometers and allows manipulating individual atoms and molecules. Since Norio Taniguchi of Tokyo Science University first used the term nanotechnology in 1974, the governments, corporations, and venture capitalists invest every year billions of dollars in nanotechnology and more than a half of advanced technologies incorporate nanotechnology products in different ways.

Chapter 12: “Acceleration”

This part of the book provides an occasion to combine visual presentation of concepts related to speed, velocity, and acceleration with the real-life circumstances (such as car or horse races) and at the same time with artistic connotations about motion and artistic responses to it. The goal of this project is to show acceleration, speed, and velocity by producing an image that would look very dynamic. For example, dynamic changes of motion can be presented as a scene with racecars or horses. Connotations related to art may enhance both our knowledge about acceleration and a message it evokes.

Chapter 13: “Carbon: A Gem, a Molecule, and a Heart of Nanotechnology”

“Carbon: A Gem, a Molecule, and a Heart of Nanotechnology” is about related habitats and technologies seen from the scientific, artistic, and educational points of view. It explores carbon as mineral: coal, carbon as a molecule, carbon as soft matter, and biologically inspired models for computing. Art inspired by carbon and enhanced by digital technologies are a means to understand and interpret nature- and science-related concepts.

Chapter 14: “Mathematics-Related Visual Events”

A mathematical way of thinking may often involve the visual processes while the beauty of forms derived from mathematical formulas may become an inspiration and a source for creating art works. This text examines organic/geometric forms present in nature, mathematics, and art, symmetry, fractals, artists’ responses, and computational solutions in the form of visual presentations. This is followed by some aesthetical and critical notions about mathematics-derived art.

Chapter 15: “Poem Illustration for the Spoon River Anthology by Edgar Lee Masters”

This project makes connection between visual arts and literary analysis of the masterpiece collection of poems, *Spoon River Anthology*, by Edgar Lee Masters, as well as his work and his times. Masters created imaginary stories about people whose names he found on gravestones. The aim of this project is to create one’s own artistic expression of our understanding of Edgar Lee Masters’s work as a personal response to the spirit and the meaning of the verse, as well as to the author’s comments on the philosophical, social, and historical issues. In addition, the reader is asked to visually interpret Masters’s literary descriptions of imaginary events in the lives of the deceased people.
Chapter 16: “Four Trapped in an Elevator”

In this physics/psychology related integrative project, gravitation acting on the elevator riders is discussed in psychological terms. It may be interesting to portray some characters and convey their emotional states and actions in this unusual situation. Science-based themes that serve as inspiration for this project refer to the physical concepts of gravitation as a natural force causing objects with mass to attract one another, acceleration due to gravity, and the potential energy of the stuck elevator. This project is also about an artistic interpretation of psychological and social aspects of the unusual and stressful circumstances.

Chapter 17: “The History of Love”

This text provides insight about love, seen as a power that lets people survive in spite of all overwhelming forces. It helps us to understand, preserve the natural world, and protect values; love as a force gives us strength and motivation to perform both heroic and everyday deeds, develop knowledge at the macro, micro, and nano levels, produce medicine drugs and vaccines, initiate social changes, and enhance communication networks to share and exchange information.

Chapter 18: “Architecture and Media”

This part of the book explores how architects and urban developers apply computational solutions and create a fusion of architecture and media. The use of new technologies for communication, sustainability, functionality, and economy of resources is discussed next. Issues that are relevant to computational methods in design, urban aesthetics, ambient computing, sustainable habitats, novel materials, biology-inspired projects, and many others all pertain to innovative solutions that we can observe in architecture. Themes related to some of the tools and technologies, models of architectural structures, intelligent buildings, and sustainable and green architecture complete this chapter.

Chapter 19: “Educational Implications”

An integrative art-science approach to teaching is described, involving imaging concepts about science, with three approaches to integration of art and science: 1) visual presentation of scientific concepts, 2) creating art by finding inspiration in a science-based topic, 3) learning visually for other courses taken concurrently by arranging data into a structured whole. The next part of the chapter is about several dimensions that seem important in blended and online learning regarding social networking and the collaborative virtual environments. Virtual education in a first life and a Second Life classroom environment is discussed next.

Section 3: Computing Solutions for Entertainment

Chapter 20: “Ways to Entertain with the Use of Computing Technologies”

Entertainment has gained some new values, and our participation in amusement has become more active along with the developments in social communication technologies. Examples that discuss the meaning of computational solutions for entertainment include intelligent environments, augmented and
virtual reality, computer animation, games, live entertainment, and social media. This text examines the enhanced role of the participant’s self-consciousness while engaging in social networking, and the role of the biologically active substances such as oxytocin and dopamine in shaping the ways of entertaining with the use of computing technologies.

Chapter 21: “Challenges in Game Design”

Electronic games and gaming can serve as the tools for visual solutions. It depends on the methods through which the games are delivered and the ways people think about electronic games. First, traditional and electronic gaming is described, and then, various goal-oriented game applications are discussed. Game features acting in favor of or against gaming complete this part of the book.


This part of the book tells about combining pictorial and verbal solutions. Visual and verbal expression is gaining additional communication possibilities by the developments in data organization techniques, such as search engines on the Internet, cognitive and semantic structuring of information, concept mapping, social networking, and cloud computing. Electronic art, Web design, and communication media support creation of electronic media languages in visual representation and design. This chapter is focused on text visualization and on storytelling delivered in various literary styles.

Chapter 23: “Metaphorical Portraits”

Telling stories verbally and visually involves structuring the data toward different metaphorical representations of a person. Creating metaphors for a set of factors that make up a profile or a portrait will allow showing individual features of a portrayed person. This text encourages the readers to apply their visual literacy and exercise their cognitive processes related to imaging.

Chapter 24: “Visual Music”

Visual music projects involve visuals combined with music in various configurations. They may refer to the use of images, light, and sound, such as music and voice, including songs, and also haptic experiences, touch, and gesture. This chapter examines this century-old form of entertainment in terms of the technology options available in the successive decades.

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REFERENCES


APPENDIX: SELECTED WEBSITES WITH ART WORKS SUPPORTING THE TEXT

Listed are some art related Web addresses that may support the text. While links become perishable, there are still Google Images available.

Figures in color and time-based works can be viewed at http://ursyn.com/student%20gallery/index.html; color figures have the QR codes (quick response codes) for the URL of the author’s Website.

- **Art History Resources on the Web**: http://arthistoryresources.net/ARTHLinks.html
- **Contemporary Art**: http://arthistoryresources.net/ARTHcontemporary.html
- **WEB Museum**: (Nicolas Pioch) http://www.ibiblio.org/wm/
- **SFMOMA ArtScope**: Established for exploring the Museum collection, http://www.sfmoma.org/projects/artscope/index.html#artwork=48370&r=73&zoom=4 shows art works from the San Francisco Museum of Modern Art; artwork images and descriptions pop-up
- **Whitney Museum**: http://www.whitney.org/
- **Whitney Artport**: http://artport.whitney.org - Artport is the Whitney Museum’s portal to net art and digital arts, and an online gallery space for commissioned net art projects.
- **Emerging Artistic Practices**: http://www.rhizome.org
- **National Gallery of Art, Washington D.C.**: http://www.nga.gov/copyright/toc.htm
- **New Museum, New York**: www.newmuseum.org/
- **Published Reproductions of Art**:
- **Photoshop Resources**: http://sixrevisions.com/photography/70-excellent-photoshop-resources/