

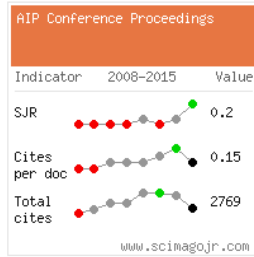
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Subject Category [Physics and Astronomy \(miscellaneous\)](#)
Publisher
Publication type Conferences and Proceedings
ISSN 0094243X
Coverage -

37

H Index

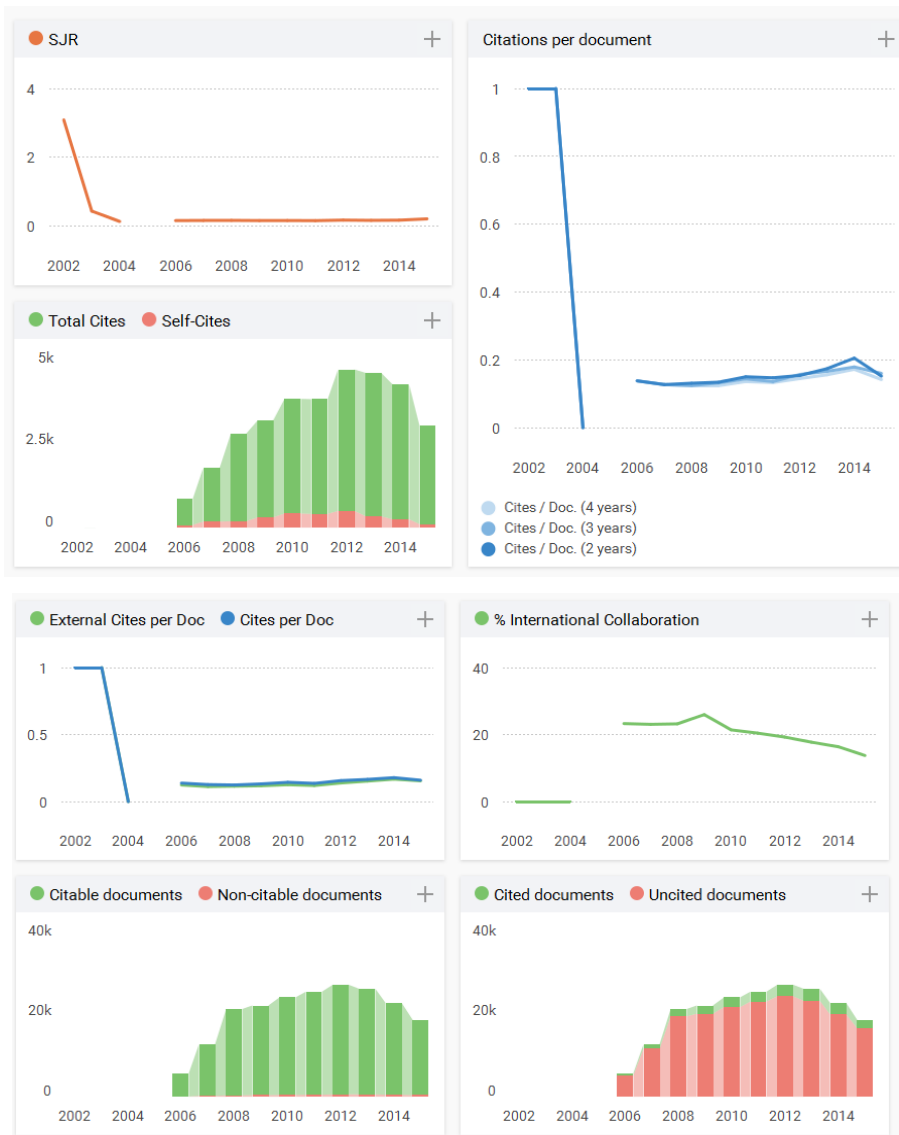
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PREFACE

First of all, we would like to thank to all participants of “The 7th SEAMS UGM 2015 International Conference on Mathematics and Its Applications” which was held on August 18-21, 2015. The conference is very important as a communication forum of the mathematicians, not only in Indonesia, but also in Southeast Asia and surrounding areas. We also thank to the steering committee members and all of the reviewers for all supports during the conference and the preparation of this proceedings.

