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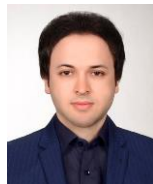
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Preface

Nowadays, access to the spatial data and deriving information from these data plays a crucial role in effective decision making in different fields of management. Accordingly, Geographical Information Systems (GIS) is considered as an important tool in crisis and disaster management; it guarantees the possibility of data extraction from various sources and helps us to discover and monitor the complex and hidden relationships between different phenomena. GIS is a collection of hardware, software, geographical, and human data that are stored in order to collect, monitor, update, and analyze various geographical bits of information on the web or on local area networks. Due to the capabilities of GIS in combining data and providing the tools needed in the complex analyses of spatial and non-spatial data, GIS is recognized as the best system in determining the regions which may be subject to natural disasters in the future. The application of GIS generally involves the storage and comprehensive analysis of information based on spatial data. Therefore, access to reliable and usable spatial information is the most important factor in the establishment and implementation of GIS system. Spatial data and GIS meet the needs of a wide range of users. These systems can be applied to Urban and Regional Planning Management, Crisis Management, Management of Natural Disasters, Sociology and Social Sciences, Archeology, Oceanography, Marine Sciences, Natural Resources and Environmental Management, and Climate Change Studies. Iran is one of the countries that are prone to various unexpected natural disasters such as earthquakes, floods, cyclones and thunderstorms, landslides, wildfires, and sea water fluctuations, and the economic and social impacts of such disasters are often devastating. Therefore, it is very important to monitor the hazards that threat this area and to identify the areas where natural disasters are most likely to occur. For instance, we can prepare people for natural disasters and dangers that can result in devastating damages and to recommend emergency response plans in advance. Experience has shown that preparation for disasters can significantly reduce death tolls and decrease predictable damages to properties, industries, and the environment. In this regard, information derived from spatial data, remote sensing technologies, and GIS can provide a suitable framework for preemptive planning, prevention, preparation, and proper and timely crisis management. Consequently, research on and the development of data processing algorithms, web-based databases, web-based GIS tools, hardware and software, and most importantly, instruction, culturalization, and provision of suitable organizational contexts and environments can prove very helpful in offering appropriate information services to a large variety of users. The International Station of Ecosystem Studies in Humid Regions (ISESHR) has been established at University of Guilan in collaboration with the Xinjiang Institute of Geography and Ecology of China and in recognition of the widespread use of data and spatial information. The information recorded in this station has massive contribution to the development of data processing algorithms and calibration of space observation in Guilan province. In the end, I hope that the publication of the latest scientific achievements in the technical quarterly journal of Mapping and Geospatial Information Journal of Guilan will be beneficial in the instruction and culturalization of the application of spatial data and geographical information all over the world.



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Geospatial hydraulic modeling and Non-Revenue Water (NRW)

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Abstract

Present research in order to reduce non-revenue water through cluster testing of meters was arranged in the Rasht city's water plant. In this study, rapid data intercommunication model based on Geography Information System GIS were considered in District Metering Area DMA. During the study, the consumption curve, Minimum Night Flow MNF and pressure distribution curves by water distribution network hydraulic model was investigated. The hydraulic model in compliance with GIS and WATERGEMS8.2 software in the form WATERGEMS8.2 was defined. The results of research ordered the change of 4058 meters with a negative measuring error.

Keywords: Non-Revenue water, Geographic Information System, Intelligent management of pressure, Calibration.

(Original language in Persian)

Using the best geostatistic methods to interpolate pressure isobaric

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Abstract

Using convenient interpolation method can result to generate more precise and more accurate maps. The aim of this study is to determine the most appropriate interpolation method from a variety of Kriging, invers distance weighting and variety of Co-Kriging to zoning and drawing hydro-statics curves of Razjerd complex. For this purpose, the pressure of 60 different points of Razjerd complex was examined. The performance of inverse distance weighting (IDW) in pressure zoning was weaker than the Kriging; and by increasing the power of reverse method, amount of R^2 was decreased and the amount of RMSE was increased. The gained maps of simple Kriging method had shown a perfect match with statistics obtained from installed logger barometers in complex. Generally, because of the grate accuracy, less computing and less requirement to data, the simple Kriging method recommended to zoning pressure.

Keywords: Simple kriging, Ordinary kriging, Cokiriging, IDW, GIS.

(Original language in Persian)

Study of non-isolated urban burned solids site improper local on water resources and contribution networks NRW amount (Case study: Rostamabad City, Guilan Province)

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Abstract

One of the the most important causes of Non-Revenue water is waste of water reduction. The factors, damaged consumers meters or lack of precision meters due to the presence of sediment resulting from chemical changes. Of the reasons for these changes can pointed to penetration the garbage leachate to water resources. Sediment or corrosive features water distribution network (the quality of the chemical) would be on the amount of waste-water supply network will be more effective. Rostam abad town landfill is in the Western town of drinking water sources and above of underground water resources. In this study, the process route of chemical quality parameters for Rostamabad in the past five years, was analyzed, the potential of corrosive and sediment of water according to the Langelier & Ryznar index was calculated. The changes of chemical parameters, respectively, of the total hardness and calcium, total Alkalinity, electrical conductivity, pH, sulfate and chloride origin years (1390-91) and the target years (1394-95) is compared. Due to the increase of qualitative parameters, in spite of that it seems that their impact is laid waste leachate, but still within the scope of the national standard and the WHO (World Health Organization). Study of corrosion and sedimentation of index values indicate that the water is a little balanced in terms of chemical quality and has low precipitation and weak. The impact of quality changes is increasing and must be taken seriously.

Keywords: Rostamabad, Garbage leachate, Chemical quality, Langelier & Ryznar index, Waste of water.

(Original language in Persian)

Denitrification optimization process by using absorption fosterage

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Abstract

Several types of bacteria exist on the organic materials in anaerobic conditions. During lack of oxygen for normal respiration, they use nitrate as final electron acceptor instead of oxygen. This work tried to do aerobic respiration phase in the aeration unit as long as hydraulic time to (MCRT) for 8 hours in the wastewater treatment of Bandar Anzali by using bacteria fosterage of denitrification index. These bacteria can be activated in rich environment of organic materials and without oxygen which are widely found in the domestic absorption wells. The results of this work showed that the advantages of this method demonstrate remove denitrification manufacturing facility and reduce moss and algae growth in the wastewater treatment process outdoor channels.

Keywords: Denitrification, Absorption well, Wastewater.

(Original language in Persian)

Fuzzy logic modeling & Geographic Information System

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Abstract

The fuzzy logic is a new technique which refers to professional knowledge instead of complex mathematical modelling for progressive systems. In this work the fuzzy logic performance investigated due to high speed data intercommunication for urban water distribution system. Therefore present work analytically concentrated on decreasing rate for Minimum Night Flow “MNF” of Rasht city water distribution network by evaluate of the two variances of water transmission system. These variances were analysed by the WATERGEMS8.2 software as a subprogram of ArcGIS9-ArcMap9.3. The results showed that the 200 (*lit / sec*) decreasing of Minimum Night Flow for variant of water transmission from 50000 (*m³*) Saravan water reservoir to 40000 (*m³*) water reservoirs at east and west side in Rasht City.

Keywords: Minimum Night Flow, Geographic Information System, Water distribution system, Water transmission, Fuzzy Logic.
(Original language in Persian)

Using Geospatial Information System and analytical hierarchy process in landslide hazard zonation

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Abstract

Identifying areas prone to landslides more than damage prevention can provide grounds for slope stabilization projects. Landslide hazard zonation is one of indirect and efficient methods in identifying these areas. Geospatial Information Systems (GIS) combined with Multi Criteria Decision Making (MCDM) methods can be used for this purpose. In this research an Analytical Hierarchy Process (AHP) combined with spatial analyst has been used for identifying landslide hazard zones of Alborz province. The zoning results has been categorized in four class including very high, high, medium risk and low risk, while high and very high risk zones has been considered as a whole. The results showed 81/70percent of landslides have occurred within the hazardous zone with 3724/37 kilometers area.

