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Nota di contenuto	Architectures for Computer Vision; Contents; About the Author; Preface; Part One Verilog HDL; 1 Introduction; 1.1 Computer Architectures for Vision; 1.2 Algorithms for Computer Vision; 1.3 Computing Devices for Vision; 1.4 Design Flow for Vision Architectures; Problems; References; 2 Verilog HDL, Communication, and Control; 2.1 The Verilog System; 2.2 Hello, World!; 2.3 Modules and Ports; 2.4 UUT and TB; 2.5 Data Types and Operations; 2.6 Assignments; 2.7 Structural-Behavioral Design Elements; 2.8 Tasks and Functions; 2.9 Syntax Summary; 2.10 Simulation-Synthesis 2.11 Verilog System Tasks and Functions2.12 Converting Vision Algorithms into Verilog HDL Codes; 2.13 Design Method for Vision Architecture; 2.14 Communication by Name Reference; 2.15 Synchronous Port Communication; 2.16 Asynchronous Port Communication; 2.17 Packing and Unpacking; 2.18 Module Control; 2.19 Procedural Block Control; Problems; References; 3 Processor, Memory, and Array; 3.1 Image Processing System; 3.2 Taxonomy of Algorithms and Architectures; 3.3 Neighborhood Processor; 3.4 BPBP Processor; 3.5 DP Processor; 3.6 Forward and Backward Processors; 3.7 Frame Buffer and Image Memory

3.8 Multidimensional Array3.9 Queue; 3.10 Stack; 3.11 Linear Systolic Array; Problems; References; 4 Verilog Vision Simulator; 4.1 Vision Simulator; 4.2 Image Format Conversion; 4.3 Line-based Vision Simulator Principle; 4.4 LVSIM Top Module; 4.5 LVSIM IO System; 4.6 LVSIM RAM and Processor; 4.7 Frame-based Vision Simulator Principle; 4.8 FVSIM Top Module; 4.9 FVSIM IO System; 4.10 FVSIM RAM and Processor; 4.11 OpenCV Interface; Problems; References; Part Two Vision Principles; 5 Energy Function; 5.1 Discrete Labeling Problem; 5.2 MRF Model; 5.3 Energy Function; 5.4 Energy Function Models
5.5 Free Energy5.6 Inference Schemes; 5.7 Learning Methods; 5.8 Structure of the Energy Function; 5.9 Basic Energy Functions; Problems; References; 6 Stereo Vision; 6.1 Camera Systems; 6.2 Camera Matrices; 6.3 Camera Calibration; 6.4 Correspondence Geometry; 6.5 Camera Geometry; 6.6 Scene Geometry; 6.7 Rectification; 6.8 Appearance Models; 6.9 Fundamental Constraints; 6.10 Segment Constraints; 6.11 Constraints in Discrete Space; 6.12 Constraints in Frequency Space; 6.13 Basic Energy Functions; Problems; References; 7 Motion and Vision Modules; 7.1 3D Motion; 7.2 Direct Motion Estimation
7.3 Structure from Optical Flow7.4 Factorization Method; 7.5 Constraints on the Data Term; 7.6 Continuity Equation; 7.7 The Prior Term; 7.8 Energy Minimization; 7.9 Binocular Motion; 7.10 Segmentation Prior; 7.11 Blur Diameter; 7.12 Blur Diameter and Disparity; 7.13 Surface Normal and Disparity; 7.14 Surface Normal and Blur Diameter; 7.15 Links between Vision Modules; Problems; References; Part Three Vision Architectures; 8 Relaxation for Energy Minimization; 8.1 Euler-Lagrange Equation of the Energy Function; 8.2 Discrete Diffusion and Biharminic Operators; 8.3 SOR Equation
8.4 Relaxation Equation

Sommario/riassunto

This book provides comprehensive coverage of 3D vision systems, from vision models and state-of-the-art algorithms to their hardware architectures for implementation on DSPs, FPGA and ASIC chips, and GPUs. It aims to fill the gaps between computer vision algorithms and real-time digital circuit implementations, especially with Verilog HDL design. The organization of this book is vision and hardware module directed, based on Verilog vision modules, 3D vision modules, parallel vision architectures, and Verilog designs for the stereo matching system with various parallel architectures. It provide