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HASIL PENILAIAN SEJAWAT SEBIDANG ATAU *PEER REVIEW*
KARYA ILMIAH : PROSIDING

Judul Prosiding (Artikel) : Hybrid Mathematical Model Of Inventory System With Piecewise Holding Cost And Its Optimal Strategy
Nama/Jumlah Penulis : Sutrisno ; **Widowati** ; Dita Anies Munawwaroh / 3 orang
Status Pengusul : penulis ke- 2
Identitas Prosiding :
a. Nama Prosiding : ICAMIMIA 2015 - InternationalConference on Advanced Mechatronics, Intelligent Manufacture, and Industrial Automation, Proceeding - In conjunction with Industrial Mechatronics and Automation Exhibition, IMAE
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URL ARTIKEL : https://eprints2.undip.ac.id/1930/1/ARTIKELC15-WIDOWATI.pdf
g. Terindeks di Scopus : Scimagojr, Scopus, IEEE Explore
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b. Ruang lingkup dan kedalaman pembahasan (30%)	7.13	5,00	6,06
c. Kecukupan dan kemutahiran data/informasi dan metodologi (30%)	6,75	5,00	5,87
d. Kelengkapan unsur dan kualitas terbitan/ prosiding (30%)	6,6	6,67	6,63
Total = (100%)	22,73	**19,17**	20,93
Nilai Pengusul=40% x ½	**4,54**	**3,83**	**4,18**

Semarang, April 2020

Reviewer 2

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NIP. 196809071993031002
Unit kerja : Matematika FMIPA UNNES

Reviewer 1

Prof. Dr. Basuki Widodo, M.Sc
NIP. 19650506 1989031002
Unit kerja : Matematika FSAD ITS

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Hasil Penilaian *Peer Review* :

Komponen Yang Dinilai	Nilai Maksimal Prosiding			Nilai Akhir Yang Diperoleh
	Prosiding Internasional Terindeks ☑	Prosiding Terakreditasi ☐	Prosiding Nasional ☐	
a. Kelengkapan unsur isi prosiding (10%)	2,5			2,25
b. Ruang lingkup dan kedalaman pembahasan (30%)	7.5			7.13
c. Kecukupan dan kemutahiran data/informasi dan metodologi (30%)	7,5			6,75
d. Kelengkapan unsur dan kualitas terbitan/prosiding (30%)	7.5			6,6
Total = (100%)	**25,00**			22,73
Nilai Pengusul = 40% x1/2 x 22,73 = 4,54				

Catatan Penilaian artikel oleh Reviewer :

1. **Kesesuaian dan kelengkapan unsur isi prosiding :**

Penulisan artikel cukup baik dan mengikuti standard penulisan artikel di Prosiding ICAMIMIA 2015 – International Conference on Advanced Mechatronics, Intelligent Manufacture, and Industrial Automation, yaitu abstract, Introduction, Result and Discussion (IRaD), Conclusion. Belum memuat Methodology dan Acknowledgement. Artikel ini didukung dengan referensi yang sesuai.

2. **Ruang lingkup dan kedalaman pembahasan:**

Lingkup bahasan dari artikel ini adalah bidang matematika terapan, khususnya pada bidang riset operasi (supply chain management). Dalam artikel ini dibahas dengan baik tentang penggunakan metode kontrol model prediktif untuk menghasilkan strategi optimal dalam hal jumlah pengiriman produk yang tiba sehingga pelacakan tingkat persediaan sesuai dengan tingkat persediaan yang diinginkan. Relevansi hasil terkait dengan strategi optimal dalam jumlah pengiriman yang tiba sehingga tingkat stok mengikuti level stok yang diinginkan sesuai yang diberikan oleh pengambil keputusan

3. **Kecukupan dan kemutakhiran data/informasi dan metodologi :**

Informasi yang disajikan relatif baru dan hasil yang diperoleh memuat substansi orisinil dengan aspek aplikasi yang penting Sumber gagasan penulis untuk artikel ini cukup banyak, komprehensif dan update, yang lebih sepuluh tahun terakhir hanya 2 paper dari 15 sumber yang dirujuk. Methodologi belum disebutkan dalam artikel ini.