Keywords: Landslide, Geospatial Information Systems (GIS), Hazard Zoning, Analytic Hierarchy Process (AHP).
(Original language in Persian)

The formation geomorphologic factors of KARKAS Mountain by using GIS

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Abstract

KARKAS Mountain is the highest peak of the Kashan Natanz regains. On the one hand due to the diversity of geomorphologic. For Example: diversity of heights, tilt of foothills, valleys, types of faults, and time-rock units, types of units, glaciers, and sediment On the other hand, due to geomorphic processes such as tectonics, dry and hot to cold temperate climate, luxuriant vegetation and some areas without vegetation, landslides, rock debris It can be described as a place for research in the earth sciences .The paper studies of the geomorphology of KARKAS Mountain Try to interpret variety of forms and processes by using GIS... Due to the introduction of the gradient of the mountain, evidence of glaciers is currently slopes of the activity of the earth (the dynamics), we conclude that, especially on the northern slopes of the mountains above 1700 meters, is very sensitive to environmental changes morph tectonic exercise and it is happening very rapidly.

Keyword: KARKAS Mountain, Geography information system, Glaciers, Geomorphic.
(Original language in Persian)

Aquaporin technology (sea water desalinated)

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Abstract

A group of independent aquaporin proteins in eukaryotes regulate the water in the membrane. Two groups of aquaporin are: classic aquaporin that is very high water permeability and the other is aquaglyceroporin with ability of glycerol pass in addition to water. World population growth, climate change, high evaporation, sea level rise, due to the increasing demand of fresh water is limited. Hence the new technique can help us in achieving a stable and reliable supply of water with salt agent. The membranes of carbon nanotubes are one of these methods. One of these new methods, imitation synthetic living cell membranes (biomimetic) is aquaporin. More recently, research on this aquaporin membranes and their use for seawater desalination by some universities and scientific and research centers is considered. Due to the high efficiency of aquaporin technology, it is estimated that the cost of desalinating reduced to 70 to 80 percent compared with conventional methods and techniques such as reverse osmosis.

Keywords: Aquaporins, Desalinated water, Synthetic membrane, Biomimetic.
(Original language in Persian)

HVAC&R facilities control by Web-based GIS

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Abstract

Quick turn-based georeferenced information is a new technology that has a positive impact on the performance and efficiency of facility systems including Heating, Ventilating, Air-Conditioning & Refrigeration (HVAC&R's). The technology of signal detection through remote reading system, provide the management of facility HVAC&R through the geo-reference world area network (Web-based GIS) based on geographic information system (GIS). This method as a new concept in the control science and optimize energy consumption can be an effective factor in design, maintenance, energy consumption management, and commissioning of the facilities and building industry. Also, this method provides online control of energy consumption of the facilities and building industry. So in this work, the model of control of HVAC&R in the context with GIS and Web-based GIS were investigated. The empirical results besides the regression mathematical analysis show that this model is able to predict and evaluate energy consumption.

Keywords: Geographic Information System, World Area Network, HVAC&R Facilities.
(Original language in Persian)

Goharrod River flood risk mapping by using GIS within Rasht City

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Abstract

Drainage of surface runoff is one of the main problems in Rasht city. In this study, using HEC-GeoRas in GIS environment and maps of the river, geometry of Goharrod River bed and border is obtained. Then, by using this information in the hydraulic model of HEC-RAS, hydraulic behavior of the river is simulated and then after transferring again into the GIS, river flood area is drawn. According to the land-use map of the area, flood prone areas are categorized into three zones with low, medium and high risk and finally flood prone areas according to their land-use (residential, agricultural, industrial, etc.) are identified and presented. The area under this study is a 15 km portion of the Goharrod River inside the city of Rasht. The flood maps produced by the discharge with a return period of 50 years indicated that river flooding happens only in a 500 meters region, north of the city, called Siahestalkh.

Keywords: Flood area, Software HEC-GeoRas, Goharrod River.
(Original language in Persian)

Study of land use variation using remote sensing and GIS (Case study: Baba Vali Siahkal Basin)

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Abstract

In the present study, land use changes in Babavali Basin watershed have been evaluated over a 13-years period. For this research, 2000 Landsat 7 satellite ETM + images and Landsat 8 satellite imagery have been used. After performing the required actions in the preprocessing stage, the maximum probability of the images is classified. The land use map of the region was obtained in 2000 and 2013 the validation results with ground realities and field visits indicate the total accuracy is equal to 0.89 and 0.88. The Kappa coefficient is equal 0.88 and 0.88 in the ETM + images of 2000. Therefore the Landsat 8 of 2013 was acceptable.

Keywords: Land use, Identification of Changes, Maximum Likelihood Method, Skeleton Bastard.
(Original language in Persian)

The effect of physicochemical factors on the population of phytoplankton and the quality of surface water Shahr-e-Bijar by using GIS tools

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Abstract

Quality and quantity of phytoplankton depend on the load nutritious in part on water. Therefore, the use of phytoplankton in different ecosystems, water is used to measure quality or pollution of water. The Shahr-e-Bijar River is at Guilan Province as the main rivers in Iran. In addition, as the main source of drinking water The Shahr-e-Bijar River uses in agriculture and economy area. In this study, the impact physicochemical factors on the composition and frequency of phytoplankton in different seasons were analyzed. The results of the study of biological Shahr-e-Bijar River, indicates the presence of 5 branches and 57 Genus the region. The frequencies of Bascillariophyta branches on other branches were dominant in all seasons. Data collected for all the parameters are normally distributed and determined by using the Kolmogorov-Smirnov test. The correlation between phytoplankton and physicochemical parameters shows the number of phytoplankton significant correlation with the parameters of temperature and PH and nitrogen. In this work, it also uses GIS software and take advantage of various colors, color zoning qualitative phytoplankton were prepared.

Keywords: Geographic Information System, Phytoplankton, Ecosystem, Shahr-e-Bijar.
(Original language in Persian)

Geospatial modeling & water pressure wave

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Abstract

In this research, the relationship between spatial and non-spatial data is a tool for creating a spatially related relationship to data associated with water loss. Therefore, for the desired complication, the type of communication and its quantity are determined by a basic location-based hydraulic model and access to leakage points is provided. Comparison of the results of the computational model and pressurized fluid transfer and its location-based model made it possible to call these composite models in advanced software to determine the leakage position. Therefore, the hydraulic model is created in compliance with the Geospatial Information System (GIS) location-based system and in the HAMMER7 software under ArcGIS9-ArcMap9.3 software management and the result of the research analysed the water pressure wave and water loss.

Keywords: Water pressure wave, Waste loss, Geospatial Information System, Hydraulic model.
(Original language in Persian)

Investigating the flood effect on physical development in Rahimabad City using GIS

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Abstract

In this research, we tried to study the natural and geomorphological processes of the area Rahimabad City from Rudsar county, using the field study and survey of city and area maps using GIS, the effect of urban flood and geomorphologic constraints existing in different directions of Rahimabad development. The findings show that due to topographic conditions, proper slope and adequate coverage of scum and plowing in the city, The possibility of flood and waterlogging passages is very low, and in some parts of the northern part of the city, due to slopes, there is a possibility of watering. The city of Rahimabad is limited to the highlands from the south, and the topographical factor in these directions as a natural phenomenon is considered as a factor in the lack of development of the city. On the other hand, from the west and northwest, there is a developmental restriction due to the Polrood River, on the northern side, when the altitude is minimized, the agricultural lands operating are limiting the city's development. Therefore, only the physical development path of the city is in the east and northeast direction near the Rahimabad road to Kalachai.

