Book of Abstracts

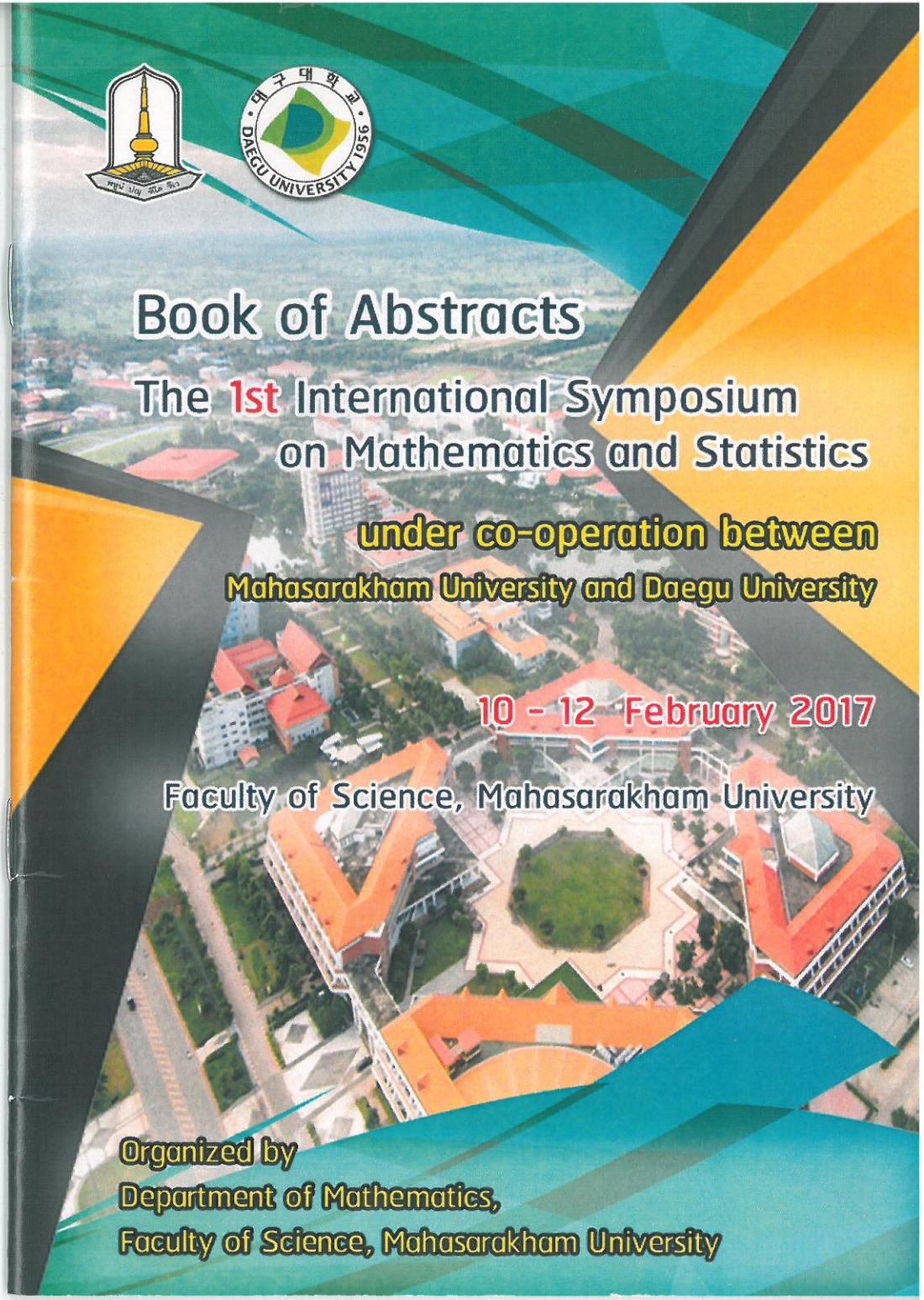
The 1st International Symposium on Mathematics and Statistics

under co-operation between

Mahasarakham University and Daegu University

10 - 12 February 2017

Faculty of Science, Mahasarakham University



Organized by

Department of Mathematics,

Faculty of Science, Mahasarakham University

ISMS 2017

The 1st International Symposium on Mathematics and Statistics

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Department of Mathematics
Faculty of Science, Mahasarakham University
Thailand