4. **Kelengkapan unsur dan kualitas terbitan:**

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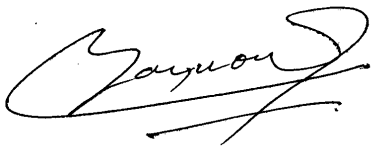
Surabaya, 17 April 2020
Reviewer 1



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a. Kelengkapan unsur isi prosiding (10%)	2,5			2,50
b. Ruang lingkup dan kedalaman pembahasan (30%)	7.5			5,00
c. Kecukupan dan kemutahiran data/informasi dan metodologi (30%)	7,5			5,00
d. Kelengkapan unsur dan kualitas terbitan/prosiding (30%)	7.5			6,67
Total = (100%)	**25,00**			**19,17**
Nilai Pengusul = 40% x ½ x19,17= 3,83				

Catatan Penilaian artikel oleh Reviewer :

1. **Kesesuaian dan kelengkapan unsur isi prosiding**:

Kesesuaian dan kelengkapan unsur isi baik. Artikel tersusun dalam kaidah penuliasan karta ilmiah. Terdiri atas 5 bagian: Introduction, Hybrid mathematical model of inventory systems with piecewise holding cost, Model predictive control method for hybrid system, Results and discussions, Computational simulation, Conclusion and future research. Didukung 17 referensi yang sebagian besar berupa jurnal.

2**. Ruang lingkup dan kedalaman pembahasan**:

Ruang lingkup dan kedalaman pembahasan cukup baik. Pendahuluan sudah diantarkan dengan cukup baik. Pembahasan mengenai control problem of inventory system with piecewise holding. Termasuk dalam lingkup Matematika Terapan yang sesuai dengan bidang keilmuan pengusul. Intrepertasi terutama hasil simulasi kurang dibahas mendetail dalam pembahasan.

3. **Kecukupan dan kemutakhiran data/informasi dan metodologi** :

Kecukupan dan kemutakhiran data/informasi dan metodologi cukup baik. Terdapat 17 referensi yang sebagian besar berupa jurnal (4 diantara referensi lebih dari 10 tahun). Secara substansi ada temuan kebaharuan.

4. **Kelengkapan unsur dan kualitas terbitan**:

Kelengkapan unsur dan kualitas terbitan cukup baik. Artikel diterbitakan dalam ICAMIMIA 2015 - InternationalConference on Advanced Mechatronics, Intelligent Manufacture, and Industrial Automation, Proceeding - In conjunction with Industrial Mechatronics and Automation Exhibition, IMAE. Penerbit IEEE. Terindeks di Scimagojr dan Scopus. Masih terdapat editorial yang kurang cermat.

Semarang, , April 2020
Reviewer 2

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ICAMIMIA 2015 - International Conference on Advanced Mechatronics, Intelligent Manufacture, and Industrial Automation, Proceeding - In conjunction with Industrial Mechatronics and Automation Exhibition, IMAE
8 July 2016, Article number 7507996, Pages 29-33
2015 International Conference on Advanced Mechatronics, Intelligent Manufacture, and Industrial Automation, ICAMIMIA 2015; Hotel Bumi Surabaya CitySurabaya; Indonesia; 15 October 2015 through 16 October 2015; Category numberCFP15AWY-ART; Code 122707

Hybrid mathematical model of inventory system with piecewise holding cost and its optimal strategy (Conference Paper)

Sutrisno ✉, Widowati ✉, Munawwaroh, D.A. ✉

Department of Mathematics, Diponegoro University, Semarang, Indonesia

Abstract

View references (17)

In this paper, we formulate a hybrid mathematical model of an inventory system with piecewise holding cost. We write the hybrid model of this system in the piecewise-affine (PWA) form. We use model predictive control method to generate the optimal strategy i.e. the amount of the arriving product shipment so that the inventory level tracks some desired inventory level given by decision maker as close as possible and this inventory system meets the demand with minimum total holding cost. Firstly, we convert the model of the PWA form into mixed logical dynamic (MLD) form and then we apply the model predictive control for hybrid system to this model in the MLD form. We simulate the model with various desired inventory level. From the computational simulation results, we observed that the inventory level follows the given desired inventory level very well. © 2015 IEEE.

