

Automation Control Development with Capstone Projects

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I. Abstract

This article presents the development of the automation control projects developed in the Mechanical Engineering Technology Program of the Engineering Technology Department at Old Dominion University. These capstone projects are designed to help students gain industrial application experiences on design, test, and implementation. Two projects on automation controls are the focus of this article: (1) an automatic ship-bottom blasting machine and (2) a fully automated Car Jack. Three major topics are presented in each project: (1) introduction of the background, (2) methods to solve the problems in mechanical designs and automation controls such as hydraulic circuit and/or PLC programming, and (3) implementation and test results.

II. Introduction

The course objectives of Automation and Controls that offered in the Mechanical Engineering Technology Program of the Department of Engineering Technology at Old Dominion University are:

- (1) Pneumatic components and pneumatic circuit designs.
- (2) Feedbacks from electrical sensors and related ladder diagrams.
- (3) Introduction to Programmable Logical Controllers (PLC) and PLC ^{[1][2]} programming.
- (4) Integration of pneumatic, electrical, and/or hydraulic components with PLC programming controls.

To ensure students have hands-on experiences in this course, a two-hour/week lab is also required to teach the students with integrate mechanical, pneumatic, and electrical components in ladder diagrams and PLC programming. Basically, the lab includes three main sessions: (1) four weeks of pneumatic applications, (2) four weeks of pneumatic components, electrical sensors, and ladder diagrams, and (3) five weeks of PLC programming using IDEC ^[3] and TRiLOGI ^[4] PLCs. In addition, the simulation software of Automation Studio ^[5] is also used in each project so that students can check their designs before the actual implementation. Depending on the

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A decorative graphic element consisting of a light blue horizontal bar with a rounded right end, and a red circular arc with a gradient effect positioned to the right of the bar.

Automation Control Development With Capstone Projects:

Robotic Sailing Alexander Schlaefer, Ole Blaurock, 2011-07-15 While sailing has a long tradition both as a means of transportation and as a sport robotic sailing is a fairly new area of research One of its unique characteristics is the use of wind for propulsion On the one hand this allows for long range and long term autonomy On the other hand the dependency on changing winds presents a serious challenge for short and long term planning collision avoidance and boat control Moreover building a robust and seaworthy sailing robot is no simple task leading to a truly interdisciplinary engineering problem These proceedings summarize the state of the art as presented at the International Robotic Sailing Conference 2011 Following an overview of the history of autonomous sailing a number of recent boat designs is presented ranging from small one design boats to vessels built to cross the Atlantic Ocean Subsequently various aspects of system design and validation are discussed further highlighting the interdisciplinary nature of the field Finally methods for collision avoidance localization and route planning are covered

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SME Technical Paper Society of Manufacturing Engineers, 2005 **Congressional Record** United States. Congress, 1999 CAD/CAM, Robotics, and Factories of the Future '90: Flexible automation Suren N. Dwivedi, Alok K. Verma, John E. Sneckenberger, 1991 Contents Volume 2 I Factory Enhancements From the Existing Manufacturing System to CIM Flexible Manufacturing System in Manufacture of Precision Engineering Components Key Issues in Implementation A Survey of CIM Strategic Planning in U S Industry Modelling and Optimization of a Flexible Manufacturing System Computer Based Safety System for the FMS Management Logic CIM Repositories The Selection and Prospect of CAD CAM System for Diesel Engine Design and Manufacturing A Model for the Factory of the Future for Industrialized Housing Enabling Automation Technologies for an Automated Mail Facility of the Future Some Optimization Problems of Scheduling in a Flexible Manufacturing System Some Methods of Modeling for Computer Integrated Workshop Combined Procedures for Simulation of Manufacturing Systems Expert Systems in CIM II Production Planning A Taxonomy on Event Driven Production Systems An Improved Lot Sizing Policy for Variable Demand Simulation for Real Time Control Advantages Potential Pitfalls Opportunities Decomposition

Approach for the Job Shop Scheduling Problem Evaluation of the Impact of Plant and Production Management Automation on Job Shop Manufacturing Performances Role of Non Productive Time in the Evaluation of Computer Generated Process Plans
 III Process Technology Computer Managed Process Planning for Cylindrical Parts An Application of Non Linear Goal Programming in Electrodischarge Machining of Composite Material An Expert System for Metalforming Optimal Process Planning for Robotic Assembly Operations Effect of Angular Errors in Part Registration for PC Board Assembly An Evaluation Framework for AGVS Within FMS Computer Aided Machine Loading Technique An Optimal Parallel Algorithm for Channel Assignment
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 VII Task Performance Sensing and **Online Engineering & Internet of Things** Michael E. Auer, Danilo G. Zutin, 2017-09-14 This book discusses online engineering and virtual instrumentation typical working areas for today s engineers and inseparably connected with areas such as Internet of Things cyber physical systems collaborative networks and grids cyber cloud technologies and service architectures to name just a few It presents the outcomes of the 14th International Conference on Remote Engineering and Virtual Instrumentation REV2017 held at Columbia University in New York from 15 to 17 March 2017 The conference addressed fundamentals applications and experiences in the field of online engineering and virtual

instrumentation in the light of growing interest in and need for teleworking remote services and collaborative working environments as a result of the globalization of education The book also discusses guidelines for education in university level courses for these topics *Federal Register* ,2000-06-08 Computerworld ,1981-09-21 For more than 40 years Computerworld has been the leading source of technology news and information for IT influencers worldwide Computerworld s award winning Web site Computerworld com twice monthly publication focused conference series and custom research form the hub of the world s largest global IT media network **Proceedings** American Society for Engineering Education. Conference,1993 Annual Air Traffic Control Association Fall Conference Proceedings Air Traffic Control Association. Fall Conference,2001 **Winter Annual Meeting** American Society of Mechanical Engineers,1998 Paper ,1998 Proceedings. College Industry Education Conference ,1990 **PM Network** ,1998 The Vertical Farm Kheir Al-Kodmany,Andrew Keong Ng,Abel Tablada,Chittaranjan Kole,2024-10-25 Amid economic uncertainties fluctuating oil prices and a rising environmental consciousness the need for sustainable and efficient food production has become dire The Vertical Farm Scientific Advances and Technological Developments systematically navigates the realm of vertical farming VF rooted in a robust scientific foundation Unveiling the intricate convergence of plant biology environmental science and agronomy it provides a profound understanding of contemporary agriculture The book spans lighting systems and climate control mechanisms focusing on sustainability From small urban initiatives to significant commercial endeavors real world case studies showcase VF s adaptability scalability and resilience Addressing multiple challenges the book explores economic considerations and public perceptions recognizing their roles in fostering meaningful advancements in agricultural innovation A volume in the Nextgen Agriculture series this book is valuable to scientists practitioners and students in urban agriculture and planning horticulture engineering landscape architecture and plant technology sciences **Annual Index/abstracts of SAE Technical Papers** ,2006 **FIE '98, Tempe, Arizona** ,1998 *IECON '01* IEEE Industrial Electronics Society. Conference,2001 **ASEE Annual Conference Proceedings** American Society for Engineering Education. Conference,2005 **Annual Conference & Exposition** American Society for Engineering Education,2005

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