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AUTOMATIC CONTROL and COMPUTER SCIENCE Section

CONTENTS

Image Based Controller for Visual Servoing Systems

Adrian Burlacu and Corneliu Lazăr

Full text

In this paper an image controller using model predictive control (MPC) for visual servoing systems is presented and its performances are analyzed. An eye-in-hand type servoing architecture, composed from a 6 degrees of freedom robot and a camera mounted on the gripper is considered. Modeling the visual servo open loop is composed from two stages: first the designing of a model for dynamics of the velocity controlled robot and second a model of the visual sensor. In classical approach, an image interaction matrix maps image space errors into errors in Cartesian space. For the MPC approach, using the open loop visual servo model, a image based predictor is developed. The image based predictor the future trajectories of a visual feature ensemble when past and future camera velocities are known. In order to obtain better performances for visual servoing systems an advanced technique is required, for this mater using the developed predictor an image based predictive controller (IbPC) is designed. Implementation, tests and validation of IbPC are conducted via a simulator developed in Matlab and performances in an image based visual servoing scheme are revealed in comparison with a PI image based controller. Experimental results underline the better performances of IbPC as an evaluation regarding the performances of PI classical approach.

Keywords: visual servoing, image based predictor, predictive controller

2000 Mathematics Subject Classification: 70Q05, 68T45, 68U10

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Numerical Design of State-Space Observers with Componentwise Monitored Error

Octavian Păstrăvanu, Mihaela Matcovschi and Mihail Voicu

Full text

The paper considers state-space observers for continuous- and discrete-time linear systems. The estimation accuracy can be increased if, for the error equation, the componentwise stability is used instead of the standard stability concept. The advantage of the former consists in a step-by-step individual monitoring of the elements of the error vector approaching zero, unlike the global information provided by the latter that guarantees the norm of the error vector approaches zero for long term. A characterization of componentwise stability by nonlinear inequalities is available in literature for more than two decades, but its exploitation in synthesis was cumbersome and unsuitable for numerical applications. This paper shows that the observer design based on componentwise stability can be addressed as a linear programming problem. We formulate new results representing computable necessary and sufficient conditions for componentwise stability with direct applicability to synthesis. An example illustrates the practical usage of these results.

Keywords: state estimation, obsevers, linear systems, estimation error, componentwise stability

2000 Mathematics Subject Classification: 34K20, 93C05, 62G05

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QCL Implementation of the Bernstein-Vazirani Algorithm

Simona Aruştei and Vasile Manta

Full text

In this paper we present an implementation in the quantum computer simulator QCL of the Bernstein-Vazirani algorithm. The analysis of this algorithm is made using the formalism of quantum gates. This formalism allows the decomposition of the computational process into elementary operations for an adequate hardware. The control gate used in the description of the algorithm is simulated by a set of 2-qubit CNot elementary quantum gates. We give an example by considering the case of a 5-dimensional input register.

Key words: quantum computing, quantum gate, quantum algorithm

2000 Mathematics Subject Classification: 81P68, 68Q05

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A Wireless ECG Module for Personal Area Network

Cristian Rotariu, Hariton Costin, Dragos Arotăriţei and Bogdan Dionisie

Full text

The current common goal in medical information technology today is the design and implementation of telemedicine solutions, which provide to patients services that enhance their quality of life. Recent technological advances in sensors, low-power integrated circuits, and wireless communications have enabled the design of low-cost, miniature, and intelligent physiological sensor modules. These modules are capable of measuring, processing, communicating one or more physiological parameters, and can be integrated into a wireless personal area network (WPAN). In this paper we present the realization of a wireless ECG module, as a part of a personal area network for patient monitoring, capable to measure and transmit physiological parameters such us heart rate and two ECG leads. The use of wireless ECG is suitable for continuous long-time cardiac activity monitoring as a part of a diagnostic procedure, can achieve medical assistance of a chronic condition, or can be supervised during recovery from an acute event or surgical procedure. For instance, the computer-assisted rehabilitation involves unwieldy wires between sensors and monitoring device that are not very comfortable for normal activity. We propose a wireless module, based on low power microcontrollers and RF transceivers that perform the measurements and

compute some physiological parameters. Personal server, in form of a Personal Digital Assistant (PDA) that running a personal heart monitor application, receives the information from wireless ECG module, activates the alarms when the measured parameters are above the limits, and communicates periodically to the central server (part of the telemedicine system) by using Wi-Fi or GSM/GPRS connection. The heart monitor reacts to potential heart risks and records physiological information into a local database.

Keywords: patient monitoring, wireless ECG, personal area network, intelligent sensors, telemedicine.

2000 Mathematics Subject Classification: 68M10, 94A12

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A Fault Primitive Based Model of All Static Four-Cell Coupling Faults in Random-Access Memories

Petru Caşcaval, Radu Silion, Doina Caşcaval and Cristina Huzum

Full text

A logic design for a built-in self-testing (BIST) implementation of a March test able to detect all static simple three-cell coupling faults in $n \times 1$ random-access memories (RAMs) is presented. Single–array single bit and multiple–array single bit test architectures have been considered in this work. The memory test (March S3C [1]) needs $66n$ operations and is able to detect all realistic simple (i.e. not linked) static three-cell coupling faults that have been shown to exist in real designs: state coupling faults, transition coupling faults, write disturb coupling faults, read destructive coupling faults, deceptive read destructive coupling faults, and incorrect read coupling faults. To reduce the length of the test, only the coupling faults between physically adjacent memory cells have been considered. The test assumes that the storage cells are arranged in a rectangular grid and that the mapping from logical addresses to physical cell locations is known completely.

Keywords: Memory testing, static fault models, three-cell coupling faults, built-in self-testing.

2000 Mathematics Subject Classification: 94C12, 68M15.

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In Memoriam Florin Hoza

Full text