Fibonacci Spatial Hazardology of Earthquakes (FSHE)

(West of Iran)

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Abstract

A borderline destructive earthquake (M: 7.3) hints the urban regions of Ezgeleh, Sar-Pol-Zahab and Ghasre-Shirin in Kermanshah province (western part of Iran) and left more than 600 kills, hundreds of injured peoples and building damages in 12 November 2017. In this research, I have used Fibonacci numbers to set 117 years epicenters (USGS catalogue, 1900-2017) based on a post predictive model contained the main and aftershocks of this region. This scenario reveals unique geometrical associations (30 and 137.5 degrees) between the recent epicenters and more than one century seismic onsets according to triangular-circular distributions. The primary results showed that Kermanshah epicenters tend to be patterned by golden shapes and golden angles in self-organized geometrical distributions. Also many of Ezgeleh aftershocks illustrate spiral distribution that is because of their inherent association with fault systems. As the final result, a forecast map issued in the end of research to realize the spatial hazard assessments and prognosis of seismic potentials based on Fibonacci simulation of the aftershock locations.

Keywords: Earthquake, Fibonacci sequence, Kermanshah province, Spatial hazardology.

Introduction

Leonardo Fibonacci was a famous Italian scientist introduced a numerical sequence was known as “Fibonacci Number” in his book released in 1202 [1]. This is a series of numbers where a number is found by adding up the two numbers before it. Starting with 0 and 1, the sequence goes 0, 1, 1, 2, 3, 5, 8, 13, 21, 34, and so forth. Written as a rule, the expression is:

$$F_n = F_{n-1} + Fx_{n-2} \quad (1)$$

Where, Fn is obtained Fibo-number and Fn-1 , Fn-2 are two sequences before Fn respectively [2].

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Both real sets and integer sequences of Fibo-numbers have impressed many of natural phenomena and therefore known as the mathematical keys for terrestrial and infra-terrestrial solutions. For instance, earthquakes and climate changes are two main threats have close relationships with golden spiral distribution as a result of spatio-temporal evolutions in nature.

A simple sequence of Fibo-numbers is shown as below:

1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, …, Fn

In above sequence, a ratio of (F_n/F_{n-1}) gives constant value (golden ratio, ℚ) equal with 1.618.

$$\varphi = Fn / F(n-1) = 1.618 \quad (2)$$

This ratio has important roles in bio-creatures. Also it plays a global game in galactic strategies for expansion. From geological point of view, many of mantle related geodynamics have been regulated by ℚ to prompt the self-organized patterns of the crustal appearances. As a rule of geometrical properties, golden ratio gives rise to producing golden shapes such as triangles, circles and rectangles. Golden triangles have two isosceles with exactly 36 degree of angle between the isosceles. Golden circles consist of two unequal arcs which one of them has golden angle equal with 137.5 degrees. Golden rectangles are usual natural patterns mostly studied by geoscientists [3]. As it is shown in Figure1, seismic events and their focal mechanisms are relevant examples from golden rectangles with affinity of the events to spiral distributions.

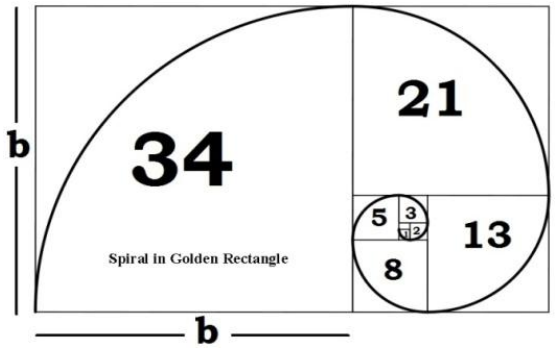

Fig. 1. Spiral distribution of natural events (such as earthquakes) in golden rectangles

A simple consideration for geometrical behavior of earthquakes is golden triangular distribution which can be modified as golden Pentagon-Gnomons and extended toward golden decagons (resemble to circles) around the huge events (such as Ezgeleh earthquake) (Figure2).