Keywords: Rahimabad City, Polrood river, Urban flood, GIS.
(Original language in Persian)

Application of GIS techniques in disaster relief after earthquakes in urban areas and provide an appropriate model for the organization (The region: district 3 of Tehran)

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Abstract

In this research, the application of GIS techniques to post-earthquake relief in Tehran's municipality 3 and the provision of a suitable model to relief agencies were discussed. To conduct research, 10 effective measures were selected based on library studies and experts' opinions. The criteria were entered into the GIS software as a digital layer. The Euclidean distance maps were prepared and the layers are matched with fuzzy membership functions. Then weighted in Expert Choice software and according to the weights obtained were combined. The weight of the criteria included: treatment centers, population density, green spaces, building floors, type of materials, land use, building area, distance from faults, aqueducts and street widths after comparison, the couples obtained 0.081, 0.047, 0.206, 0.036, 0.051, 0.103, 0.074, 0.021, 0.049, and 0.022 respectively, respectively. The final map of the vulnerability showed that the total study area was 360.0082, 706.4217, 555.3693, 238.6628 and 102.2051 hectare, respectively, at high, low, moderate, high and very high levels respectively.

Keywords: Earthquake Crisis, Rescue, GIS, District 3 of Tehran.
(Original language in Persian)

Geospatial modeling & reclamation of water distribution network for Langarud City

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Abstract

The present work analysed the model of real condition for water distribution network of Langarud City by Geospatial modeling. Hydraulic calculations and comparison of water supply model of Langarud city in two existing variants and proposed model emphasized the modification of existing water distribution model while implementing two cases of GAP1 and GAP2 rings around the city. Along with this operation in 5 stages, creation of independent pressure zone and isolated consumption areas in the network besides the intelligent pressure management through the system of remote reading and implementation of demand management in the form of water split reform were also considered.

Keywords: Geographic Information System, Rapid data intercommunication, Non-Revenue Water, Water distribution model.
(Original language in Persian)

Spatial analysis relief and rescue bases in Yazd Model in order to achieve maximum efficiency with crisis management approach

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Abstract

In order to conduct this research, spatial and spatial proportionality of emergency rescue and rescue centers of Yazd City was carried out in 12 indicators. The indexes of the five-point Likert spectrum were performed. The relative weight of the indices was obtained from the AHP technique. Then, the layer and composite index were calculated using the Weighted Overlay model. The results of the research showed that none of the rescue and rescue centers of Yazd are in a fully compatible position, and many of the centers are in an indifferent and relatively incompatible position. Medical and educational centers are also suitable places for creating crisis management bases in Yazd and the largest area of the historical area is in the middle position and the smallest area is suitable for the situation. On the other hand, a significant part of the historical fabric of Yazd is destroyed. Accordingly, it can be said that the historical context of Yazd City in the event of an accident does not have the ability to manage the crisis appropriately.

Keywords: Spatial analysis, Rescue and relief base, Crisis management, Yazd City.
(Original language in Persian)

Determination of dynamic and periodic orbits in limited three body problem

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Abstract

In this research dynamic orbits of limited circular and elliptical three body problem in planar and three dimensional cases and also periodic orbits in planar case are calculated. For this purpose, equations of motion in limited three body problem with use of proper numerical integration method and specific primary conditions are calculated and the results are drawn into various orbits. The way of achieving to zero velocity surfaces which are determinant of allowed regions of motion, are another cases that are studied in this research.

Keywords: Limited three body problem, Lagrangian points, Hill's problem, Periodic orbits.
(Original language in Persian)

Comparison of three classification methods in vegetation mapping using remote sensing (Case study: Shalmanrud Basin)

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Abstract

Map information in research and studies is of great importance. The satellites are very suitable for the assessment of natural disasters because they have an extensive and integrated view, with a large part of the electromagnetic spectrum and up-to-date. The present study evaluates three classification (unsupervised, supervised and hybrid) methods for mapping vegetation in the Shalmanrud region. Using the ETM2002 satellite imagery, the 166-channel Land-Sat Satellite 34 in the ILWIS software version 3.1 was compiled. After performing the necessary corrections and initial processing, data classification was performed. Finally, the efficiency of classification methods using index User accuracy, overall accuracy and kappa coefficient was evaluated. After checking the numbers obtained, the index Comparison of three classification methods with the ground truth map showed that the supervised classification method using the Maximum likelihood method with a total accuracy of 67.84% and kappa coefficient of 0.6752 had better results than the other two methods. Also, analysis of the accuracy of each classification and comparison with ground truth map showed that the supervised classification method with a precision of 75.14% has the best result compared to the other two methods for the studied area.

Keywords: Vegetation cover, Remote sensing, Classification, Shalmanrud.

(Original language in Persian)

Identification of promising mineralized areas in the Anzali Geological Map Sheet (Scale 1:100,000), using the Index Overlay Method in the GIS data processing

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Abstract

The Geology sheet of Bandar Anzali on the southwest of Caspian contains parts of the Alborz and Kopet Dagh and Caspian. Plane which has possible of following one types of epithermal gold (presence of granite intrusive bodies, siliceous and argillitic alloys) As it is important to identify the effective factors in the formation of a deposit in obtaining promising areas, the way to integrate the information layers and how to weigh them into these parameters is also has particular importance. For this purpose, exploratory studies to track the mineral prospecting areas were done on 1:100,000 sheet of Bandar- Anzali using a combination of exploratory data including Geological, Geo-chemical, Geo-physical and satellite data in the GIS environment. Therefore, after extensive research, the Index Overlay modeling method, a simple method, is selected and used in the integration of information. The result of these studies was the preparation of a map of promising mineral areas of epithelial gold. Using the final map derived from the combination of different heuristic data, the three regions as the promising areas of the region, respectively, are the priority of the region, the Gasht, Siahmezgi and Masouleh Khani area The Bandar Anzali sheet was introduced which should be visited and sampled in order to control the promising areas.

Keywords: Mineralized Areas, Geological Map, Index Overlay method, Bandar Anzali City.

(Original language in Persian)

Pressure zone based on GIS

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Abstract

In this paper, by using the information items provided by the location and specifications of the selected dams and structures in Iran and in the world, in terms of distance from the targets used in the downstream and, if necessary, the related positions in the upper hand, as well The view of the altitude of the sea relative to the sea level and its complications will be pursued through written sources (books, sites, articles, etc.) and visual resources (maps and satellite imagery) and its application on the selected map of the unit. This information is connected to the location of the dams with the location of the software, and according to the intended purposes in the results, the program is defined and Reviews and comparisons. The results of the research showed that by choosing a dam site at very high elevations (for example, more than 1500 meters), the catchment areas are more limited and due to the high slopes around the reservoir and the decrease of the lake's surface, It will extremely decreases the dam volume. Therefore, this option is economically optimal in the absence of water-rich rivers or low rainfall.

Keywords: Geographic Information System, Geospatial, Location details, Construction of dams and hydraulic structures.
(Original language in Persian)

Remote sensing techniques for producing land use maps

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Abstract

Monitoring of land use changes in Lahijan County is the purpose of this study. In this study, land use maps produced by +ETM and OLI Landsat sensor images by Maximum Likelihood method in 2002 and 2015, has been classified in four classes: water, forest, agriculture and human made, with a kappa coefficient of 0.87 and 0.92 percent, as well as a total accuracy of 89.73 in 2002 and 93.68 in 2015. Then, the changes of land use maps were monitored using Change detection method. The results of this monitoring showed the urban use class had the highest increase with 4437.16 hectares, and in contrast, the forest class had decreased by 3347.48 hectares which is largely due to the construction of tourism in the second homes and catering centers in the city of Lahijan.