Greetings from Symposium Chair

Asst. Prof. Piyapatr Busababodhin, Ph.D.
Head of Department of Mathematics, Mahasarakham University

It is my great pleasure to chair the 1st International Symposium on Mathematics and Statistics (ISMS 2017) under co-operation between Mahasarakham University and Daegu University. On behalf of organizing committees, I take this opportunity to welcome you all to our first international symposium.

The world with modern technology has produced much more data than it is used to be. This includes all branches of science, quality improvement, manufacturing, service industry, government, public health, and public policy among many other settings. There will be many analyses of these data. If you want to use data to learn how the world works, you must have mathematical and statistical knowledge in order to trust your data and your results. Even if you are not performing the study, understanding mathematical and statistical principles can help you assess the quality of other studies and the validity of their conclusions. The symposium comprise of a set of invited talks and oral presentations. I am certain that this symposium will provide an exciting venue and time to discuss state-of-the-art knowledge of Mathematics and Statistics. The symposium is organized by the Department of Mathematics in co-operation with the Department of Statistics and Computer. The con has been given by our colleagues, and friends from other universities and beyond words of appreciation. I take this great honor to thank the co-organizers, for their esteemed support and co-operation. Finally, I would like to thank once again the participants of the symposium and wish that you enjoy the symposium in Mahasarakham University.

Message from Dean of Faculty of Science Mahasarakham University

Professor Wichian Magtoon, Ph.D.

On behalf of the Faculty of Science, Mahasarakham University, I am delighted to welcome all of you to the 1st International Symposium on Mathematics and Statistics under co-operation between Mahasarakham University and Daegu Univerisity. This event would not occur without the MOU between both universities. The initial objective of the meeting was to share experiences and knowledge between statisticians and mathematicians from both universities. However, we feel this is a great opportunity to provide a platform for those with mutual interests to present their thoughts on the area. The symposium is hence taking place and everybody is welcome to join.

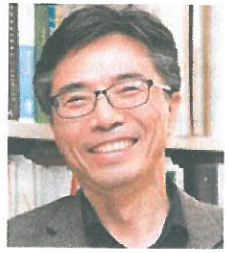
In this symposium, various topics in the areas of Statistics and Mathematics will be presented. We are very honoured to have the invited speakers from Mahasarakham Univerisity and Daegu Universitiy. I am confident that during the course of the symposium we will encounter and perceive some insight ideas and knowledge and hopefully those will be well integrated. I consider this as a success of the event.

As the name of the event stated, this is our first international symposium under the co-operation between the two universities. We are hopeful that the symposium will end with a great success. If this is the case, hopefully, the 2nd, the 3rd International Symposium and so on will follow. I would like to take this opportunity to express my deepest appreciation for those who have a great contribution to the symposium.

Thank you every one for being here with us and hope that we are a good host at this time. I hope our guests from South Korea will have a pleasant time staying in Thailand.

Message from Dean of College of Natural Sciences Daegu University

Professor Tai Jong Kang, Ph.D.



Thank you for coming and taking your valuable time to attend The 1st International Symposium on Mathematics and Statistics under the co-operation between Mahasarakham University in Thailand and Daegu University in Korea. I am honored to have the opportunity to express my deepest appreciation to all of you who are participating in this symposium held on Feb.10-12, 2017 at the Faculty of Science in Mahasarakham University.

This symposium will be held under the theme of "Mathematics and Statistics: Sharing and Collaboration", and it will focus on several issues to provide strategies for mathematics and statistics applied in a variety of fields.