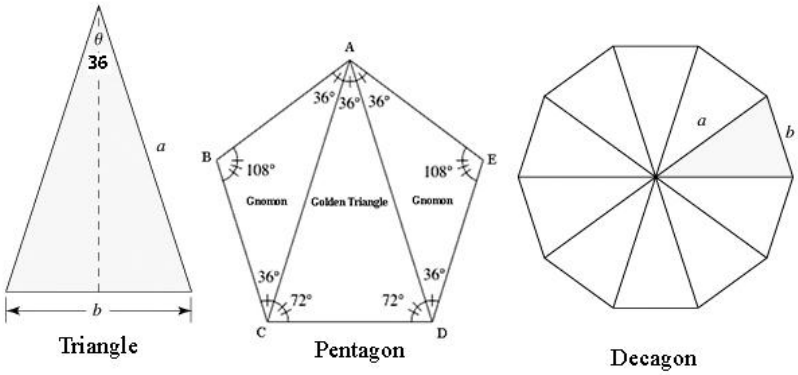

Fig. 2. Triangular-Decagonal distributions in nature (ratio a/b = Φ)

Methodology

Here, a Post Prediction of Earthquake (PPE) is well done by applying Fibonacci numbers into USGS catalogue. Natural earthquakes usually distributed in spirals and used for spatial interpretations [3]. At least, 117 years backgrounds of seismic events (USGS, 1900-2017), provide this unique opportunity to answer the question of "where is the next destructive earthquake in the regional or local scales?"

It means, with a dense and accurate catalogue, scientists will be able to predict location of the future earthquakes and Fibonacci-based techniques have closely impressions to revealing the imitation games of the nature as an important key for earthquake prediction [3,4]. According to PPE, a main shock event not only initialized post seismic processes, but is relevant to middle or long term catalogues as a regional Fibonacci variable. In practice, seismic databases from west of Iran including epicenters [5], interferogram [6] and structural lineaments [6,5], have been gridded by GIS facilities to illustrate the possible golden peculiarities of the recent earthquakes.

Discussions

Ezgeleh event (2017-11-12) seems to be initial point for long ranges of post seismic events, which many of them should be considered as Ezgeleh aftershocks. In figure3, a significant spiral distribution can be seen in near territory of Ezgeleh epicenter. Also in this Figure, we can find an obvious golden circle within the radius lesser than 20 Km from main shock event.

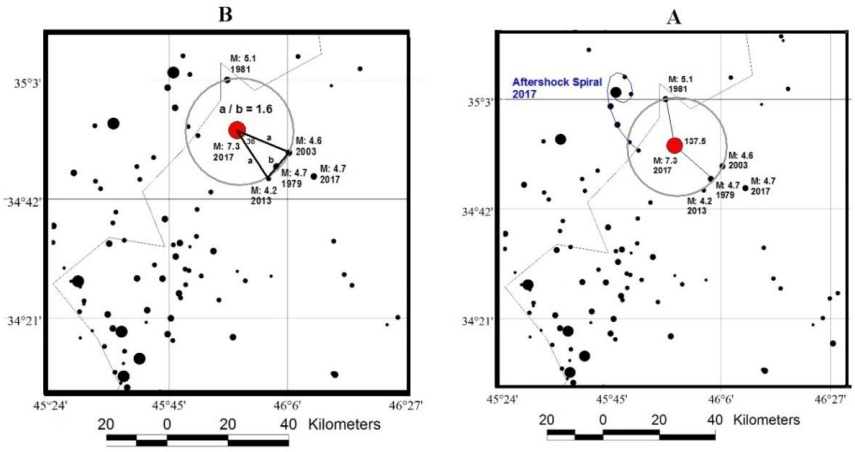

Fig. 3. A: aftershock spiral distribution (golden rectangle) next to golden circle of the main and before shock events B: geometrical properties of golden triangle in lesser 20 Km from main shock epicenter (Red Point).

As a primary result, above mentioned facts indicate a natural distribution of all seismic events in western part of Iran. For the second, spatial assessment of 117 years magnitudes (since 1900), provides spatial hazardology of the Kermanshah earthquakes based on post predictive algorithm [7]. In other word, Ezgeleh earthquake is a dependent spatial variable to post seismic events as well as its dependency to foreshocks in the catalogue.

Conclusion

-This research introduced a Fibonacci method for evaluation and analysis of 117 years Kermanshah earthquakes as an active seismic zone in western part of Iran.

