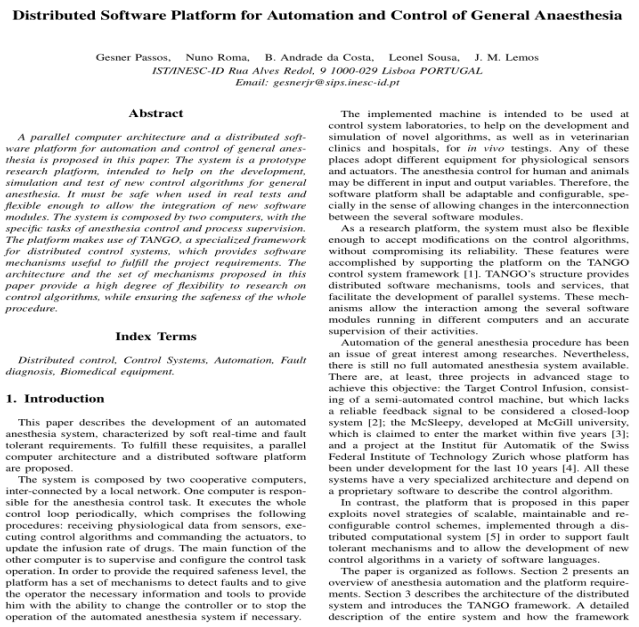
Control and Automation in Anaesthesia



Distributed Software Platform for Automation and Control of General Anaesthesia

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Abstract

A parallel computer architecture and a distributed software platform for automation and control of general anesthesia is proposed in this paper. The system is a prototype research platform, intended to help on the development, simulation and test of new control algorithms for general anesthesia. It must be safe when used in real tests and flexible enough to allow the integration of new software modules. The system is composed by two computers, with the specific tasks of anesthesia control and process supervision. The platform makes use of TANGO, a specialized framework for distributed control systems, which provides software mechanisms useful to fulfill the project requirements. The architecture and the set of mechanisms proposed in this paper provide a high degree of flexibility to research on control algorithms, while ensuring the safeness of the whole procedure.

Index Terms

Distributed control, Control Systems, Automation, Fault diagnosis, Biomedical equipment.

1. Introduction

This paper describes the development of an automated anesthesia system, characterized by soft real-time and fault tolerant requirements. To fulfill these requisites, a parallel computer architecture and a distributed software platform are proposed.

The system is composed by two cooperative computers, inter-connected by a local network. One computer is responsible for the anesthesia control task. It executes the whole control loop periodically, which comprises the following procedures: receiving physiological data from sensors, executing control algorithms and commanding the actuators, to update the infusion rate of drugs. The main function of the other computer is to supervise and configure the control task operation. In order to provide the required safeness level, the platform has a set of mechanisms to detect faults and to give the operator the necessary information and tools to provide him with the ability to change the controller or to stop the operation of the automated anesthesia system if necessary.

The implemented machine is intended to be used at control system laboratories, to help on the development and simulation of novel algorithms, as well as in veterinarian clinics and hospitals, for *in vivo* testings. Any of these places adopt different equipment for physiological sensors and actuators. The anesthesia control for human and animals may be different in input and output variables. Therefore, the software platform shall be adaptable and configurable, specially in the sense of allowing changes in the interconnection between the several software modules.

As a research platform, the system must also be flexible enough to accept modifications on the control algorithms, without compromising its reliability. These features were accomplished by supporting the platform on the TANGO control system framework [1]. TANGO's structure provides distributed software mechanisms, tools and services, that facilitate the development of parallel systems. These mechanisms allow the interaction among the several software modules running in different computers and an accurate supervision of their activities.

Automation of the general anesthesia procedure has been an issue of great interest among researches. Nevertheless, there is still no full automated anesthesia system available. There are, at least, three projects in advanced stage to achieve this objective: the Target Control Infusion, consisting of a semi-automated control machine, but which lacks a reliable feedback signal to be considered a closed-loop system [2]; the McSleepy, developed at McGill university, which is claimed to enter the market within five years [3]; and a project at the Institut für Automatik of the Swiss Federal Institute of Technology Zurich whose platform has been under development for the last 10 years [4]. All these systems have a very specialized architecture and depend on a proprietary software to describe the control algorithm.

In contrast, the platform that is proposed in this paper exploits novel strategies of scalable, maintainable and reconfigurable control schemes, implemented through a distributed computational system [5] in order to support fault tolerant mechanisms and to allow the development of new control algorithms in a variety of software languages.

The paper is organized as follows. Section 2 presents an overview of anesthesia automation and the platform requirements. Section 3 describes the architecture of the distributed system and introduces the TANGO framework. A detailed description of the entire system and how the framework

Some of the latest developments in the automation of therapeutic interventions in anaesthesiology have been covered in this book, with special emphasis on the.Control and Automation in Anaesthesia: Medicine & Health Science Books @ medscopesolutions.com(). Individualized PID control of depth of anesthesia based on patient . ranean Conference on Control and Automation (MED13).Download Citation on ResearchGate Control and Automation in Anesthesia An abstract is not available. }.Automation of anaesthesia: a review on multivariable control. Article (PDF Available) in Journal of Clinical Monitoring and Computing 29(2).Control and Automation in Anaesthesia. Front Cover. H. Schwilden, H.O. Stoeckel. Springer Science & Business Media, Dec 6, - Medical - pages.J Clin Monit Comput. Apr;29(2) doi: /s Epub Jun Automation of anaesthesia: a review on multivariable control.Anaesthesia represents a complex part of surgery also carries risks for patients. new monitors and devices; mathematical modelling; and control algorithms;.Pris: kr. Haftad, Skickas inom vardagar. Kop Control and Automation in Anaesthesia av H Schwilden, H O Stoeckel pa medscopesolutions.comFeedback control systems in anaesthesia are used for computer?assisted dosing of anaesthetics as the result of data collection and analysis of.Control and automation in anaesthesia /? H. Schwilden, H. Stoeckel, eds. Other Creators. Stoeckel, H. (Horst), ; Schwilden, Helmut. Published.Target-controlled anesthesia infusion systems reduce the anesthesiologist's delivery of anesthesia is feasible and provides anesthetic control as good as or.automation of anaesthesia. The system is structured in two main units, one mainly concerned with feedback control and the other with supervision functions.This question isdiscussed with respect to the anaesthesia machineas well as The various modes and approaches to the control and automation of artificial.Automation In Anaesthesia. Definitely, to enhance your life high quality, every e- book control and automation in anaesthesia will certainly have their certain.a closed-loop automated drug administration approach to control Depth In contrast with most of the existing research on anesthesia control.Design and clinical evaluation of robust PID control of propofol anesthesia in children. K van Heusden, GA 17, On Automation in Anesthesia. K Soltesz.Hence, the impact of automation in anesthesia in terms of patients' . Application to Anesthesia Control Reducing the Uncertainty.Control technology has been applied to a wide variety of industrial and domestic applications to improve performance, safety and efficiency. Anesthesia.Control and Automation in Anesthesia. Authors: H. O. Stoeckel H. Schwilden. Publication: Cover Image. Book. Control and Automation in Anesthesia.Methods and analysis The 'Automated control of mechanical ventilation during general anesthesia study' (AVAS) is an international investigator-initiated.This e-book documents the shows given at a workshop held in Bonn in might the purpose of the assembly used to be to collect scientists.Abstract: Anaesthesia is a multivariable problem where a combination of drugs are used to induce desired hypnotic, analgesia and immobility states.Should Neuromuscular Transmission Be Monitored Routinely During Anaesthesia?.- III Control and Automation

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