I hope the research topics and examples presented at the symposium will be valuable assets for the growth and development of both Korean and Thai academia and lead to new research ideas. Finally, I hope you will enjoy every moment of the symposium and the relationship between the two universities will be further strengthened.

I would like to thank again all of you who participate in the 1st international symposium on mathematics and statistics between Mahasarakham University and Daegu University.

Keynote Speakers

Assist. Prof. Sanghoo Yoon, Ph.D.
Department of Statistics and Computer Science
Daegu University
South Korea

Assistant Professor SanghooYoon is currently the Head of Department of Statistics and Computer Science, Daegu University. Previously, he had professional positions in Chonnam National University, the University of Auckland and the University of Southampton. He obtained his Ph.D. in Applied Statistics from Chonnam National University. His research interest lies in spatial data analysis, extreme value analysis, design and analysis of computer experiments. He has a long list of publications in many areas in Statistics.

Assist. Prof. Bungon Kumphon, Ph.D.
Department of Mathematics
Mahasarakham University
Thailand

Assistant Professor Bungon Kumphon is working for the Department of Mathematics, Mahasarakham Univerisity, of which she is the vise dean of the postgraduate school and also the head of Statistics and Applied Statistics Research Unit. She obtained her Ph.D. in Mathematics from the University of Brunei. Her research interest centres on statistical modeling. She has several publications focusing on an application to rainfall. Recently, she has involved in the number of journals by working as an editor. During her profession, Assist. Prof. Bungon Kumphon also makes a large contribution on an improvement of the University. She worked as a vise dean several times and also used to be the Head of the Department of Mathematics.

Agenda

08.00 am - 08.30 am	**Registration and Reception**
08.30 am - 09.00 am	**Opening Ceremony and Introduction**
09.00 am - 09.30 am	**Special talks from Keynote speakers**
	Road weather service in big data *Assist. Prof. Sanghoo Yoon, DU*
	Genetic algorithm for multi-objective optimization: Application to a multi-reservoir system in a Chi river Basin, Thailand *Assist. Prof. Bungon Kumphon, MSU*
09.30 am - 10.50 am	**Session 1**
	Topic 1: Clustering and classification to characterize daily electricity demand *Dain Park, DU*
	Topic 2: Semiparametric Fay-Herriot small area estimation under measurement error models *Soorak Ryu, DU*
	Topic 3: Prevalence estimates of Dengue fever for the Northeast region of Thailand: A case study of Nakhon Ratchasima *Stapanee Nintarat, MSU*
	Topic 4: Ordinary smooth r-Minimal structures *Orathai Srikoonsaen, MSU*
10.50 am - 11.00 am	**Break**
11.50 am - 12.20 am	**Session 2**
	Topic 1: The effectiveness of electronic cigarette among South Korea based on national sample survey *Changmin Kang, DU*
	Topic 2: Economic order quantity model for imperfect items under repair option and inspection errors *Panuwat Pimsab, KKU*
	Topic 3: The iterative method with higher convergence orders for solving nonlinear equations *Narongrid Rorsena*, MSU
	Topic 4: Modeling for the number of influenza patients in the Northeast of Thailand using extreme value theory *Wichuda Hencharoen, MSU*

12.20 pm - 01.20 pm	**Lunch**
01.20 pm - 02.40 pm	**Session 3**
	Topic 1: Principal component analysis and integrated artificial neural networks in econometric model for forecasting the volatility of gold price *Wichit Khangphukhieo, MSU*
	Topic 2: Viscosity iterative method for a new general system of variational inequalities in Banach spaces *Suwicha Imnang, TSU*
	Topic 3: Extreme value analysis for daily maximum precipitation with typhoon *Gwanghae Park, DU*
	Topic 4: The development of tourism recommendation algorithm for Jeju Island *Yurim Kim, DU*
02.40 pm - 02.50 pm	**Break**
02.50 pm - 04.10 pm	**Session 4**
	Topic 1: The machine learning techniques for detecting flash flood *Aeri Kang, DU*
	Topic 2: Solving nonhomogeneous Cauchy-Euler equations by differential transformation method *Thanachok Mahahong, MSU*
	Topic 3: The development of earthquake hazard map in Korean peninsula *Yelim Lee, DU*
	Topic 4: Discretizing surfaces using Riesz energy and Riesz polarization configurations and some open problems in Riesz polarization optimization *Nattapong Bosuwan, MU*
04.30 pm - 05.00 pm	**Wrap up and closing**