As the scientific documentation of the conference, we provide two-types of proceedings. The first one is the AIP Proceedings which contains the high quality paper selected by blind review process. The second one is the regular proceedings, which contain the selected papers which are not published in the AIP Proceedings and the paper of our invited speakers.

We would like to say thanks to all authors who have submitted the paper to our proceedings. During the review process, we found that almost all papers has good quality. However due to the limitation number of the paper which can be published in our proceedings, we should select the submitted paper based on the reviewer recommendation and score. So, there are some papers which are not accepted to publish in this proceedings, we apologize to the authors about this inconvenience.

Lastly, we would like to say thanks for all partners and all sponsors in supporting our conference.

Warm regards,

Dr. Fajar Adi Kusumo
Editor in Chief.



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The uniform continuity of characteristic function from convoluted exponential distribution with stabilizer constant

Dodi Devianto

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[Convolution Approximation for the n-Particle Distribution Function](#)

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[Exponential Stability of Non-uniform Guiding Center Plasma](#)

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[Stability of a Plasma with a Continuous Density Distribution](#)

Phys. Fluids **4**, 1053 (1961); 10.1063/1.1706438



PROCEEDINGS OF THE 7TH SEAMS UGM INTERNATIONAL CONFERENCE ON MATHEMATICS AND ITS APPLICATIONS 2015: ENHANCING THE ROLE OF MATHEMATICS IN INTERDISCIPLINARY RESEARCH

Conference date: 18–21 August 2015

Location: Yogyakarta, Indonesia

ISBN: 978-0-7354-1354-2

Editors: Fajar Adi Kusumo, Indah Emilia Wijayanti, Irwan Endrayanto Aluicius and Yeni Susanti

Volume number: 1707

Published: 11 February 2016




PRELIMINARY

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Dafik, Ika Hesti Agustin and Khuri Faridatun N.

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[On the rainbow coloring for some graph operations](#)


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Ketut Queena Fredlina and Edy Tri Baskoro

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Hendy

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Anie Lusiani, Edy Tri Baskoro and Suhadi Wido Saputro

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Mark Camilo C. Mamaril and Ma. Louise Antonette N. De Las Peñas

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Siti Afiqah Mohammad, Nor Haniza Sarmin and Hazzirah Izzati Mat Hassim

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Some special classes μ whose upper radical $U(\mu)$ determined by μ coincides with the upper radical $U(\mu)_k$ determined by $(\mu)_k$


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Locating-coloring on Halin graphs with a certain number of inner faces


I. A. Purwasih, E. T. Baskoro, H. Assiyatun and D. Suprijanto

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Connected size Ramsey numbers of matchings and stars

Budi Rahadjeng, Edy Tri Baskoro and Hilda Assiyatun

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On Ramsey (P_3, P_6)-minimal graphs

Desi Rahmadani, Edy Tri Baskoro and Hilda Assiyatun

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Antimagic covering on double star and related graphs


Mania Roswitha, Sri Kuntari, Dwi Suraningsih, Titin Sri Martini and Tri Atmojo Kusmayadi

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An α -cut chromatic number of a total uncertain graph and its properties


Isnaini Rosyida, Widodo, Ch. Rini Indrati and Kiki A. Sugeng

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Existence of independent [1, 2]-sets in caterpillars

Eko Budi Santoso and Reginaldo M. Marcelo

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Restricted size Ramsey number for P_3 versus small paths


Denny Riama Silaban, E. T. Baskoro and Saladin Uttunggadewa

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Denny Riama Silaban, E. T. Baskoro and Saladin Uttunggadewa

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Application of the empirical orthogonal function to study the rainfall pattern in Daerah Istimewa Yogyakarta province

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A combined kriging and stochastic method to map paraffin scale growth in oil pipeline

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Modeling the Philippines' real gross domestic product: A normal estimation equation for multiple linear regression