Keywords: Change detection, Land use, Maximum Likelihood, Remote sensing, Lahijan County.
(Original language in Persian)

The zoning of gully erosion in the southern regions of Guilan; the overlap index, fuzzy summation and multiplication in the GIS environment

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Abstract

In this research, the zoning of gully erosion in semi-arid regions of Guilan province was investigated. Initially, different land use maps, land units, lithology and slope, extraction plan and work units were selected. In the work units, a control area and three dams were identified. In each unit, profiling and soil sampling and its soil characteristics were evaluated for each unit. Using gully mapping, morphometric and morphometric properties of gully were extracted. In each case, the permeability and the percentage of protection on the soil were studied. After determining the data on the factors affecting erosion (lithology, landslide percentage, soil type, average annual rainfall, type of land use and the percentage of soil protection), we determined the value of each of the mentioned factors and based on this, the gully erosion zonation map was used using the GIS model or overlapping index model and fuzzy algebraic summation operators and fuzzy algebraic multiplication.

Keywords: Gully erosion, Zoning, Overlap index, Fuzzy summation and multiplication, GIS.
(Original language in Persian)

GIS applications for construction of dams and hydraulic structures; geospatial view

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Abstract

In this paper, by using the information items provided by the location and specifications of the selected dams and structures in Iran and in the world, in terms of distance from the targets used in the downstream and, if necessary, the related positions in the upper hand, as well as the view of the altitude of the sea relative to the sea level and its complications will be pursued through written sources (books, sites, articles, etc.) and visual resources (maps and satellite imagery) and its application on the selected map of the unit. This information is connected to the location of the dams with the location of the software, and according to the intended purposes in the results, the program is defined and reviewed and compared. The results of the research showed that by choosing a dam site at very high elevations (for example, more than 1500 meters), the catchment areas are more limited and due to the high slopes around the reservoir and the decrease of the lake's surface, it will extremely decrease the dam volume. Therefore, this option is economically optimal in the absence of water-rich rivers or low rainfall.

Keywords: Geographic Information System, Geospatial, Location details, Construction of dams and hydraulic structures.
(Original language in Persian)

Reclamation & development for smart & georeferenced water system

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Abstract

In the distribution network analysis, a step-by-step algorithm based on flow and pressure equations is used. In this method, solving energy and continuity equations in each repetition is used to analyze the branch and loop networks in separate network segments. In this way, numerically, the network was maintained by one-way pressure regulating valves with an independent function. The present work examines the baseline reclamation and development model in the District Metering Area's "DMA" and in Independent Districts and the separate sections of the network that are separated from the permanent boundaries of the network while analyzing the flow and pressure parameters. The results of this work show that the intelligence of the facility will ensure the realization of the objectives of the model of reclamation and development.

Keywords: Smart facilities, District Metering Area, Step-by-step algorithm, Reclamation and development model.

(Original language in Persian)

Extraction of coastal changes in Bushehr Province using supervised classification and landsat satellite imagery

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Abstract

The purpose of this research is to extract changes of shore line in Bushehr Province using satellite imagery processing. In this study, land use maps produced by +ETM and OLI Landsat sensor images by Maximum Likelihood method in 2006 and 2016, has been classified in 5 classes: Vegetation, water, man-made, pastureland and bay. According to given Kappa coefficient and overall accuracy, the results of this monitoring showed process of coastal changes during the 10-year period has been most affected by the construction of offshore structures and the largest amount of coastal morphology has been the forefront of this complication at the edges of the breakwaters to the sea.

Keywords: Shoreline, Land use, Maximum Likelihood, Remote sensing, Bushehr Province.

(Original language in Persian)

Landslide hazard zoning in Lahijan County using entropy and multi decision making promethee methods

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Abstract

Landslides are one of the geomorphological hazards responsible for considerable damages as direct and indirect expenses in different regions every year. They play a major role in the destruction of human installations, human casualties, destruction of pastures and forests, and sedimentation in watersheds. This study aims at evaluating a Promethean model and entropy in landslide zonation of Lahijan city and identifying the impact of all the six factors in landslide and landslide hazard map using the Promethean model and entropy. It then provides scientific solutions for better management of the region against landslide hazard. The region landslides were initially identified using the visual interpretation of different maps and data. Through examining the landslides in the region, the six-factors of lithology, distance to fault (DFT), topography, slope, slope direction, and land use were identified as the effective factors in a landslide occurrence. With respect to the characteristics obtained from the landslides in the region, the layers were weighted and classified based on experts opinions and the Promethean matrix and entropy weight were formed for them.

Keywords: Landslide, Management, Zoning, Entropy model, Prometheus, Lahijan.
(Original language in Persian)

Georeferenced pressure zone covered by District Metering Area (DMA) for Amlash City

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Abstract

The present work investigated the modification and optimization project for the water transmission and distribution system, based on the Georeferenced and smart management of pressure zones in Amlash City. In order to calibrate the distribution network, data was obtained by remote sensing and data logger of ultrasonic flowmeters and pressure gauge. Therefore, the results of the research emphasize the separation of the distribution network in the area of independent measurement based on Geospatial Information System (GIS) for the improvement of the facility. The results of the executive activities affected by the current research in 1397 resulted in a decrease of production and increase of the city's water income.

Keywords: Smart urban, Independent measuring zones, Pressure zone, Calibration.
(Original language in Persian)

Visibility hydrothermal alteration holes Babavali (Guilan) by applying logical operators of Aster's images

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Abstract

The study area is part of the Alborz Mountains and the western part of the Central Alborz Zone Aster image processing have been used for mapping hydrothermal alteration zones in studied area. We have combined hybrid algorithm of banding and false color with logical operators and threshold setting that have been based on field, Laboratory and experimental studies. In this paper we present algorithm of logical operators mapping that was distinguished by propylation alteration of Calcite and Epidote–Chlorite minerals which was confirmed by the results of alterations. Separate altered zones by using the banding ratio method. Detect hydrothermal alteration (Argilic and Flick) according to the sampling and field observations results.

Keywords: Alteration, Logical Operator, Limit, Remote Sensing, Babavali.
(Original language in Persian)

The application of aerospace remote sensing data and image in detecting and monitoring oil spill

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Abstract

Aquatic and marine environments are one of the most important and, at the same time, the most sensitive habitats for the living organism on Earth. The spread of oil spills resulting from human activities in marine environments, causing serious and irreparable damage to aquatic organisms and ultimately significant environmental and socio-economic impacts to human societies. Various studies have shown that quick and accurate identification of oil spills in large marine areas is possible by aerial and spatial remote sensing data. In this research, the ability of different types of data and remote sensing sensors such as visible, near and far infrared, and microwave in monitoring and identifying oil spots was investigated. In addition, by analyzing the appropriate features extracted from the data presented in the previous research, finally, suitable and comprehensive conceptual models for observing oil spots from optical and radar images are presented.

Keywords: Remote sensing, Oil spills, Optic images, Radar images, Conceptual Framework, Aerospace data.
(Original language in Persian)

Geospatial modeling for landslide at western of Guilan

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Abstract

Masal district, like other parts of western of Guilan, is exposed to a number of natural hazards, including landslides due to its special conditions. In this study 91 identified landslides indicate the high importance of this phenomenon and its associated risks to the Masal. Therefore, the present study was based on a descriptive and analytical method, based on library studies and the use of existing documents and articles and researches previously done. Topographic maps with scale of 1:25000 and 1:50000 and maps Geology was used on a scale of 1:1000000. The GPS was used as research tool and Analytical Hierarchy Process (AHP) as algorithm. Data were analyzed in AutoCAD environment using ArcGIS software. In AHP method dual comparison of factors and components as the best zoning method was selected. Data were combined by using ArcGIS software and extraction of restriction and vector models and three-dimensional models such as DAM and TIN models. As a result of the work, not only in the hierarchical analysis method but also in the frequency of each of the factors, slopes of 10 to 30 degrees had the highest percentage of landslide.