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Road weather service in big data[+]

Sanghoo Yoon[12]

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It is well recognized that vehicle is necessary for citizens who are working or staying in cities. Rainfall has a direct impact on vehicles. However, the rainfall is not measured on roads directly. In this study, I predicted the amount of rainfall on the road for representative days of rainfall at Seoul in 2013. The total number of gaugedsites is 190. Around 15% of site is used for model validation. Inverse distance weighting method (IDW) and ordinary kriging (OK) were considered for spatial interpolation. The bias, the root mean squared error (RMSE), the mean absolute error (MAE) and correlation coefficient (CC) is used for criteria of prediction performance. As expected, prediction performance is increased when the number of rainfall observations are increase. Especially, when the observations are exceeded 30%, the correlation coefficient is reached at 0.77 and RMSE, MAE, and bias were a rapid decreased. I also simulated the road condition with accumulated rainfall. The total of 177,599 road position is reproduced by 22,184 pieces of load link unit for convenience. Lastly, road weather service with the safe driving speed is calculated.

Keywords: big data, inverse distance method, ordinary kriging, road link, spatial inverpolation

[+]This research was supported by Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education (NRF-2014R1A1A2009060).
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Genetic algorithms for multi-objective optimization: Application to a multi-reservoir system in the Chi River Basin, Thailand

Bungon Kumphon[1]*

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The multi-objective genetic algorithm is applied to determine the optimal operation of a multi-reservoir system in the Chi River Basin, Thailand. Two competing objective functions are considered; dam release and dam storage. The predicted values for the release and storage needed are mostly lower than in current established management practice.

Keywords: multi-objective function, genetic algorithms, optimization, Pareto-optimal, evolutionary computation

[1]Assistant Professor, Mahasarakham University, Thailand

Clustering and classification to characterize daily electricity demand

Dain Park[13] and Sanghoo Yoon[23]*

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The purpose of this study is to identify the pattern of daily electricity demand through clustering and classification. The hourly data was collected by KPS (Korea Power Exchange) between 2008 and 2012. The time trend was eliminated for conducting the pattern of daily electricity demand because electricity demand data is times series data. The independent variables for cluster analysis is each time zone of 24 hours, and two principal components were extracted. K-means clustering, Gaussian mixture model clustering and functional clustering were considered to find the optimal clustering method. The classification analysis was conducted to understand the relationship between external factors, that are day, holiday, and weather, and the pattern of electricity demand. Data is divide into training data and test data. Training data is consisted of external factors and cluster between 2008 and 2011. Test data is daily data of external factors in 2012. Decision tree, random forest, Support vector machine, and Naïve Bayes were used. As a result, Gaussian model based clustering and random forest showed the best prediction performance when the number of cluster was 8.

Keywords: clustering, classification, electricity demand

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Semiparametric Fay-Herriot small area estimation under measurement error models

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In recent years, the demand for solving small domain and measurement error problems has highly increased worldwide and semiparametric models also have been used for the solution of complex scientific problems. This paper presents semiparametric Fay-Herriot small area estimation under measurement error models. Specifically, we consider small area model by using penalized splines of non-linear pattern and we use radial basis functions with knots on a grid of equally spaced sample quantiles of the independent variable. To fit the model and estimate parameters we suggest a hierarchical Bayesian framework using Markov Chain Monte Carlo methodology. Simulation results suggest that the method performs well and we compare models based on the root mean squared errors. Furthermore, we illustrate the method in an application data and we use the posterior predictive p-value and the mean logarithmic conditional predictive ordinate to compare models.