Jackie D. Urrutia, Razzelle L. Tampis, Joseph Mercado, Aaron Vito M. Baygan and Edcon B. Baccay

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Modified SNOW 3G: Stream cipher algorithm using piecewise linear chaotic map

Muhammad Arif Ali Wasi and Susila Windarta

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Solutions of inverse problems for biodegradation of xenobiotic polymers

Masaji Watanabe and Fusako Kawai

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L. H. Wiryanto and S. Mungkasi

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Benny Yong and Nor Azah Samat


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Research of smart real-time robot navigation system

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Godunov method for multiprobe cryosurgery simulation with complex-shaped tumors

D. Tarwidi

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Modeling and simulation of M/M/c queuing pharmacy system with adjustable parameters

A. R. Rashida, Mohammad Fadzli, Safwati Ibrahim and Siti Rohana Goh

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Contributed Paper 

Validity analysis of development lesson plan and student worksheet based realistic mathematics education

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Contributed Papers 

Parameter estimation of general regression neural network using Bayesian approach

Achmad Syahrul Choir, Rindang Bangun Prasetyo, Brodjol Sutijo Suprih Ulama, Nur Iriawan, Kartika Fitriyasi and Mohammad Dokhi

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Small area estimation for estimating the number of infant mortality in West Java, Indonesia


Arie Anggreyani, Indahwati and Anang Kurnia

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Simulation study for biresponses nonparametric regression model using MARS

Ayub Parlin Ampulembang, Bambang Widjanarko Otok, Agnes Tuti Rumiati and Budiasih

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Comparison of some designs of wavelet model for time series


Budi Warsito, Subanar and Abdurakhman

Source: AIP Conf. Proc. **1707**, 080004 (2016); <http://dx.doi.org/10.1063/1.4940861> 

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Statistical downscaling modeling with quantile regression using lasso to estimate extreme rainfall

Dewi Santri, Aji Hamim Wigena and Anik Djuraidah

Source: AIP Conf. Proc. **1707**, 080005 (2016); <http://dx.doi.org/10.1063/1.4940862> 

+ VIEW DESCRIPTION

The uniform continuity of characteristic function from convoluted exponential distribution with stabilizer constant


Dodi Devianto

Source: AIP Conf. Proc. **1707**, 080006 (2016); <http://dx.doi.org/10.1063/1.4940863> 

+ VIEW DESCRIPTION

Vector generalized additive models for extreme rainfall data analysis (study case rainfall data in Indramayu)

Eka Putri Nur Utami, Aji Hamim Wigena and Anik Djuraidah

Source: AIP Conf. Proc. **1707**, 080007 (2016); <http://dx.doi.org/10.1063/1.4940864> 

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Pricing of European options under BS-BHM-updated model and its properties


Mutijah, Suryo Guritno and Gunardi

Source: AIP Conf. Proc. **1707**, 080008 (2016); <http://dx.doi.org/10.1063/1.4940865> 

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Analysis of variables affecting unemployment rate and detecting for cluster in West Java, Central Java, and East Java in 2012

Putra A. Samuel, Yekti Widyarningsih and Dian Lestari

Source: AIP Conf. Proc. **1707**, 080009 (2016); <http://dx.doi.org/10.1063/1.4940866> 

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Bootstrap inference longitudinal semiparametric regression model

Rahmawati Pane, Bambang Widjanarko Otok, Ismaini Zain and I. Nyoman Budiantara

Source: AIP Conf. Proc. **1707**, 080010 (2016); <http://dx.doi.org/10.1063/1.4940867> 

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Statistical downscaling with generalized Pareto distribution (Study case: Extreme rainfall estimation)

Shynde Limar Kinanti, Aji Hamim Wigena and Anik Djuraidah

Source: AIP Conf. Proc. **1707**, 080011 (2016); <http://dx.doi.org/10.1063/1.4940868> 

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Analyzing split-plot experimental design using partitioned design matrices

Sigit Nugroho

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Estimation of unemployment rates using small area estimation model by combining time series and cross-sectional data

