

Date of publication xxxx-xx-xxxx, date of current version xxxx-xx-xxxx.

Digital Object Identifier: 10.1109/ACCESS.2023.3286032

Observer-based model-free adaptive sliding mode predictive control

BING REN^{1,2}, GUANGQING BAO³

¹School of Automation, Electrical Engineering, Lanzhou Jiaotong University, Lanzhou 730070, China.

²College of Electrical Information Engineering, Lanzhou University of Technology, Lanzhou 730050, China.

³School of Electronics & Information Engineering, Southwest Petroleum University, Chengde.

Corresponding author: Bing Ren (e-mail: ren84_03@163.com).

This research was funded by National Natural Science Foundation of China (51907012), Key Research and Development Program of Gansu Province (20YF8GA055), Natural Science Foundation of Gansu Province (22JR5RA359) and Youth Foundation of Lanzhou Jiaotong University (2019034).

ABSTRACT This paper proposes a new observer-based model-free adaptive sliding mode predictive control method (MFASPC) for discrete-time nonlinear systems. This scheme first equates the discrete-time nonlinear system to a linear form using a data-driven compact form dynamic linearization (CFDL) technique, establishes a data model consisting of only the pseudo partial derivatives (PPD), input data and output data, designs adaptive observers to achieve the estimation of the unknown PPD. The controller design part uses integral sliding mode control (SMC) to ensure the system's robustness. In contrast, with its constraint characteristics, the model predictive control (MPC) replaces the traditional switching control of SMC. The closed-loop control quantities are obtained by solving a rolling optimization problem in the finite time domain to provide dynamic optimal control action. The theoretical derivation of the Lyapunov function is used to demonstrate the system's stability. In order to verify the effectiveness of the proposed algorithm, numerical simulations and Photovoltaic power generation system simulation experiments are conducted, respectively, and the results show that the proposed control algorithm has a very reliable tracking capability and control accuracy.

INDEX TERMS Adaptive observer, model free, sliding mode predictive control, rolling optimization, data-driven

I. INTRODUCTION

IN recent years, adaptive control techniques for nonlinear systems have attracted a large number of scholars and much effort has been devoted to them [1]–[3]. However, most methods require dynamical or mechanistic analysis of the control system to obtain an accurate mathematical model first, and there are inevitably approximation links throughout the process [4]. In contrast, the ignored unmodeled dynamics part may be a potential factor that makes the closed-loop system unstable and reduces the controller performance.

Model-free adaptive control (MFAC) is a data-driven control method for discrete-time nonlinear systems to improve modeling difficulties [5], and its most important features compared to other data-driven control methods are the equivalent dynamic linearization process and the introduction of virtual parameters (PPD). MFAC uses the input and output data of the system to update the

virtual parameters online dynamically, thus establishing an equivalent data model, both the PPD and the data model, which depend merely on the data and are unrelated to the structural information of the system, thus thoroughly characterizing the nonlinear and uncertain features of the system [6]. It has been widely used in the past few years, such as urban traffic control, heading control, zero-sum game control, flexible joint control, etc. [7]–[10].

As the research progresses, to further solve the uncertainty problem of the control system and ensure robust performance in control, some scholars bring the SMC into the MFAC algorithm to carry out the research, which produces the model-free adaptive sliding mode control (MFASC) scheme. Among them, the sliding phase of the SMC law ensures the excellent stability performance of the system, and the arrival phase determines the system's dynamic performance. For example, [11]

Observer Based Model Predictive Control Researchgate

M Mosston



Observer Based Model Predictive Control Researchgate:

Enjoying the Melody of Appearance: An Emotional Symphony within **Observer Based Model Predictive Control Researchgate**

In a world eaten by displays and the ceaseless chatter of immediate connection, the melodic beauty and mental symphony developed by the written term often fade into the back ground, eclipsed by the persistent sound and interruptions that permeate our lives. However, nestled within the pages of **Observer Based Model Predictive Control Researchgate** a marvelous literary treasure full of raw emotions, lies an immersive symphony waiting to be embraced. Crafted by a masterful composer of language, this charming masterpiece conducts visitors on an emotional journey, skillfully unraveling the hidden melodies and profound affect resonating within each carefully crafted phrase. Within the depths with this emotional evaluation, we shall investigate the book is key harmonies, analyze its enthralling publishing model, and surrender ourselves to the profound resonance that echoes in the depths of readers souls.