- Spatial hazardology of Ezgeleh event, indicates a long distance association of Kermanshah post-seismic traces with other Seismogenic traces within 100 Km from 7.3 main shock epicenter (Figure4).

- Rectangular distribution of earthquakes, make an easier and accurate forecasting of future events (usually means aftershocks) and other post seismic activities originate from Ezgeleh event in golden radiuses (Figure 5).

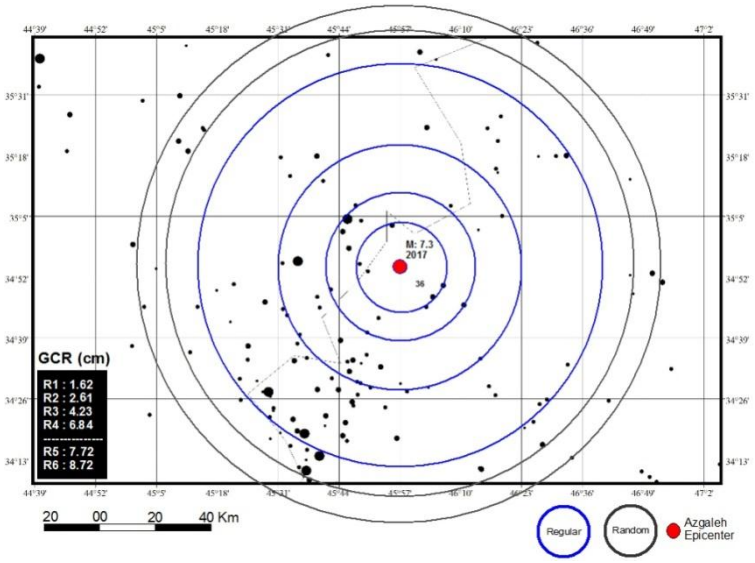

Fig. 4. Regional golden circles around Ezgeleh seismic event (Nov. 2017) according to regular (blue) and random (gray Fibonacci sequences) [8] .

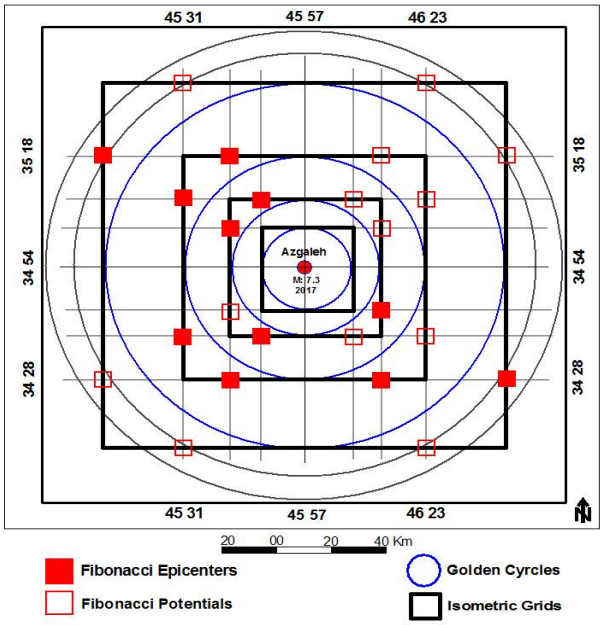

Fig. 5. A Fibonacci based spatial hazardology of Ezgeleh earthquake (12 Nov. 2017)

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Selection of suppliers in the green supply chain High-tech oil industry by combining fuzzy multi-criteria decision-making methods

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Abstract

Considering the increasing environmental hazards caused by industrial activities, more attention has been paid to the aspects of this issue and the efforts to carry out sustainable activities, which has made it very important to pay attention to environmental issues. The purpose of this research is to find the effective criteria for selecting suppliers of oil and gas products, considering the importance of these suppliers to the environmental hazards resulting from the operation of their products. By studying the past functions and reviewing the lessons, which have been learned from the implemented projects, and taking into account the experts and owners of the executive experience, key points in the supply chain that were directly related to the environmental functions were identified, and the criteria were recognized and combined with two methods of the process of Hierarchical Analysis (AHP) and the preferred method based on similarity to the fuzzy TOPSIS solution and performing paired comparisons to determine the weights of each of the criteria and the comparison of each of the suppliers according to the criteria identified in the end of the main criteria and Effective in identifying the choice of a green supplier. The results of this research can be applied in the models used by decision makers to select contractors, oil suppliers, and gas products, which can play a very important role in greening the supply chain of goods.