Siti Muchlisoh, Anang Kurnia, Khairil Anwar Notodiputro and I. Wayan Mangku

Source: AIP Conf. Proc. **1707**, 080013 (2016); <http://dx.doi.org/10.1063/1.4940870> 

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Estimating piecewise exponential frailty model with changing prior for baseline hazard function


Sri Astuti Thamrin and Armin Lawi

Source: AIP Conf. Proc. **1707**, 080014 (2016); <http://dx.doi.org/10.1063/1.4940871> 

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Algorithms of D-optimal designs for Morgan Mercer Flodin (MMF) models with three parameters


Tatik Widiharah, Sri Haryatmi, Gunardi and Yuciana Wilandari

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Small area estimation (SAE) model: Case study of poverty in West Java Province


Titin Suhartini, Kusman Sadik and Indahwati

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A study of area clustering using factor analysis in small area estimation (An analysis of per capita expenditures of subdistricts level in regency and municipality of Bogor)

Wahyudi, Khairil Anwar Notodiputro, Anang Kurnia and Rahma Anisa

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Asymptotic approach to model testing for heteroscedastic spatial regression with independent observations


Wayan Somayasa

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Post-stratification sampling in small area estimation (SAE) model for unemployment rate estimation by Bayes approach

Yusrianti Hanike, Kusman Sadik and Anang Kurnia

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The Uniform Continuity of Characteristic Function from Convoluted Exponential Distribution with Stabilizer Constant

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Abstract. It is constructed convolution of generated random variable from independent and identically exponential distribution with stabilizer constant. The characteristic function of this distribution is obtained by using Laplace-Stieltjes transform. The uniform continuity property of characteristic function from this convolution is obtained by using analytical methods as basic properties.

Keywords: convolution, exponential distribution with stabilizer constant, characteristic function, uniform continuity.

PACS: 02.50.Ng

INTRODUCTION

The characteristic function is a complex valued function which defines as Laplace-Stieltjes transform. This transformation and its properties have been introduced in formal term [1] and [4]. Furthermore, the property of characteristic function for infinite divisibility distribution has established in some well known works of Levy and Khinchine in the form of canonical representation.

This property of Laplace-Stieltjes transform as characteristic function can be used to find the distribution of convoluted random variables which are many applications in other area such as convoluted exponential random variables as service time of the queueing or reliability model by [5]. In other hand [2] has introduced properties of the characteristic function from geometric distribution as discrete version of the exponential distribution. Furthermore, the mathematical method to obtain the convolution of exponential distribution and its variations have been introduced in some works of [6], [7], [8].

The research on characteristic functions of various kinds of exponential distribution are always interested to set their properties such as in canonical representation or its uniform continuity. Devianto et al. [3] have introduced convolution of generating random variables from exponential distribution with stabilizer constant. It is worth to give some properties of characteristic function from this new distribution. Now let us adopt the process of constructing this new introduced distribution. Let X be a random variable from exponential distribution with parameter λ . Probability density function for this random variable is given by

$$f(x; \lambda) = \lambda e^{-\lambda x} \quad (1)$$

for positive λ and all real number x . It is denoted W as random variable related to x_i which way generated from exponential distribution with values spread in form

$$w_i = \frac{x_i}{x_m} \quad (2)$$

where it is defined $x_m = \max \{x_1, x_2, \dots, x_n\}$ for $x_i \in [0, x_m]$ and $n, m \in \mathbb{Z}^+$. Then random variable W has probability density function as follows

$$f(w; \lambda) = \theta \lambda e^{-\lambda w} \quad (3)$$

for positive λ and $0 < w \leq 1$ where stabilizer constant is to maintain the nature of probability density function defined as $\theta = -1/(e^{-\lambda} - 1)$.