Keywords: Landslide, Analytical Hierarchy Process, Restriction Model, Vector Model, Fault.
(Original language in Persian)

Application of TCI and GIS index in zoning of ecotourism development in Guilan Province

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Abstract

The Impact of Climate Factors on Tourism Planning The importance of ICI is of great importance. In this project, the data of 10 stations of Meteorological and Sinopetic Province of Golestan in a 10-year statistical period (2003-2012) were collected by using the Tourism climate index for assessing climate conditions. Data The defect was reconstructed through linear regression. In this system model, seven parameters, average monthly rainfall, mean temperature, mean relative humidity, maximum mean, relative humidity, daily average of sunshine hours and wind speed were evaluated. The purpose of this study was to study the climate conditions of the province of Guilan based on the TCI model and using the Geographic Information System (GIS) technique, a TCI map was prepared for all months of the year. Is. The results of this study showed that favorable conditions in this province are in terms of climate in May and is the most unfavorable month in terms of the tourism climate of the month of November, which has the lowest TCI. Geographically, the climate is ideal in the northern part of the province (including Talesh, Astara, Anzali, Kyashahr, Lahijan and Rudsar).

Keywords: Climate Change, TCI Index, Geographic Information System (GIS), Guilan Province.
(Original language in Persian)

Investigation of spatial and temporal changes in groundwater level of Khorramabad plain using geostatistical method (During a 10-Year, Statistical period: 2004 to 2014)

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Abstract

Much of Iran is dry and poor water, and the water required by villages, industries and cities is used by groundwater sources. Excessive groundwater harvesting in many parts of the world has caused a severe drop in groundwater levels. Therefore, this study was conducted to investigate the spatial and temporal variations of groundwater level in Khorramabad plain over a ten year statistical period (2004-2014) using the best method, geostatistical estimator. In this regard, firstly, the available groundwater statistical data were collected and various conventional and simple kriging and IDW (RBF) methods with Gaussian, exponential and circular models were used. The mediation method was performed using two criteria (ME, RMSE). Then their location maps were plotted in Arcmap 10.3. The results showed that the multi-quadratic photo-distance method (RBF) is the best groundwater interpolation method in 2004 and 2014.

Keywords: Groundwater, Geostatistics, Variogram.
(Original language in Persian)

Electric power exchange in V2G network by exploiting AVL technology and using Spatial Data Infrastructure (SDI)

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Abstract

Optimizing the use of spatial data for macro planning, making the right decisions, better identifying patterns, and managing data are essential to helping communities excel. Spatial Data Infrastructure (SDI) is a cohesive infrastructure that facilitates the optimal use of spatial data. This infrastructure offers new ways to optimize data management by providing the conditions for data sharing. The use of electric cars due to their high efficiency, low power consumption and low emissions as a development criterion in societies is expanding. SDI exchanges location data with AVL technology by providing convenient data sharing and data sharing. Moving Detection and Navigation System (AVL) is a combination of hardware and software that utilizes satellite technology and GIS-based technology to enable tracking of motions with the aim of knowing whereabouts and optimal management capabilities. The charging process is connected to the grid and charges the battery to the nearest charging station.

Keywords: SDI Spatial Data Infrastructure, GIS System, AVL System, Electric Machines, Charge Discharge Management, Voltage Profile, DSO (Distribution System Operator).
(Original language in Persian)

Risk assessment of 20 kV lines using parameters Meteorology in the context of the Geospatial Information System (GIS) (Case study of Gonbad Kavous electricity distribution management)

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Abstract

There is no risk to the avoidance system, but identifying and evaluating the risk is essential to reducing or counteracting it. In this article, using GIS data of Golestan Electricity Distribution Company, spatial and descriptive information of insulators including insulator life, shape, structure and arrangement of insulators of 20 kV lines are distributed, extracted and based on statistical and experimental information. Insulators and some meteorological parameters, using the model of the backup vector machine, the parameters of which are optimized by the particle density method, the estimated surface electrical failure rate and the risk risk associated with the relevant feeder are specified. Finally, by calculating the model error and comparing it with the actual values, the correctness of the model is discussed and based on the proposed model, the status of the system and high-risk lines are determined and measures are taken to prevent certainty and damage in the system.

Keywords: Risk, Electrical failure rate, Insulator, GIS, Backup vector machine.
(Original language in Persian)

Assessment of urban geometry's effects on nocturnal urban heat islands using GIS (Case study: district of Golsar in Rasht)

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Abstract

Urban heat islands (UHI) is one of the most substantial phenomena related to urbanization defined by the air temperature increase of cities compared to their rural surroundings. Due to the effects of urban geometry on changing energy balance, it is considered to be one of the most important factors in the formation of UHI. One of the most important indexes of defining urban geometry is the aspect ratio parameter, which is defined by the ratio of building height to street width in urban canyons. So far, various models have been developed to simulate the intensity of UHI, and Oke's model is one of the most successful models. This model uses the aspect ratio index. Since Oke's model require descriptive and spatial analysis (especially topological analysis), the use of Geospatial Information Systems (GIS) is inevitable. This study examines the effects of urban geometry on nocturnal UHI intensity of 10 urban canyons in Golsar District of Rasht, by Oke's model and using GIS tools. The results show the canyons with higher aspect ratios intensify the nocturnal UHI, while the canyons with lower aspect ratio leads to lower UHI intensity.

Keywords: Nocturnal Urban Heat Islands, Canyon, Oke's model, Aspect Ratio, GIS.
(Original language in Persian)

Survey of land surface temperature changes and evapotranspiration in relation to the standardized vegetation index using GIS (Case study: Minoodasht City)

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Abstract

The purpose of this study is to investigate the changes in land surface temperature and evapotranspiration in relation to the standard vegetation cover index using GIS in Minoodasht City. In this study, we used satellite images of the Terra Modis satellite for the years 2001–2016. The satellite image is from January 1, 2005 to January 31, 2016. To evaluate the Seabull model, evapotranspiration was calculated using Penman Monteith and Hargreaves Samani methods and calculated using vegetation growth coefficient and compared with the evapotranspiration obtained from the Seabull algorithm and also to estimate the ground surface temperature of the images. Landsat 5 band 6 satellite which is thermal or thermal band was used. The results showed that the parameter of the coherent vegetation and the surface temperature of the earth changes in the opposite direction to evapotranspiration. So that in areas with good and dense vegetation and low ground temperature, evapotranspiration is more than other areas.

Keywords: Evapotranspiration, Vegetation Index (NDVI), Geographic Information System (GIS), Minoodasht County.

(Original language in Persian)

Nonlinear dynamics modeling by Geospatial Information System (GIS)

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Abstract

A particular challenge in terms of calculations is a hydraulic shock, accompanied by discontinuities of the flow. This phenomenon has not been fully studied, so the works of many scientists are devoted to experimental and theoretical studies of non-stationary processes with column separation of liquid. In this work it was defined the nonlinear heterogeneous model based on Geospatial Information System (GIS). By the way the process of modeling for unsteady fluid flow at drinking water transmission pipeline was presented.

Keywords: Unsteady Fluid Flow, Nonlinear Heterogeneous Model, Geospatial Information System.