Keywords: Environmental hazards, Green supply chain, Fuzzy multi-criteria decision-making methods

Introduction

It is clear that in the project procedure, after decision-making and design, efficient design can provide satisfactory results regarding to the purposes and hypotheses of the study. However, can modern techniques, methods, accurate design, and prediction of various factors lead to the ultimate goal? Of course the answer is

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negative, because the mental and physical efforts can lead to efficient results when it is possible to show everything in practice. The accuracy and efficiency of planning should be indicated in practice; otherwise, all of them will lead to failure. Therefore, in addition to accurate planning and design, we should attempt to find a way to measure the results and find a solution to deal with problems and deviations. No system can work and achieve its highest capacity without control. All of us are familiar with chaos and delay, which is resulted to the lack of control in traffic systems. Uncontrolled water or electricity network systems can cause problems or decrease efficiency. If a building system is efficiently designed but progresses without any control, it may lead to delays or replacement. This study aims to utilize theoretical models and methods in practice to achieve new methodology in project progress measurement. Then, important points in this regard are taken into considerations and finally, theoretical foundations of methodology design are presented.

The present research intends to examine whether it is possible to combine decision-making methods that can be used to provide green supply suppliers in the supply chain of the Pars Oil and Gas Company with the intention of reducing environmental risks, including reducing environmental pollution. Then, by combining AHP and TOPSIS fuzzy methods, and applying green criteria, it provides a framework for ranking suppliers in the supply chain and selected the most suitable supplier for cooperation in the supply chain.

Materials and Method

In this research, the indicators and criteria for selecting green suppliers were collected through library studies. In particular, six major indicators were used in this study. Then, by designing a pairwise comparison questionnaire (questionnaire 1), these indicators were compared in two groups. The data from this questionnaire are included in the fuzzy AHP model to become numerical weights for the indices. In the next stage, another questionnaire (questionnaire number 2) is designed in which decision makers or respondents compare the suppliers with regard to the indicators. The data of this questionnaire and the weights obtained by the fuzzy AHP model are included in the fuzzy TOPSIS model, so that the suppliers, at the end, are prioritized according to the green criteria.

The problem of choosing green suppliers for solving multiple problems can be solved by multivariable decision analysis methods. In this research, the combination of two methods of AHP and TOPSIS has been used to achieve the answer. Since the data were collected inaccurately, and sometimes qualitatively, the use of definite methods can lead to incorrect results. Therefore, for fuzzy logic, the following methods are combined to obtain accurate results.

Conclusion

In this research, two methods of fuzzy AHP and TOPSIS, which are fuzzy multi criteria decision-making methods, are used to rank green suppliers that play a key

and undeniable role in reducing environmental hazards and sustainable development in the supply chain used. Initially, six sources of green supply choices were identified by studying the literature. The basis of the questionnaire was compilation: comprehensive environmental management, hazardous material management, green innovation, green image, green product and pollution control. After collecting data from the experts, the Fuzzy AHP method was used to determine the significance or weight of the criteria and the green innovation indicator was identified as the most important indicator. Then, the suppliers of the company were ranked by using the fuzzy TOPSIS method. This research with a semantic approach can be the first step in the implementation of the green supply chain in service organizations and other institutions.

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Evaluate the effect of agricultural inputs and chemical pesticides on rurals' environment (Case study: Zarindasht City rural area)