SciVal Topic Prominence

Topic: Inventory control | Inventory | Optimal policies

Prominence percentile: 85.301

Author keywords

hybrid mathematical model | inventory system | piecewise holding cost

Indexed keywords

Engineering controlled terms: Automation | Costs | Decision making | Hybrid systems | Intelligent mechatronics | Inventory control | Manufacture | Optimal systems

Engineering uncontrolled terms: Computational simulation | Decision makers | Holding costs | Inventory levels | Inventory systems | Mixed logical dynamics | Optimal strategies | Piecewise affines

Engineering main heading: Model predictive control

This year, ICAMIMIA 2015 holds a series of events of the International Conference and Workshop and will be held also along with robot competition and industrial exhibition in the series of events of Industrial Mechatronics and Automation Exhibition (IMAE), which is scheduled from 14-25 October 2015. We cordially invite all related engineers and scientists to attend and contribute to ICAMIMIA 2015.

KEYNOTE SPEAKERS

Prof. Mohammad Nuh ITS, Indonesia

Prof. Agus Budiyono Konkuk Univ., South Korea

Prof. Er Meng Joo NTU, Singapore

Prof. Sreenatha G. Anavatti UNSW, Australia

Dr.-Ing. Detlef Ahlborn Karl-Ahlborn Masch. GmbH, Germany

Evan Liu ELIPSE Software, Taiwan

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General areas of interest to ICAMIMIA 2015 include the mechatronics, robotics, automation, manufacture, instrumentation and measurement, control and modeling, information and computational engineering, design and system, material, and energy. More specialized topics within ICAMIMIA include, but are not limited to:

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? Material

Smart Material, Nano-material, Piezoelectric, Motor Drive, Battery Cell, Corrosion Control, Material Radar Absorber, Vibration Reduction, Composite Materials

? Energy

Table of Contents

Target Tracking in Dynamic Background using Generalized Regression Neural Network

Kalyan Kumar Halder,* Murat Tahtali, and Sreenatha Gopalarao Anavatti
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***Abstract*—In this paper, we present a new approach to track moving objects in videos having a dynamic background. At first, we apply an object detection algorithm that deals with the detection of real objects in a degraded video by separating them from turbulence-induced motions using a two-level thresholding technique. Then, a generalized regression neural network is used to track the detected objects throughout the frames in the video. The proposed approach utilizes the features of centroid and area of moving objects and creates the reference regions instantly by selecting the objects within a circle. The performance of the proposed approach is compared with that of an existing approach by applying them to turbulence degraded videos, and competitive results are obtained.**

***Keywords*—Dynamic background; target tracking; moving object detection; generalized regression neural network; Kalman filter.**

I. Introduction

Target detection and tracking is an important task in many computer vision applications such as surveillance, safety detection, traffic management, military guidance, and so on [1]–[3]. Tracking can simply be defined as the problem of estimating the path of a target in the image plane as it moves around a stationary or dynamic scene. Target tracking can be challenging due to several reasons such as noise in the images, non-rigid nature of targets, illumination changes of scenes, and turbulence in the propagation medium. Amongst those problems, turbulence is a significant one, especially in the cases of long-distance imaging and underwater imaging, which is caused due to the reflection and refraction of light rays throughout the medium of interest's path resulting in random geometric distortions and non-uniform blurring of the acquired videos [4]–[6]. A variety of tracking algorithms has been proposed so far; only a few of those algorithms take the effect of dynamic backgrounds into consideration whilst most of them do not.

A model-based algorithm is proposed in [7] to track moving objects in a complex background. The algorithm decomposes the images of objects into 2D motion and 2D shape-change, which are explicitly represented by a sequence of models used to track the objects. The application of this algorithm is limited to those problems where objects move slowly, that is, the non-translational motions are small from frame to frame. The authors in [8] show that the color distributions of multi-color targets can be modeled based on Gaussian mixtures, which in turn, are used to track the targets. A probabilistic method is developed in [9] for background subtraction, in which each pixel of an image is modeled as a mixture of Gaussians. The models are updated using an on-line approximation that is suitable for real-time target tracking. The sensitivity of detection for this method decreases when the background changes rapidly, and also if modeled with a small number of Gaussian distributions.