Keywords: Fay-Herriot, hierarchical bayes, Markov Chain Monte Carlo, measurement error, semiparametric

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Prevalence estimates of Dengue fever for the northeast of Thailand: A case study of Nakhon Ratchasima

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An outbreak of Dengue fever has been reported in Thailand for more than 50 years. It has been a public health problem for the country. In recent years, there is no sign that the disease will die out from the population. In this study, we calculate the number of weekly infections and estimate the prevalence of Dengue fever for Nakhon Ratchasima based on weekly incidence data for the last 10 years, 2006-2015. We employ back-calculation method to estimate the incidence of the disease. Whereas, the prevalence is estimated using convolution equation and the survival function. The confidence intervals of the estimates are obtained using a bootstrap method.

Keywords: back-calculation, prevalence, Dengue fever, incubation period, survival function

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Ordinary smooth r-Minimal structures

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In this research, we introduce a new space which is called ordinary smooth *r*-minimal structure spaces which study properties of open sets, closed sets, closure operator, interior operator, continuity and compactness. Moreover, we study *b*-generalized closed sets, their relationships and characterization of extremely disconnected and T_{gs} spaces.

Keywords: ordinary smooth r-minimal structure space, closure operator, interior operator, b-generalized closed sets

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The effectiveness of electronic cigarette among South Korea adult smoker based on national sample survey

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This study aims to identify the effectiveness of electronic cigarette for smoking cessation and smoking reduction based on the sixth Korea National Health and Nutrition Examination Survey data. We select 704 subjects aged 19 years or older after excluding never smokers and former smoker. Considering the complex survey design, we conduct a descriptive analysis and we compare urine cotinine between smoker types (dual user and tobacco only user) using linear regression with confounder that may affect urine cotinine and smoker types such as sex, age, income, and so on. Although the results of this study did not show statistically significant different of urine cotinine between smoker types, dual users have more urine cotinine than tobacco only users. From results of this study, we expect that it can be used as a basis evidence that electronic cigarette may not be effective for smoking cessation and smoking reduction.

Keywords: complex survey design, electronic cigarette, Korea National Health and Nutrition Examination Survey, urine cotinine

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Viscosity iterative method for a new general system of variational inequalities in Banach spaces[+]

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In this paper, we study a new iterative method for finding a common element of the set of solutions of a new general system of variational inequalities for two different relaxed cocoercive mappings and the set of fixed points of a nonexpansive mapping in a real 2-uniformly smooth and uniformly convex Banach spaces. We prove the strong convergence of the proposed iterative method without the condition of weakly sequentially continuous duality mapping. Our result improves and extends the corresponding results announced by many others.

Keywords: A new general system of variational inequalities, relaxed cocoercive mapping, strong convergence

[+]This work was completed with the supports of the Commission on Higher Education, the Thailand Research Fund and Thaksin university.
[1]Assistant Professor, Thaksin University, Thailand

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Extreme value analysis for daily maximum precipitation with typhoon

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The Korean peninsula is affected by typhoons every year. Typhoon is tropical cyclone, it should be considered in estimating maximum daily precipitation because it is accompanied by strong wind heavy rain. The general extreme value distribution (GEVD) is considered to calculate the return level based on the annual maximum precipitation. However, the heavy tail distribution is more suitable for precipitation over the typhoon period rather than GEVD. So we estimated the parameters of GEVD by the maximum likelihood estimation for excepting typhoon period. Heavy tail distribution such as Weibull distribution, Gamma distribution, lognormal distribution, etc.; were considered during the typhoon period. Daily precipitations were collected from meteorological stations in five cities from 1973 to 2015. As a result, the risk of precipitation was assed at 25, 50, and 100 return levels considering both GEVD and heavy tail distribution.