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Abstract extended

Introduction

Risk is a form of entrepreneurship [18]. Environmental hazards are sudden or gradual occurrences of the natural or human origin, which is threatened by the health and safety of a wide range of habitats and human habitats [8]. Many of the natural disasters are occured in the rural areas of the country, which , causes many damage to the villagers, due to the weakness of facilities in these areas [15]. The use of chemical pesticides to control agricultural pests causes unpredictable damage to human health, other living, and environmental conditions. In the same way, in the last two decades, the use of microbial agents have been very much taken into consideration, which are controlling pests that have lower levels and have a narrower and more specific range of effects on target insects [10]. Toxins and chemical fertilizers come from agricultural land to water sources include about 15 percent of the cause of water pollution. Agricultural pesticides directly affect water quality, but in the case of organic fertilizers, when these fertilizers enter large amounts of soil, the excess is fed into the rivers and lakes through drainage waters and provides rapid growth of algae food [1]. In order to prevent the destruction and destruction of their agricultural products, which are costly, and time-consuming, as well as due to population growth and constraints on the production of various food products, different methods for controlling plant pests are used. Among these methods, one of the most popular are the pesticides. In conventional agriculture, more than 300 kinds of hazardous synthetic chemical compounds, such as toxins and chemical fertilizers, are used to control pests, diseases, weeds and soil fertility. In addition to contaminating water, soil and air, some plants enter and remains as a residue of pesticides in agricultural products and is transmitted to the human body during the process of consumption, which can lead to endemic diseases like cancers and allergies in humans [26].

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Research method and analysis

This research follows a descriptive survey in its proposed method. Since most of the residents of Zarindzht City are engaged in agriculture (32% in the agricultural sector and 3.5% in the gardening sector), the statistical population of this study are farmers of 15 villages of this city. The number of members of the statistical society is 19622 people, using the Cochran formula and at 95% confidence level, the number of members of the sample, 377 household heads were selected as the sample population for answering the questionnaires. Therefore, a stratified random sampling method was used to obtain the logical volume of the sample, taking into account the villages of Zarindsth city (15 villages) as statistical classes.

Discussion

In this research, Pearson correlation coefficient was used to determine the effect of chemical pesticides (independent variable) on the environment of the villages (dependent variable). As it can be seen in the results, the use of chemical pesticides in agriculture has had an impact on the environment and the health of living creatures. The poisoning of agricultural workers with chemical pesticides is one of the most common occupational hazards. The excessive use of these pesticides by farmers has had damaging effects on the environment, and in particular on the environment of the village. The aim of this study was to assess the effects of agricultural pesticides on the environment of the villages.

Conclusion

According to the results of this study, the use of chemical pesticides in agriculture causes environmental pollution. These contaminations affect the environment and cause its destruction. In this regard, providing educational programs to raise farmers' awareness of the amount and correct use of pesticides is advised. The Ministry of Agriculture can help farmers to properly use chemical pesticides and appropriate spraying time. Therefore, according to the mentioned variables, promoting propagation has a constructive role in the knowledge of farmers about the harmful effects of pesticides on agricultural products. The authenticity of the assertion confirms the extension of the correct use of poisons. According to the presented materials, it can be said that today the use of high quality agricultural inputs and pesticides has been unbalanced and excessively damaging to aquatic, plant, animal and human ecosystems. Therefore, the use of fertilizers and chemical pesticides on the environment has caused irreparable damage. This is particularly noticeable in rural areas, which account for the vast majority of agriculture and natural areas of the country. Considering the importance and position of the rural community in the country and the challenges this community faces in its development process, recognizing and analyzing the characteristics of rural development planning in the country and addressing all aspects of it is imperative.

Keywords: "Agricultural toxins", "Environment", "Inputs", "Structural equations of PLS"), "Zarin Dasht villages".

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Identification and Analysis of Synoptic of Heat Waves in West of Iran (Case Study: Ilam, Khouzestan, Lorestan, Kermanshah)

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Abstract

Heat wave has harmful effect on environment and human life. First of all, this research identifies the heat wave of four provinces of Ilam, Kermanshah, Lorestan, and Khuzestan, for the period between 2000 and 2010. This study uses the heat index, and the return period of this wave using the Gambel distribution function. According to obtained results, total redundancy of extracted heat waves was detected as 143, which 70 waves of this amount have been in warm period and 73 waves in cold period of the years. Monthly process of thermal waves shows that the highest wave was occurred in the month of Farvardin. Process the maps of surface pressure of the earth during warm period of the year shows that low pressure tabs of Ganges had pulled near the central Iran, even its tabs in to north east of Iran and the center of Iran is low-pressure heat. In time of occurrence of this wave, there was pressure heat occurred in the earth surface from Horn of Africa, Europe, Iraq, and Saudi Arabia. Hence, the low pressure tab of Saudi Arabia has been affected southern, south-western, and western parts of Iran. Synoptic Process of the heat wave condition shows that area is located in front of the hot air and the influence of hot air on the area has caused the temperature rise at this time of the year.