Devianto et al. [3] has shown the convolution of this new introduced distribution by setting W_1, W_2, \dots, W_n be n independent and identically exponential distribution with stabilizer constant where probability density function is defined as follows

$$f(w_i; \lambda) = \theta \lambda e^{-\lambda w_i} \quad (4)$$

for positive parameter λ , $0 < w_i \leq 1$ and $\theta = -1/(\exp(-\lambda) - 1)$. Then the sum of random variables $S_n = W_1 + W_2 + \dots + W_n$ has probability density function

$$f(s_n; \lambda) = \theta^n \frac{\lambda^n}{(n-1)!} s_n^{n-1} e^{-\lambda s_n} \text{ for } 0 < s_n \leq n. \quad (5)$$

The properties of distribution from an exponential distribution with stabilizer constant and its convolution can be given in the form of characteristic functions. This paper gives a brief explanation of these characteristic functions and their properties of uniform continuity in Section 2 and Section 3.

THE PROPERTIES OF CHARACTERISTIC FUNCTION FROM GENERATING RANDOM VARIABLE OF EXPONENTIAL DISTRIBUTION WITH STABILIZER CONSTANT

The aim of this section is to present characteristic function of distribution from generating random variable of the exponential distribution with stabilizer constant. Furthermore, it is given property of uniform continuity from this characteristic function.

Theorem 1. Let W is generating random variable from exponential distribution with stabilier constant with probability distribution function as in (3) that is

$$f(w; \lambda) = \theta \lambda e^{-\lambda w}$$

for positive parameter λ and $0 < w \leq 1$ where stabilizer constant $\theta = -1/(e^{-\lambda} - 1)$. Then characteristic function from random variable W is

$$\phi_W(t) = \frac{-\theta\lambda}{\lambda - it} (e^{-(\lambda-it)} - 1) \text{ for } -\infty < t < \infty. \quad (6)$$

Proof. Characteristic function from random variable W is derivien by direct methods of Laplace-Stieltjes transform, that is obtained as follows

$$\begin{aligned} \phi_W(t) &= E[e^{itW}] = \int_0^1 \theta \lambda e^{itw} e^{-\lambda w} dw \\ &= \frac{-\theta\lambda}{\lambda - it} (e^{-(\lambda-it)} - 1). \quad \blacksquare \end{aligned} \quad (7)$$

Proposition 2. The Characteristic function of generating random variable from exponential distribution with stabilizer constant is unifomly continuous.

Proof. The uniform continuity of characteristic function from exponential distribution with stabilizer constant is showing by define for every $\varepsilon > 0$ and $\delta > 0$ such that

$$|\phi_W(s) - \phi_W(t)| < \varepsilon \text{ for } |s - t| < \delta \quad (8)$$

where δ only depends on ε . Now let us define a new function

$$\psi(w) = \frac{e^{isw} - e^{itw}}{s - t}. \quad (9)$$

It is using Taylor expansion series to e^{isw} and e^{itw} then we have the new defined function can be rewritten as follows

$$\psi(w) = \left(-\frac{(s+t)w^2}{2!} + \frac{(s^3 + s^2t + st^2 + t^3)w^4}{4!} + \dots \right) + i \left(w - \frac{(s^2 + st + t^2)w^3}{3!} + \dots \right). \quad (10)$$

We can establish uniform continuity of characteristic function by setting

$$\begin{aligned} |\phi_W(s) - \phi_W(t)| &= \left| \int_0^1 \theta \lambda e^{isw} e^{-\lambda w} dw - \int_0^1 \theta \lambda e^{itw} e^{-\lambda w} dw \right| \\ &= (s - t) \left| \int_0^1 \theta \lambda e^{-\lambda w} \psi(w) dw \right|, \end{aligned} \quad (11)$$

so that for every $\delta > \varepsilon$ and $|s - t| \rightarrow 0$ then we have $|\phi_W(s) - \phi_W(t)| \rightarrow 0$. This confirms the characteristic function from random variable W is uniform continuous. ■