<https://matrix.jamesarcher.co/About/scholarship/default.aspx/Martial%20Arts%20Manual%202026%20Guide.pdf>

Table of Contents Observer Based Model Predictive Control Researchgate

1. Understanding the eBook Observer Based Model Predictive Control Researchgate
 - The Rise of Digital Reading Observer Based Model Predictive Control Researchgate
 - Advantages of eBooks Over Traditional Books
2. Identifying Observer Based Model Predictive Control Researchgate
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Observer Based Model Predictive Control Researchgate
 - User-Friendly Interface
4. Exploring eBook Recommendations from Observer Based Model Predictive Control Researchgate

- Personalized Recommendations
 - Observer Based Model Predictive Control Researchgate User Reviews and Ratings
 - Observer Based Model Predictive Control Researchgate and Bestseller Lists
5. Accessing Observer Based Model Predictive Control Researchgate Free and Paid eBooks
 - Observer Based Model Predictive Control Researchgate Public Domain eBooks
 - Observer Based Model Predictive Control Researchgate eBook Subscription Services
 - Observer Based Model Predictive Control Researchgate Budget-Friendly Options
 6. Navigating Observer Based Model Predictive Control Researchgate eBook Formats
 - ePub, PDF, MOBI, and More
 - Observer Based Model Predictive Control Researchgate Compatibility with Devices
 - Observer Based Model Predictive Control Researchgate Enhanced eBook Features
 7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Observer Based Model Predictive Control Researchgate
 - Highlighting and Note-Taking Observer Based Model Predictive Control Researchgate
 - Interactive Elements Observer Based Model Predictive Control Researchgate
 8. Staying Engaged with Observer Based Model Predictive Control Researchgate
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Observer Based Model Predictive Control Researchgate
 9. Balancing eBooks and Physical Books Observer Based Model Predictive Control Researchgate
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Observer Based Model Predictive Control Researchgate
 10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
 11. Cultivating a Reading Routine Observer Based Model Predictive Control Researchgate
 - Setting Reading Goals Observer Based Model Predictive Control Researchgate
 - Carving Out Dedicated Reading Time
 12. Sourcing Reliable Information of Observer Based Model Predictive Control Researchgate

- Fact-Checking eBook Content of Observer Based Model Predictive Control Researchgate
 - Distinguishing Credible Sources
13. Promoting Lifelong Learning
- Utilizing eBooks for Skill Development
 - Exploring Educational eBooks
14. Embracing eBook Trends
- Integration of Multimedia Elements
 - Interactive and Gamified eBooks

Observer Based Model Predictive Control Researchgate Introduction

In this digital age, the convenience of accessing information at our fingertips has become a necessity. Whether its research papers, eBooks, or user manuals, PDF files have become the preferred format for sharing and reading documents. However, the cost associated with purchasing PDF files can sometimes be a barrier for many individuals and organizations. Thankfully, there are numerous websites and platforms that allow users to download free PDF files legally. In this article, we will explore some of the best platforms to download free PDFs. One of the most popular platforms to download free PDF files is Project Gutenberg. This online library offers over 60,000 free eBooks that are in the public domain. From classic literature to historical documents, Project Gutenberg provides a wide range of PDF files that can be downloaded and enjoyed on various devices. The website is user-friendly and allows users to search for specific titles or browse through different categories. Another reliable platform for downloading Observer Based Model Predictive Control Researchgate free PDF files is Open Library. With its vast collection of over 1 million eBooks, Open Library has something for every reader. The website offers a seamless experience by providing options to borrow or download PDF files. Users simply need to create a free account to access this treasure trove of knowledge. Open Library also allows users to contribute by uploading and sharing their own PDF files, making it a collaborative platform for book enthusiasts. For those interested in academic resources, there are websites dedicated to providing free PDFs of research papers and scientific articles. One such website is Academia.edu, which allows researchers and scholars to share their work with a global audience. Users can download PDF files of research papers, theses, and dissertations covering a wide range of subjects. Academia.edu also provides a platform for discussions and networking within the academic community. When it comes to downloading Observer Based Model Predictive Control Researchgate free PDF files of magazines, brochures, and catalogs, Issuu is a popular choice. This digital publishing platform hosts a vast collection of publications from around the world. Users can search for specific titles or explore various categories and genres. Issuu offers a seamless reading experience with its user-friendly interface and allows users to

download PDF files for offline reading. Apart from dedicated platforms, search engines also play a crucial role in finding free PDF files. Google, for instance, has an advanced search feature that allows users to filter results by file type. By specifying the file type as "PDF," users can find websites that offer free PDF downloads on a specific topic. While downloading Observer Based Model Predictive Control Researchgate free PDF files is convenient, it's important to note that copyright laws must be respected. Always ensure that the PDF files you download are legally available for free. Many authors and publishers voluntarily provide free PDF versions of their work, but it's essential to be cautious and verify the authenticity of the source before downloading Observer Based Model Predictive Control Researchgate. In conclusion, the internet offers numerous platforms and websites that allow users to download free PDF files legally. Whether it's classic literature, research papers, or magazines, there is something for everyone. The platforms mentioned in this article, such as Project Gutenberg, Open Library, Academia.edu, and Issuu, provide access to a vast collection of PDF files. However, users should always be cautious and verify the legality of the source before downloading Observer Based Model Predictive Control Researchgate any PDF files. With these platforms, the world of PDF downloads is just a click away.