Keywords: heat wave, synoptic analysis, heat index, west of Iran.

1. Introduction

Heat wave is one of the most important natural disaster and weader conditions. That has harmful effect on environment and human life. heat wave is a warm period that is stable for several days to several weeks and maybe com with violent wet. Generally, increasing the temperature degree in extreme heat waves can cause the destruction of agriculture product and loss communities of the plant societies and ecosystems and also human death. Heat wave with Decrease the Photosynthesis

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measure in farm plants cause deacres the plants prrformance in measure product of the seed and fruit. One heat wave in could period of year can have violent Damage on garden product from the way of hasty awaking in fruit tree and deacres of Fertility of tree. according to the importance and effect of tempreture on inviromental condition and also the roles on big and small plans, pattern modeling the Temperature behavior, sience circle specially in the recent year had a great attenticn .

2. Methodology

in this research first of all identify the heat wave of the west of iran area . that consist of four state ilam Kermanshah lorestan and Khuzestan that we identify and return period of this wave with the using of Gambel distribution function and finally similar pattern concentrated on area in days who introuduce heat wave for this reason. Thereupon we recive the datas on surface of earth from the Meteorological Organization for the period of time we ricive between 2000 to 2010 and then by this data and the using of heat index and hum index (this tow index in order to using given apparent temperature is by Meteorological Service of Canada). identified heat wave In Excel spreadsheet software for this priod of time is and statistic Analysis is done by Gambel distribution function that is suitable Distributive in order to study Phenomena climate extremes. Then the Synoptic Analysis of wave of statistic we Analysis of the similar heat wave for this work were need a Representative days for per period of heat wave that we choice this Representative days at the middle of the wave Because is For each wave has a peak day that after that the temperature decreases again. Approximately 85% of this threshold or the peak temperature that day was the middle. after assiynmen of represent day we astart make the maps of dffernt level of the atmosphere by receive of the datas of the noa website. this maps consist of geo potential height and moving tempreture.

$$\text{Index heat} = -42/379 + 2.04901523T + 10/14333127Rh - 0/22475541T\ a\ Rh - (6/83783 \times 10^{-3}\ T\ a^2) - (5/481717 \times 10^{-2}\ Rh^2) + (1/22874 \times 10^{-3}\ T\ a^2\ Rh) + (8/5282 \times 10^{-4}\ T\ a\ Rh^2) - (1/99 \times 10^{-6}\ T\ a^2\ Rh^2) \quad (1)$$

$$\text{Humindex} = T_a + H$$
$$H = \cdot/5555(e-10)$$
$$e = 6/11 \exp(5417/7530 \times ((\tfrac{1}{273/16}) - (\tfrac{1}{Td}))) \quad (2)$$

3. Results and discussion

Total heat waves extracted wave was detected in the study statiscic period 144 that this nummbers 70 in warm period and 73 waves in cold period of the years had happened. The durability of these waves distincted wave two to 25 days. most occurrence waves of tow, three, and four allot of ten day wave with return period of 25 year with the average of apparent temperature of 55.5 C period return of the wave of 15 day and upper 50 year and more was calculated. Monthly process of therm waves shows that during of 11 year satistic(2000-2010). Highest of waves

occurrence was in farvardin month and also in The event heat waves in could period of year and more event is in winter season. Plenty of waves in this season more is in day and esfand month. Process the maps of pressure of surface of the earth during the warm period of the year shows that Low pressure tabs of Ganges had pulled near the centeral iran, even its tabs in to north east of iran and the center of iran is low-pressure heat. In time of occurence of this wave in the earth surface of the –pressure heat on the branch of the Africa, Europe. araq and saudi Arabia had been closed. That are from the kind of termal and showing the violent heat that is excit at the surface of the earth. Low pressure of Saudi Arabia one of the most important effective of wave occurrence of the heat That are from the kind of termal and showing the violent heat that is excit at the surface of the earth. Low pressure of Saudi Arabia one of the most important effective of wave occurrence of the heat That tabs effectet the south southwest and the parts from the west of iran. Synoptic Process of the heat wave condition shows that plan pattern pressure surface of the earth and height topografhy in the west of iran is ahigh-pressure pattern. Also, shows that area is located in front of the hot air and the influence of hot air on the area has caused the temperature rise at this time of the year.