An adaptive Kalman filter is proposed in [1] for tracking, where the moving objects selected by a user are segmented and the prime colors of those segments are extracted. Using those prime colors as features, a motion model describing the system is employed to track the objects in the upcoming frames. A linear Kalman filter-based multiple objects tracking algorithm is presented in [2] which uses the centroid and the area of the moving objects as the features for matching and tracking objects. The developed motion model in [2] does not require any manual input for initialization, though it is only applicable to scenes having a static background. In order to reduce the estimation errors caused by typical Kalman filters due to the uncertainty of the state and observation models, a centroid weighted Kalman filter is proposed in [10]. It applies a background subtraction technique to detect moving objects and uses the specialized Kalman filter to predict the objects' next locations. The method is only suitable for short-distance imaging, since a simple background subtraction operation may not accurately detect moving objects in long-distance or underwater imaging where backgrounds are always in a warping nature. Using a combination of particle filter and Gibbs sampling, a multi-target tracking approach is proposed in [11] where the particle filter predicts the trajectories of the targets in the upcoming frames and the Gibbs sampler estimates the stochastic vector of assignment. However, the conventional particle filter tracker cannot effectively differentiate moving objects from background in the case of complex sceneries.

There are several other methods that use artificial neural networks (ANNs) for tracking moving objects. The main advantage of those methods is that they do not require a motion estimation model. A feed-forward neural network (FFNN) is applied in [12] for multi-target tracking, though only for static scenes. The method handles detection and labeling of targets separately because of the specialization of target detection algorithms which intensifies individual skills. In order to apply for complex backgrounds, a new approach incorporating the learning technique of the deep neural network with an on-line boosting framework is proposed in [13]. The deep learning architecture is capable of automatically learning useful features of images in different levels, whereas boosting framework

Tracking control for a Stewart platform prototype

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***Abstract*—A Stewart platform is a well-known mechanism which can be used for a wide variety of vibration control problems. In this paper, an LQR controller for a Stewart platform prototype is proposed which, combined with proportional derivative gain matrix, achieves a good performance when compared to the classical PID control system. By testing some trajectories, we observe that the tracking error between the actual and pre-established trajectories is smaller when applying the controller designed in this work. The final purpose is not only the implementation of this kind of control to a real Stewart platform constructed at the Universitat Politècnica de Catalunya (UPC) by our research group, but its application to other similar parallel robots.**

***Keywords*—Stewart platform; inverse kinematics; LQR control; tracking control.**

I. INTRODUCTION

The control of dynamical systems affected by complex vibrations is a challenging problem of interest in the field of automatic control. In recent years, it has been remarkably developed a line of vibration control in structures subject to external perturbations in the base [1], [2], [3], [4], [5], [6], [7]. Usually, the excitations are considered in a single direction only, i.e. one degree of freedom. In very few cases there have been taken into account disturbances in multidirectional vibrations [8], [9].

One of the most significant structure of parallel robot is the Stewart platform. It can be classified as a complex mechatronic system because a variety of different topics are involved in it: mechanics, electronics, computing and control. This kind of robot is a six degree-of-freedom manipulator mechanism composed by two parallel platforms, that is, a base platform and a top plate connected by six extensible legs. To modify the position of the top plate relative to the bottom platform, the legs have to move in a coordinated direction in order to produce a desired displacement. Although it was created in 1965 as a flight simulator [10], in recent years it has been used in industry areas such as energy generation, automotive, mechanics, aeronautic or civil engineering. Some applications are found in machine tool technology [11], precision laser cutting [12], surgical operations [13], throwing platform of missiles, radio telescopes [14], vehicle suspensions [15], medical imaging [16] or biomechanics [17], among others. In addition, other potential applications can be found on ships, buoys or floating platforms at sea supporting devices such as precision instrumentation systems, cranes, positioning systems or wind turbines.

Undoubtedly, one of the main goals of a Stewart platform is to generate, with high accuracy, pre-established multidirectional movements in order to study their effect on flexible structures located on the top plate [18]. Since we have a platform prototype designed and constructed by our research group at the UPC, the first task is to get a precise tuning. For this purpose, we will design control laws in order to measure if the center of the top plate follows a given trajectory with minimum error. Once it is assumed that the platform moves with high precision, it can be used to carry out more complex simulations, generating multidirectional excitations for different applications.