FAQs About Observer Based Model Predictive Control Researchgate Books

1. Where can I buy Observer Based Model Predictive Control Researchgate books? Bookstores: Physical bookstores like Barnes & Noble, Waterstones, and independent local stores. Online Retailers: Amazon, Book Depository, and various online bookstores offer a wide range of books in physical and digital formats.
2. What are the different book formats available? Hardcover: Sturdy and durable, usually more expensive. Paperback: Cheaper, lighter, and more portable than hardcovers. E-books: Digital books available for e-readers like Kindle or software like Apple Books, Kindle, and Google Play Books.
3. How do I choose a Observer Based Model Predictive Control Researchgate book to read? Genres: Consider the genre you enjoy (fiction, non-fiction, mystery, sci-fi, etc.). Recommendations: Ask friends, join book clubs, or explore online reviews and recommendations. Author: If you like a particular author, you might enjoy more of their work.
4. How do I take care of Observer Based Model Predictive Control Researchgate books? Storage: Keep them away from direct sunlight and in a dry environment. Handling: Avoid folding pages, use bookmarks, and handle them with clean hands. Cleaning: Gently dust the covers and pages occasionally.
5. Can I borrow books without buying them? Public Libraries: Local libraries offer a wide range of books for borrowing. Book Swaps: Community book exchanges or online platforms where people exchange books.

6. How can I track my reading progress or manage my book collection? Book Tracking Apps: Goodreads, LibraryThing, and Book Catalogue are popular apps for tracking your reading progress and managing book collections. Spreadsheets: You can create your own spreadsheet to track books read, ratings, and other details.
7. What are Observer Based Model Predictive Control Researchgate audiobooks, and where can I find them? Audiobooks: Audio recordings of books, perfect for listening while commuting or multitasking. Platforms: Audible, LibriVox, and Google Play Books offer a wide selection of audiobooks.
8. How do I support authors or the book industry? Buy Books: Purchase books from authors or independent bookstores. Reviews: Leave reviews on platforms like Goodreads or Amazon. Promotion: Share your favorite books on social media or recommend them to friends.
9. Are there book clubs or reading communities I can join? Local Clubs: Check for local book clubs in libraries or community centers. Online Communities: Platforms like Goodreads have virtual book clubs and discussion groups.
10. Can I read Observer Based Model Predictive Control Researchgate books for free? Public Domain Books: Many classic books are available for free as they're in the public domain. Free E-books: Some websites offer free e-books legally, like Project Gutenberg or Open Library.

Find Observer Based Model Predictive Control Researchgate :

[martial arts manual 2026 guide](#)

emotional intelligence for kids ultimate guide

[romantasy saga quick start](#)

[math workbook grade 1 collection](#)

[mindfulness meditation framework](#)

dark romance thriller manual book

award winning photography manual

[english grammar manual advanced strategies](#)

[BookTok trending novel](#)

[practice workbook cooking techniques manual](#)

self help mindset framework

[step by step digital literacy manual](#)

[painting techniques manual collection](#)

cozy mystery bookshop fan favorite

AI usage manual collection

Observer Based Model Predictive Control Researchgate :