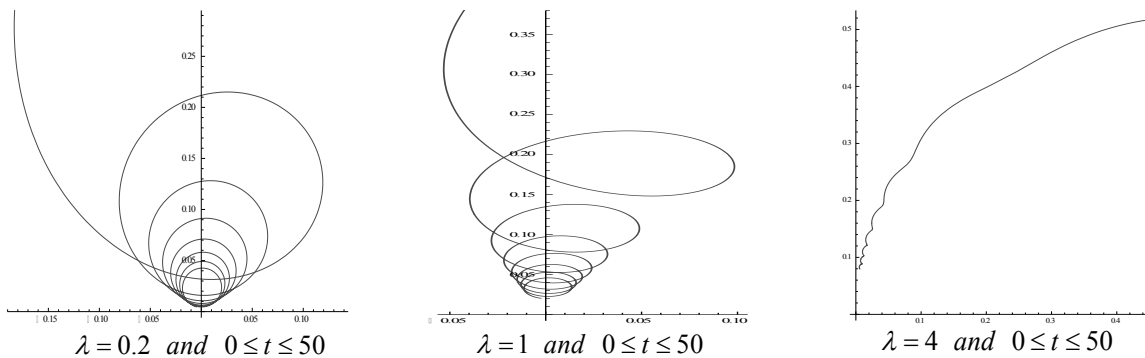


FIGURE 1. Parametric curves of characteristic function from random variable W with various parameter λ and variable t with $0 \leq \theta \leq 2\pi$.

The parametric curves of characteristic function from random variable W from Fig. 1 show smooth line and never vanish on the complex plane for all presented curves, this confirms the continuity of parametric curves by graphically.

THE PROPERTIES OF CHARACTERISTIC FUNCTION FROM CONVOLUTED EXPONENTIAL DISTRIBUTION WITH STABILIZER CONSTANT

The aim of this section is to present characteristic function of distribution from convolution of generating random variable of exponential distribution with stabilizer constant. Furthermore, it is given property of uniform continuity from this characteristic function.

Theorem 3. Let S_n is generating random variable from exponential distribution with stabilizer constant with probability distribution function as in (5) that is

$$f(s_n; \lambda) = \theta^n \frac{\lambda^n}{(n-1)!} s_n^{n-1} e^{-\lambda s_n} \text{ for } 0 < s_n \leq n.$$

for positive λ and $0 < s_n \leq n$ where stabilizer constant $\theta = -(1/(e^{-\lambda} - 1))$. Then characteristic function is

$$\phi_{S_n}(t) = E[e^{itS_n}] = \frac{\theta^n \lambda^n}{(n-1)!(\lambda - it)^n} \Gamma(n, n(\lambda - it)) \text{ for } 0 < t < \infty. \quad (12)$$

Proof. Characteristic function is derived by direct methods of Laplace-Stieltjes transform, that is obtained as follows

$$\phi_{S_n}(t) = E[e^{itS_n}] = \int_0^n e^{its_n} \theta^n \frac{\lambda^n}{(n-1)!} s_n^{n-1} e^{-\lambda s_n} ds_n \quad (13)$$

for $-\infty < t < \infty$ and $0 < s_n \leq n$. Now, by using changing variable $y = s_n(\lambda - it)$ then we have

$$\phi_{S_n}(t) = \theta^n \frac{\lambda^n}{(n-1)!(\lambda - it)^n} \int_0^{n(\lambda - it)} y^{(n-1)-1} e^{-y} dy \quad (14)$$

It is used the property of incomplete gamma function then characteristic function of random variable S_n can be written as follows

$$\phi_{S_n}(t) = \frac{\theta^n \lambda^n}{(n-1)!(\lambda - it)^n} \Gamma(n, n(\lambda - it)) \text{ for } -\infty < t < \infty, \quad (15)$$

where it is defined

$$\Gamma(n, n(\lambda - it)) = \int_0^{n(\lambda - it)} y^{n-1} e^{-y} dy. \quad \blacksquare \quad (16)$$

Proposition 4. The characteristic function of convoluted exponential distribution with stabilizer constant is uniformly continuous.