I. INTRODUCTION

N.E. Zhukovsky introduced the concept of the effective sound speed. He mentioned to reducing the motion of a compressible fluid in an elastic cylindrical pipe to the motion of a compressible fluid in a rigid pipe, but with a lower modulus of elasticity of the liquid. Calculations of hydraulic shock in multiphase systems, including a computer, are devoted to the work of V.M. Alysheva. In that work, integration of differential equations of unsteady pressure flow is also performed by the "method of characteristics". The works of Streeter, K.P. Vishnevsky, B.F. Lyamaeva, V.M. Alyshev use the method of calculation of water hammer. They are based on replacing the distributed along the length of the flow of gas parameters concentrated in the fictitious air-hydraulic caps installed on the boundaries of the pipeline. A fictitious elastic element is replaced by elastic deformation of the pipe walls, and the elastic deformation of the solid suspension is modeled by fictitious elastic elements of the solid suspension. However, detailed experimental studies are based on the solid component. First detailed study and writing the first design formula, for such cases of hydraulic shocks with discontinuities of continuous flow, was the work of A.F. Mastay.

Subsequently, the development of this issue was paid more attention by A. Surin, L. Bergeron, L.F. Moshnin, N.A. Kartvelishvili, M. Andriashvili, V.S.

Dikarevsky, K.P. Wisniewski, B.F. Laman, V.I. Blokhin, L.S. Gerashchenko, V.N. Kovalenko, and others. The most detailed experimental and theoretical study of water

hammer with a discontinuity in the flow conduits performed by D.N. Smirnov and L.B. Zubov. As a result of the research, they describe the basic laws of gap columns, fluid and obtained relatively simple calculation dependences. In the above works, there are methods of determining maximal pressures after the discontinuities of the flow. However, the results of calculations by these methods are often contradictory. In addition, not clarified the conditions under which the maximum pressure generated. There is little influence of loss of pressure, vacuum, nature and duration of flow control and other factors on the value of maximum pressure. The study of V.S. Dikarevsky for water hammer was included to break the continuity of flow. His work dealt with in detail, the impact magnitude of the vacuum on the course of the entire process of water hammer. Analytically and based on experimental data, scholars have argued that in a horizontal pipe rupture. The continuity of the flow occurs mainly in the regulatory body, and cavitation phenomena on the length of the pipeline are manifested. It investigates only in the form of small bubbles, whose influence on the process of hydraulic impact is negligible. As a result, research scientists have obtained analytic expressions for the hydraulic shock. They mention a gap of continuous flow, taking into account the energy loss, while controlling the flow and the wave nature. However, studies of V.S. Dikarevskogo were conducted mainly for the horizontal pressure pipelines and pumping units with a low inertia of moving masses. Researches of N.I. Kolotilo and others devoted to the study of water hammer to break the continuity of flow in the intermediate point. N.I.

Kolotilo analytically derived the condition for the gap of continuous flow at a turning point of the pipeline when the pressure is reduced at this point (below atmospheric pressure). Studies have shown that the location of the discontinuity of continuous flow at a turning point depends, first of all, the profile of the pipeline. Protection of hydraulic systems against water hammer by releasing part of the transported fluid is the most widespread method of artificial reduction of the hydraulic shock. Devices that perform this function can be divided into valve, bursting disc and the overflow of the column. Development of algorithms for software simulation of transients by K.P. Vishnevsky was made for the complex pressure systems. It included the possible formation of discontinuities flows, hydraulic resistance, structural features of the pumping of water systems (pumps, piping, valves, etc). However, a calculation of water hammer is adapted to high-pressure water systems for household and drinking purposes. K.P. Vishnevsky used "characteristics method" for the calculation of water hammer on a computer dedicated to the work of B.F. Lyamaeva was illustrated by Hariri Asli et al., 2009, [1].

II. MATERIALS & METHODS

The Laboratory has been a leader in the development of sophisticated numerical techniques for analysis of multiphase flows and in the construction of computer codes based on the Geography Information System "GIS" techniques. A model for liquid- vapor flows illustrates the numerical techniques for solving the resulting equations. Hence field test model was chosen for experimental presentation of water hammer phenomenon at the water pipeline. Measuring output for field tests and laboratory experiments were performed at 0:00 hours on 02/10/2007- 02/05/2009. This work although includes the description of air entrance phenomenon at the flow discontinuities and changes for gas content. The wave speed distribution along with a pipeline (with node points $i = 0, 1, \dots, N$) was given by Lee and Pejovic, 1991, [2]. In this work, at first it was simulated the transient pressure generation in the system due to an emergency power failure without any protective equipment in service. It was shown that at point P24:J28 of the water pipeline, air was interred to the system. *Max.*

Vol. of penetrated air was equal to $198.483 \left(m^3 \right)$ and current flow was equal to $2.666 \left(m^3 / s \right)$.

Treated or modeled air entrainment problems in real prototype systems and results (were shown in Table 1. and Table 2). Consistency for the observed values of maximal pressure (in the first amplitude), the corresponding values were calculated according to Joukowski's formula. Based on validity of results, it was selected protective equipment and the system was simulated. Again by investigation of modeling results, the effectiveness of the devices which selected for controlling the transient pressures was rechecked. At present, work analysis and comparison were included in nonlinear heterogeneous model results by Hariri Asli et al., 2009, Hariri Asli et al., 2010, [3, 4].

A. Formulation of the Problem

Water hammer is the result of sharp changes of fluid pressure by the instantaneous changes in the rate of flow in the pipeline. This phenomena occurs during water hammer are explained on the basis of compressibility of liquid. After closing the valves on the horizontal pipe of constant diameter, which the liquid moves with an average speed V_0 , a liquid layer, located directly at the gate valve, immediately stops. Far the away from the gate, there are successively movement of the liquid layers (turbulence, counter flows). As a result by increasing pressure the pipe will be expanded. By the way the tube includes an additional volume of liquid. Since the fluid is compressible, its mass does not immediately be stopped.

B. The Problem Solution Methods And Approbation

It moves from the gate valve along the pipeline with velocity C , called the speed of propagation of the pressure wave which was mentioned by Leon, 2007, [5]. Two cases were considered for modeling Using (1, 2) by Wylie and Streeter, 1982, [6]:

1-The inlet pressure of the pipe along it's length is equal to P_0 . The slugging pressure has a sharp increasing: $\Delta p_{y\lambda}$. $p = p_0 + \Delta p_{y\lambda}$. The Zhukovsky formula is as flowing:

$$\Delta p_{yx} = \left(C \cdot \Delta V / g \right), \quad (1)$$

Where g - acceleration of free fall. The speed of the shock wave is calculated by the formula:

$$C = \sqrt{\frac{\frac{g \cdot E_{\kappa}}{\rho}}{1 + \frac{d}{\delta} \cdot \frac{E_{\kappa}}{E}}}, \quad (2)$$

Where E_{κ} - modulus of elasticity of the liquid (water) $E_{\kappa} = 2 \cdot 10^9 (Pa)$, $\left(\frac{kg}{m^2} \right)$,
 E - modulus of elasticity for pipeline material Steel $E = 10^{11} (Pa)$, $\left(\frac{kg}{m^2} \right)$, d - outer diameter of the pipe (mm), ρ - density $\left(\frac{kg}{m^3} \right)$,
 δ - wall thickness (mm)

Stopping of a second layer of liquid exerts pressure on the following layers gradually caused high pressure. It acts directly at the valve

extends to the rest of the pipeline against fluid flow speed C .

2-The method of characteristics MOC is defined based on a finite difference technique where pressures are computed along the pipe for each time step Using (3, 4),

$$H_P = 1/2 \left(\frac{C/g (V_{Le} - V_{ri}) + (H_{Le} + H_{ri}) -}{C/g (f \Delta t / 2D) (V_{Le} |V_{Le}| - V_{ri} |V_{ri}|)} \right), \quad (3)$$

$$V_P = 1/2 \left(\frac{(V_{Le} + V_{ri}) + (g/c)(H_{Le} - H_{ri}) -}{(f \Delta t / 2D) (V_{Le} |V_{Le}| + V_{ri} |V_{ri}|)} \right), \quad (4)$$

III. RESULTS AND DISCUSSION

Significant influence of the discharge rate into the pipeline decreases of duration of the water hammer phenomenon. The duration time decreased with the increase of the air penetration. This was the strong reason for the high decreasing in duration time for water pipeline. In this work the column separations due to the turned off pump for the water pipeline were illustrated in Figures (1) and (2).