An important drawback in this problem is the nonlinear character of a Stewart platform [19]. In order to carry out a real-time control, a simplification of the motion equations is required. In this case, model linearization is a very common strategy that facilitates the controller design and implementation but, at the same time, it may introduce undesirable inaccuracies when the platform moves far from the linearization point. Usually, when working with a linearized system, the control forces applied on the legs are based on classical PID controllers. However, in this paper we design and implement an LQR controller which is modified with the addition of a derivative gain matrix to reduce the tracking error for a given trajectory. By means of two preset trajectories, the proposed controller is tested, producing less error when the modified LQR control is applied. The simulations are performed with Matlab together with the toolboxes Simulink and SimMechanics [20], [21], after introducing the parameters and the characteristics of our platform prototype. The designed controller could provide good performance when applied to a real platform.

The paper is organized as follows: Section II is devoted to the characteristics of our Stewart platform prototype. Section III summarizes briefly the inverse kinematics method for control purposes. Section IV presents two kind of controllers, a PID controller and a modified LQR control to be compared. The numerical and graphical results for two different trajectories are discussed in Section V. Finally, the conclusions are given in Section VI.

Trajectory Tracking of A Wheeled Wall Climbing Robot Using PID Controller

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National Taiwan University of Science and Technology
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***Abstract*—One of the most challenging research topics in robotics is the wall climbing robot. The wall climbing robots are able to perform dangerous operation, such as cleaning the high-rise building. This paper present Trajectory Tracking of a Wheeled Wall Climbing Robot Using PID Controller. To make sure that the wheels can be always well contacted to the wall without sacrificing robot's mobility is the most important consideration for controlling the wall-climbing robot. To evaluate the performance of the robot and the proposed controller, this paper conducted experiments of several trajectory tracking. Practically, encoder sensor provides the spatial posture information for realizing PID control schemes. The sensor is connected to a field-programmable gate array (FPGA) based onboard motion controller to generate control inputs for wheel motors and suction motor according to a specific trajectory. Finally, real tests were performed with the trajectories of circle, triangle and rectangle. The results were evaluated according to the measurement of the accuracy of trajectory.**

Keywords— Wall climbing robot, PID controller, trajectory tracking.

I. INTRODUCTION

The wall climbing robot is one of the most challenging research topics in robotics. The wall climbing robots are able to perform dangerous operation, such as inspection of the high-rise building, spray painting and sand blasting of gas tanks, maintenance of nuclear facilities, aircraft inspection, surveillance and reconnaissance, assistance in firefighting and rescue operation, etc. The wall climbing robot with the function of transit between different surfaces, which include grounds, walls, and ceilings has been developed by The robotics team of the City College of New York (CCNY) [1, 2, 3].

The designs of movement platforms of a wall climbing robot are usually categorized as legged [4], [5] and wheeled [6], [7] configurations. The legged wall climbing robots are designed with complicated leg structures. Contrarily, the wheeled wall climbing robots are designed with simple rotary wheels. In this paper discusses about the trajectory tracking of a wheeled wall climbing robot using simple controller, PID controller. [8] presents an adaptive controller for the trajectory tracking and the stabilization of the robot via the adaptive backstepping approach. Despite the remarkable theoretical accomplishments and successful applications of adaptive control, the algorithm is very complicated. To avoid this problem, this paper propose simple controller to control the robot movement along the trajectory planning.

Practically, encoder sensor provides the spatial posture information for realizing PID control schemes. The sensor is connected to a field-programmable gate array (FPGA) based onboard motion controller to generate control inputs for wheel motors and suction motor according to a specific trajectory. Finally, real tests were performed with the trajectories of circle, triangle and rectangle. The results were evaluated according to the measurement of the accuracy of trajectory.

II. SYSTEM OVERVIEW

This section describes about wall climbing robot design, which consists of Mechanical Design, electronic design and PID controller.

2.1. Mechanical Design

The design concepts for the wall climbing robot can be separated into three main components. The two major components are the vacuum motor and vacuum chamber seal. Combined together, they produce the most critical device that makes the robot "stick" to wall surfaces. The third component is the locomotion mechanism that is responsible for the planar motion on the surface the robot is adhering to. The following sub-sections describe the design concepts and alternatives of each component.

2.1.1. Vacuum Motor

In order to make the robot moving on the wall, the robot is equipped with a commercial portable vacuum cleaner (Fig. 1). The rated voltage of the vacuuming motor is 18 volt for the purpose of proper vacuuming.