Proof. The uniform continuity of characteristic function from exponential distribution with stabilizer constant is showing by define for every $\varepsilon > 0$ and $\delta > 0$ such that

$$|\phi_{S_n}(s) - \phi_{S_n}(t)| < \varepsilon \text{ for } |s - t| < \delta \quad (17)$$

where δ only depends on ε . Now let us define a new function

$$\psi(s_n) = \frac{e^{its} - e^{itw}}{s - t}. \quad (18)$$

It is using Taylor expansion to e^{isw} and e^{itw} then we have the new defined function can be rewritten as follows

$$\psi(s_n) = \left(-\frac{(s+t)s_n^2}{2!} + \frac{(s^3 + s^2t + st^2 + t^3)s_n^4}{4!} + \dots \right) + i \left(s_n - \frac{(s^2 + st + t^2)s_n^3}{3!} + \dots \right). \quad (19)$$

We can establish uniform continuity of characteristic function by setting

$$\begin{aligned} |\phi_{S_n}(s) - \phi_{S_n}(t)| &= \left| \int_0^n e^{iss_n} \theta^n \frac{\lambda^n}{(n-1)!} s_n^{n-1} e^{-\lambda s_n} ds_n - \int_0^n e^{its_n} \theta^n \frac{\lambda^n}{(n-1)!} s_n^{n-1} e^{-\lambda s_n} ds_n \right| \\ &= (s-t) \left| \int_0^n \theta^n \frac{\lambda^n}{(n-1)!} s_n^{n-1} e^{-\lambda s_n} \psi(s_n) ds_n \right|, \end{aligned} \quad (20)$$

so that for every $\delta > \varepsilon$ and $|s - t| \rightarrow 0$ then we have $|\phi_{S_n}(s) - \phi_{S_n}(t)| \rightarrow 0$. This confirms the characteristic function from random variable S_n is uniform continuous. ■

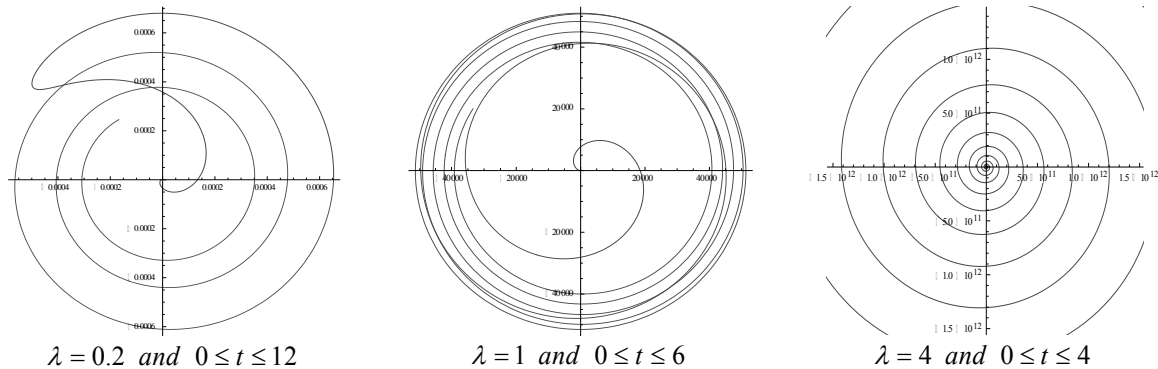


FIGURE 2. Parametric curves of characteristic function from random variable S_n for 10-fold convolution with various parameter λ and variable t with $0 \leq \theta \leq 12\pi$.

The parametric curves of characteristic function from random variable S_n from Fig. 2 show smooth line and never vanish on the complex plane for all presented curves, this confirms the continuity of parametric curves by graphically.

CONCLUSION

The characteristic function of convolution of generated random variable from independent and identically exponential distribution with stabilizer constant is constructed by using Laplace-Stieltjes transform. The uniform continuity property of characteristic function from this convolution is obtained by using analytical methods in the complex variable as basic properties. The characteristic function of this distribution is governed by smooth line and never vanish on the complex plane, this property confirms the uniform continuity of characteristic function by their parametric curves.

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Certificate of Participation

is awarded to

Dodi Devianto

for presenting the paper,

The Uniform Continuity of Characteristic Function from Convolutd Exponential Distribution with Stabilizer Constant

at SEAMS UGM International Conference on Mathematics and Its Applications
at Universitas Gadjah Mada, Yogyakarta, Indonesia
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