Keywords: extreme value analysis, heavy tail distribution, return level

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The development of tourism recommendation algorithm for Jeju island

Yurim Kim[1], Yeji Lee[1] and Sanghoo Yoon[2]*

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The weather has a great impact on traveler's plan. Tourism climate index (TCI) has been developed to represent climate condition for trip at sites. However, TCI is produced by city and district level, is does not reflect tourist's interest and weather at tourism sites. The purposes of this study are as follows. First, weather information of the tourism sites is predicted by inverse distance method. Then TCI at tourism sites are calculated. Second, we proposed a modified TCI that takes into account the natural hazard circumstance and the characteristic of tourism sites. Such as, Museum does not affect by the weather. Finally, we suggested a recommendation algorithm which combines social media data and TCI. The meteorological data are collected from weather stations during summer season between 2014 and 2015. The rating and reviews of tourism sites in tripadvisor are considered.

Keywords: inverse distance weight, tourism climate index, tripadvisor

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The machine learning techniques for detecting flash flood

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Flash flood is a rapid flooding which occurs when it rains rapidly on saturated soil or dry soil that has poor absorption ability. The land surface model is needed because the surface runoff must be calculated to account for flash flood. This study is dealt with the predicting of flash flood based on the reported flash flood casualty accident data between 2009 and 2012, and hydro-meteorological information generated by land surface model (TOPLATS). The past six hour data of soil moisture condition, surface runoff amount, rainfall amount are considered. Naïve Bayes, Support vector machine, decision tree, random forest and logistic regression are used to classification. There are limitations in evaluating the predictive performance of machine learning because the number of cases is limited to 38. This study is expected to help reduce a human and property damage by flash flood, which can be detected by land surface model based on the forecasted weather.

Keywords: flash flood, machine learning, land surface model

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Solving nonhomogeneous Cauchy-Euler equations by differential transformation method

Thanachok Mahahong[1] and Nongluk Viriyapong[2]*

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In this project, we give a solution of nonhomogeneous Cauchy-Euler equations by the differential transformation method (DTM). We approximate the solution of this equation in the form of power series. By comparing the approximated solution with the exact solution, it shows that DTM is an effective method to solve nonhomogeneous Cauchy-Euler equations.

Keywords: differential transformation method (DTM), Cauchy-Euler equation, Taylor series

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The development of earthquake hazard map in Korean peninsula

Yelim Lee[1], Hyeju oh[1] and Sanghoo Yoon[2]*

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The 5.8 magnitude earthquake in 2016 indicates that Korean peninsula is no longer safe from earthquakes. However, there is a lack of studies on the earthquake risk of the Korean peninsula. The data was crawled from Korea Meteorological Administration between 2018 and 2016. A total of 1,476 earthquakes were observed above 2 magnitude. We performed the analysis as follows. Firstly, the magnitude and epicenter of earthquake were visualized. Secondly, 150 x 150 grid was generated to evaluate the intensity of earthquake. This is because regular lattice is very important to generating the risk of earthquake. Finally, earthquake hazard map was generated by integrating the lattice. In addition, R code was created to visualize the effect of the last earthquake. Gyeongju, Shinuiju and the yellow sea are at high risk of earthquakes.

Keywords: earthquake, hazard map, visualization

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Discretizing surfaces using Riesz energy and Riesz polarization configurations and some open problems in Riesz polarization optimization+

Nattapong Bosuwan[12]*

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In my talk, we discuss the asymptotic behaviors (as $N\to\infty$) of minimum N-point Riesz s-energy configurations and maximum N-point Riesz s-polarization configurations when $s>0$. We show that for some certain numbers of s, our optimal configurations are "good points" for discretizing a large class of subsets of the d-dimensional Euclidean space R^d in the uniformly distributed sense. Moreover, we discuss some recent results and open problems on Riesz polarization optimization.

Keywords: Riesz energy configuration, Riesz polarization configuration, Riesz polarization optimization

[12]Lecturer, Mahidol University, Thailand

Symposium Committee

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