Determination of Maragheh Hazardous Areas from Geomorphological Using Fuzzy, SAW, and AHP Combinations

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Abstract

One of the important issues in the management of urban environmental crises is the geomorphological crises in urban areas. These crises are increasing because of human activities in urban areas. Therefore, in this study, the constraints and the capabilities of Maragheh have been assessed by identifying of the geomorphological processes and phenomena in the developed parts of Maragheh during the yeas of 1984 to 2017. Geomorphologic constraints in this study have been discussed in two categories of constraints due to hillslope, and flood processes. For this purpose, the needed data were gathered from different sources, as well as distant evaluation. Then, these data were changed into the necessary information layers by using the Geographical Information System (GIS), which included the geological, tectonic, seismicity, temperature, humidity and rainfall, soil erosion, the application of the land and vegetation, height classes, slope, the distance from the water ducts, and soil type information layers. Later, to align the information layers with each other, the layers were standardized by using Fuzzy Logic Theory. To get the relative value of each layer in determining the geomorphological areas, the analytic hierarchy process (AHP) was used. The results obtained from the analytic hierarchy process indicates that in the studied region, the role of the geological structures in the geomorphological events is remarkable. After the relative evaluation of the information layers, the super-positioning of the layers was done by using Simple Additive Weighing (SAW). The findings reveal that the northeastern part of Maragheh has more possibility of hillslope process and flooding point of view than the other parts. In addition, in order to study the hazard extent in the

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developed parts in the recent decades, firstly, the extent of the physical development of the city during the years of 1984 and 2017was extracted through Landsat Satellite Pictures. Then, after matching with the land application maps, the process of the physical development of the city was studied in the above-mentioned period. The Crosstab Table Method was used for this purpose. The obtained results from the study of the process of the city development in the above-mentioned period showed that the most city development has been occurred in the areas that possess the higher geomorphological hazards and this needs better management of directing the physical development of Maragheh in the less hazardous areas.

Keywords: Maragheh city, geomorphological hazards, physical development.

Preparing a Map of Iran's Predictability of Avian Influenza Using Fuzzy Logic

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Abstract

AI (Avian Influenza) is one of the most important respiratory, and contagious pathogens in poultry that has fast release power. At present, around 33 pandemics of H5 and H7 over-the-counter influenza have emerged from the 1950s to 2017. The largest pandemic is H5N1 pandemic in 63 countries, and now it turnes to H5N8. Like the H5N8 pandemic in the year 2016, the Severe strain in Guandong, China, resulted in the extinction of about 250 million poultry or wild birds in 63 countries. Most countries, in this context, use deforestation policy in the poultry industry to achieve the eradication of the extra-influenza strains. However, countries also use the vaccination strategy to control the disease. The prevalence of Avian Influenza virus and its transmission to human have been one of the main concerns of researchers in recent years. Identifying the country's regions that are more vulnerable due to the prevalence of the virus will help control and prevent its prevalence at various stages. This study aimed to identify high-risk regions in Iran for the prevalence of N5H8 virus according to effective factors. This analytical study was conducted in 2016-2017 for IRAN. First, the affective factors were identified, using experts' opinions, they were weighted, and classified into four categories. Then, the data were analyzed using fuzzy logic. The fuzzy membership functions were defined for each category. Defining 36 various rules, all the existing states were evaluated applying Mamdani's method. According to the conducted studies, the main factors affecting the prevalence of the mentioned virus included: proximity to rivers, lakes, and marshes, population, poultry farms, villages, rainfall, temperature, and wind. Finally, Tehran, Alborz, Qom, Isfahan, Qazvin, Golestan, and Gilan provinces had the greatest high-risk. The obtained zoning map of hazard had a good corresponding with the samples of report on the Avian Influenza virus.

Keywords: Geographic Information System, influenza in birds, fuzzy logic, Epidemiology.

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