Engineering Materials: Properties and Selection Encompassing all significant material systems—metals, ceramics, plastics, and composites—this text incorporates the most up-to-date information on material ... Engineering Materials: Properties and Selection ... A comprehensive survey of the properties and selection of the major engineering materials. Revised to reflect current technology and applications, ... Engineering Materials: Properties and Selection Feb 2, 2009 — Chapter 1 The Importance of Engineering Materials. Chapter 2 Forming Engineering Materials from the Elements. Engineering Materials Properties And Selection 9th Edition ... Format : PDF Size : 549 MB Authors : Michael Budinski, Kenneth G. Budinski Publisher : Pearson; 9th edition (February 3, 2009) Language : English ... Engineering Materials: Properties and Selection - 535.731 This course will concentrate on metal alloys but will also consider polymers and ceramics. Topics specific to metals will include effects of work hardening and ... Engineering Materials: Properties and Selection (9th Edition) List Price: \$233.32 ; Amazon Price: \$155.10 ; You Save: \$78.22 (34%) ; Editorial Reviews The father-son authoring duo of Kenneth G. Budinski and Michael K. Engineering Materials: Properties and Selection - Hardcover This text covers theory and industry-standard selection practices, providing students with the working knowledge to make an informed selection of materials for ... Engineering Materials Properties and Selection | Rent COUPON: RENT Engineering Materials Properties and Selection 9th edition (9780137128426) and save up to 80% on textbook rentals and 90% on used textbooks ... Engineering Materials Properties And Selection Budinski Engineering Materials: Properties and Selection (9th ... Engineering Materials Properties And Selection Covering all important classes of materials and ... Engineering Materials: Properties and Selection This text covers theory and industry-standard selection practices, providing students with the working knowledge to make an informed selection of materials for ... Pathophysiology Final Exam Practice Quiz Flashcards Pathophysiology Final Exam Practice Quiz. 5.0 (4 reviews). Flashcards · Learn · Test · Match ... answers the question correctly? a. Cell proliferation b. Matrix c ... Pathophysiology - Practice EXAM QUESTIONS - Final Study Flashcards On Pathophysiology - Practice EXAM QUESTIONS - Final at Cram.com. Quickly memorize the terms, phrases and much more. Pathophysiology Final Exam Flashcards What is the most helpful test to determine renal function? Creatinine. What bacteria is associated with acute pyelonephritis ... Pathophysiology Final EXAM Questions AND Correct ... Pathophysiology Final EXAM Questions AND Correct Answers MAY OF 2023 · What is a characteristic of coronary artery disease (CAD) · The build-up of infectious by ... Pathophysiology: Help and Review Final Exam Test and improve your knowledge of Pathophysiology: Help and Review with fun multiple choice exams you can take online with Study.com. Final Exam-Pathophysiology- Questions With Answers ... Download Final Exam-

Pathophysiology- Questions With Answers Best Exam Solutions (GRADED A+) and more Exams Nursing in PDF only on Docsity! Pathophysiology Final Exam Review - PATHO FINAL (100 ... Comprehensive review of the material needed for nursing patho final exam. Professor Kristy Martinez patho final (100 differences dysplasia, hyperplasia, Week 16 Final Exam.pdf - Week 16: Pathophysiology Final... Question 1 1 / 1 pts A patient with type 1 diabetes asks the nurse what causes polyuria. What is the nurse's best response? The symptom of polyuria in diabetes ... ATI Pathophysiology Final Exam Sign up at Naxlex Nursing Guides to find the correct answers for the above ATI pathophysiology final exam questions and discover more practical questions to ... Practice Test Questions & Final Exam Test and improve your knowledge of Pathophysiology Textbook with fun multiple choice exams you can take online with Study.com. AGFA CR 35-X Service Manual | PDF Computed Radiography · AGFA - CR 35-X · Documents; Service Manual. AGFA CR 35-X Service Manual. Loading Document... AGFA - CR 35-X by AGFA. AGFA - CR 35-X. Manual Servicio CR 35 X PDF IMPORTANT: Preferably print this manual double-sided: This PDF manual contains empty pages at the end of several chapters, to have the next chapter starting ... Agfa CR35X-CR25X Service Manual PDF Agfa CR35X-CR25X Service Manual PDF. Uploaded by. aleseb.service. 100%(3)100% found this document useful (3 votes). 2K views. 555 pages. AI-enhanced title ... Agfa CR35 CR25 Service Manual PDF Purpose of this document This document explains the functional principle including the functions of the individual assemblies always under normal conditions ... service manual for agfa digitizer CR-35x Aug 23, 2023 — Dear Sir, Good afternoon I have a lot of problem with CR-35x and I do not have the CR-35x service manual, please. Could you please send us this service ... CR 35 NDT Plus HD-CR 35 NDT Plus The Installation and Operating Instructions must be accessible to all operators of the unit at all times. ... CR 35 NDT Plus / HD-CR 35 NDT Plus. Image Plate ... Installation, Operation & Maintenance Manual CR Series Roasters Installation, Operation and Maintenance Manual. Table of ... CR-35, CR-140, and CR-280: Position the roast air cyclone so the outlet ... FISHER CR-35 SM Service Manual download ... Download FISHER CR-35 SM service manual & repair info for electronics experts. CR35 ROASTER GUIDE See section 1 of this document and the Installation, Operation, & Maintenance Manual for additional information. Additional considerations for the gas supply ... AGFA CR Series Service Manual View and Download AGFA CR Series service manual online. Digitizer. CR Series medical equipment pdf manual download. Also for: Cr 10-x, Cr reader, Cr 12-x, ...