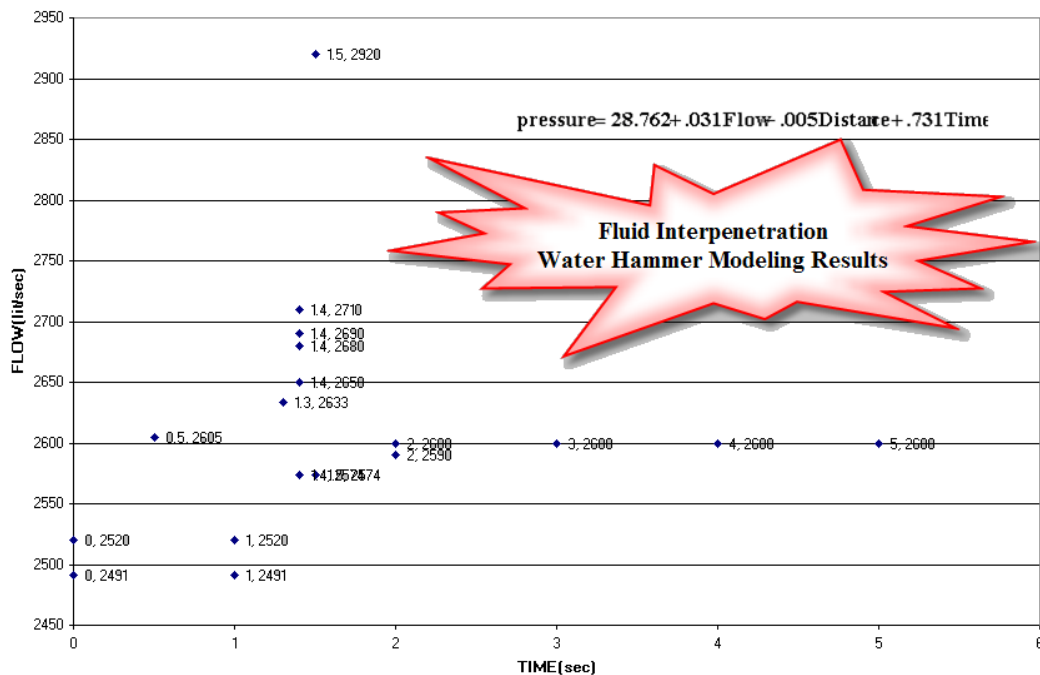


Fig. 1. Nonlinear heterogeneous model; water column Separation and entered air simulation.

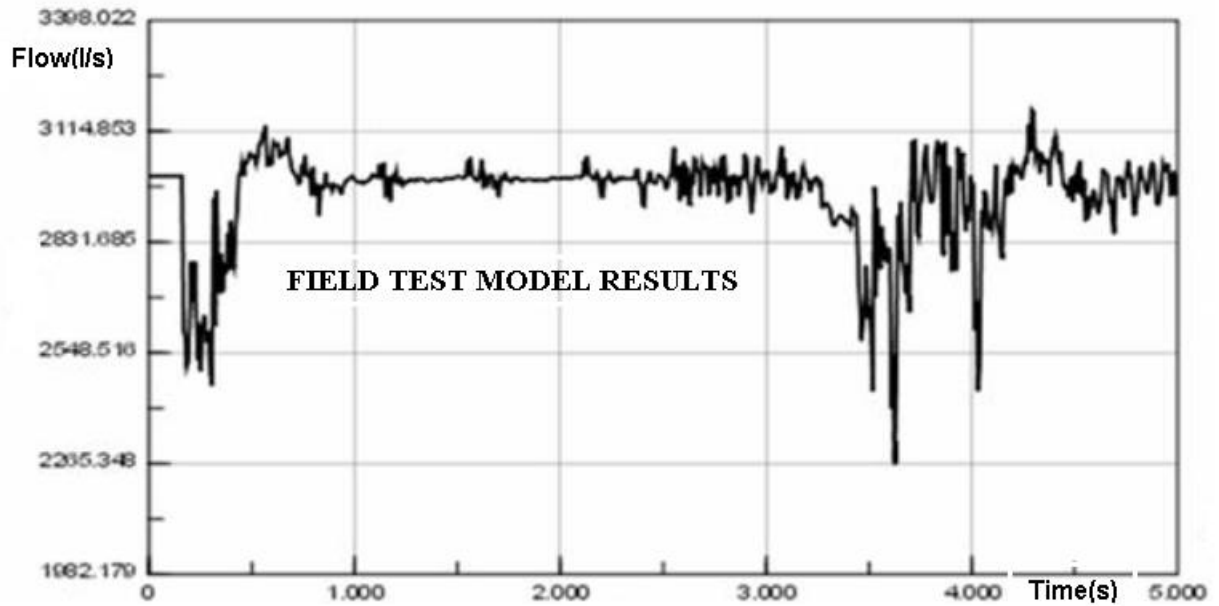


Fig. 2. Laboratory experiments and field test results

A. Air Entrance Approaches. Analysis of the nonlinear heterogeneous model showed that at point P24: J28, air penetrated into water pipeline. The maximum amount of infiltrated air was illustrated in Figure (3-5) was equal to

$$198,483 \left(m^3 \right), \text{ and the flux was equal to } 2,666 \left(m^3 / s \right).$$

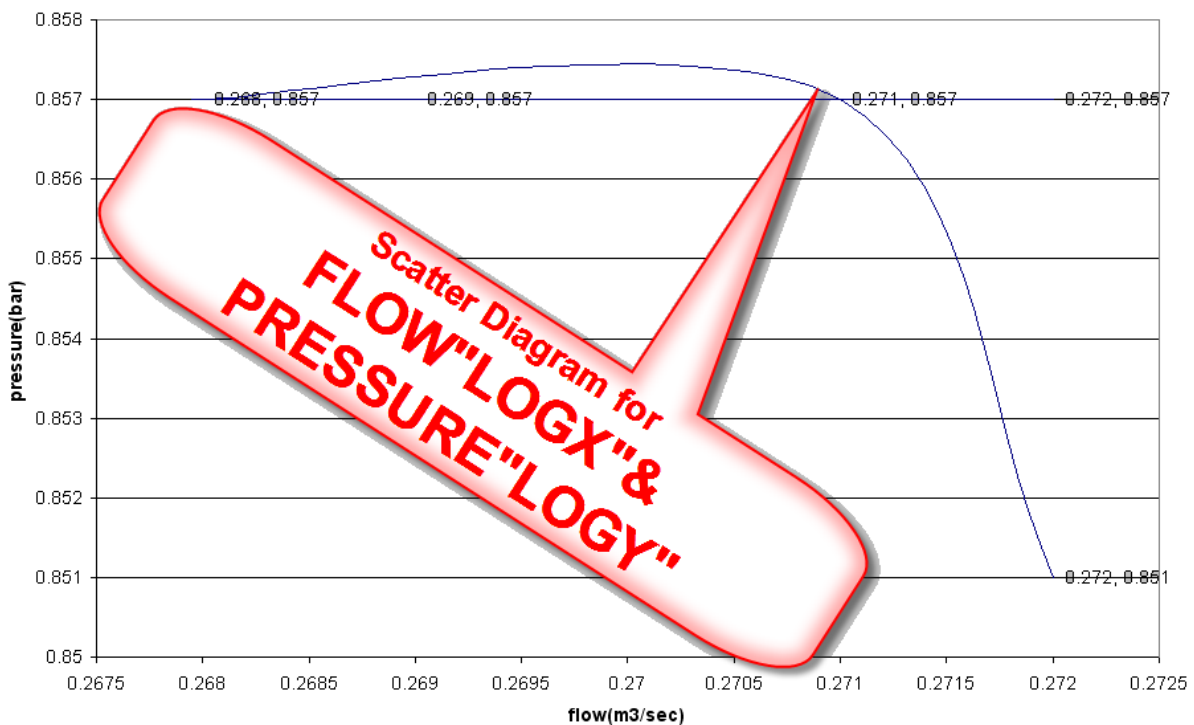


Fig. 3. Laboratory experiments

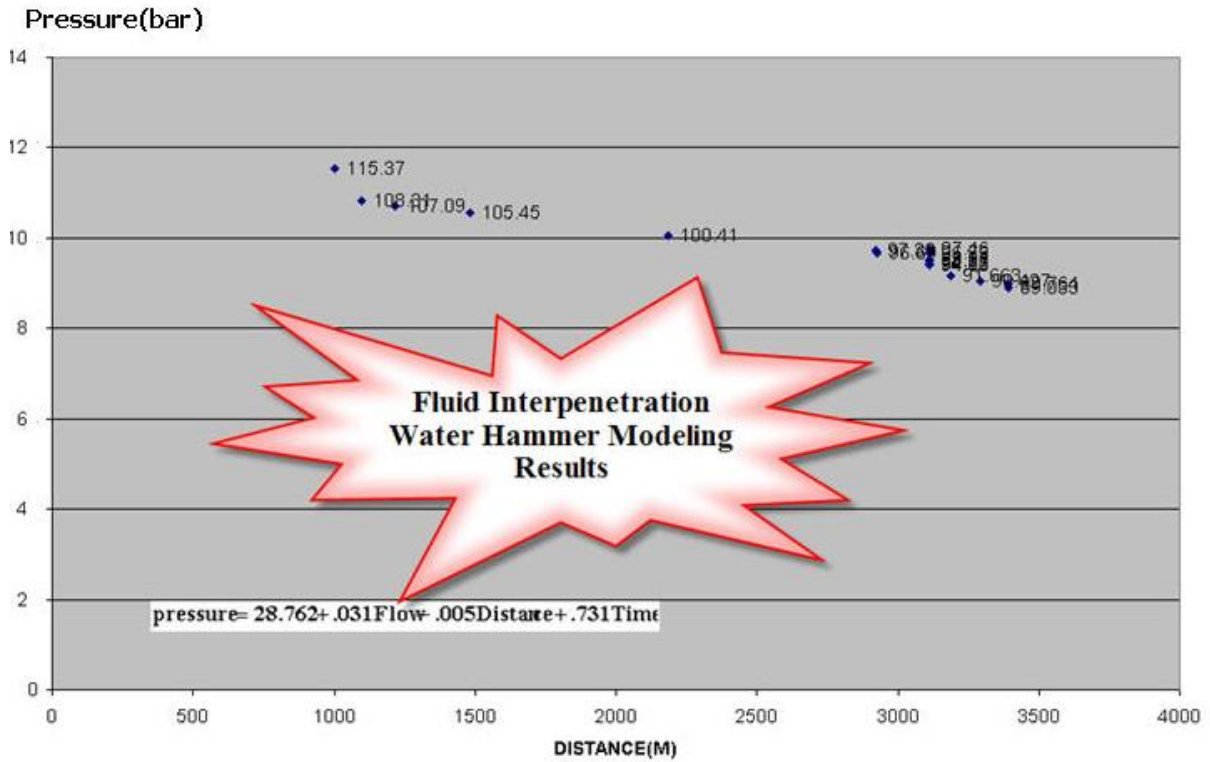


Fig. 4. Field test

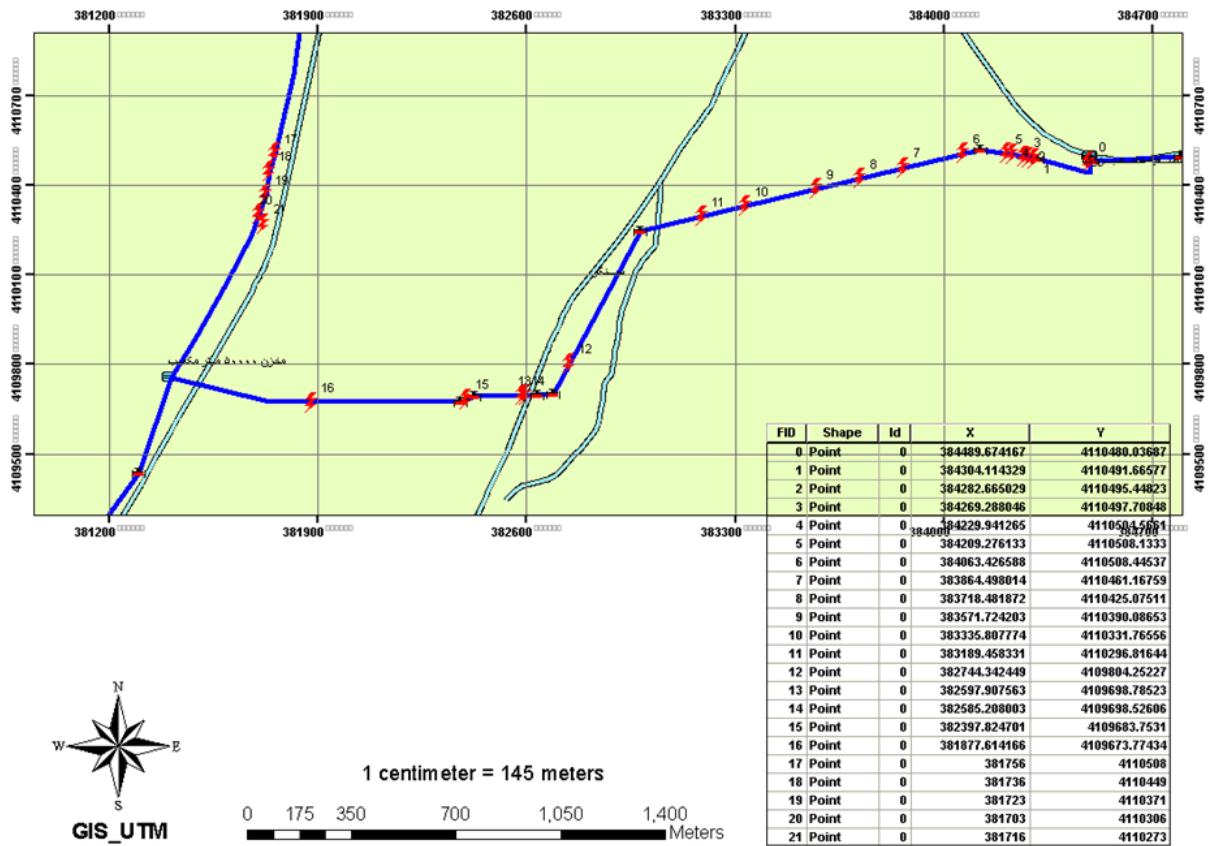


Fig.5. Field test

B. Comparison of Present Work Results With Other Expert's Research

Comparison of present work results (nonlinear heterogeneous model -water hammer software modeling), with the results of other expert's works.

Apoloniusz Kodura and Katarzyna Weinerowska, (2005). In present work water hammer has been run in pressurized pipeline. The observations, experiments and numerical analysis shows air existence in the pipeline have generated the complex condition for water hammer phenomenon. Therefore it has been influenced by some additional factors.

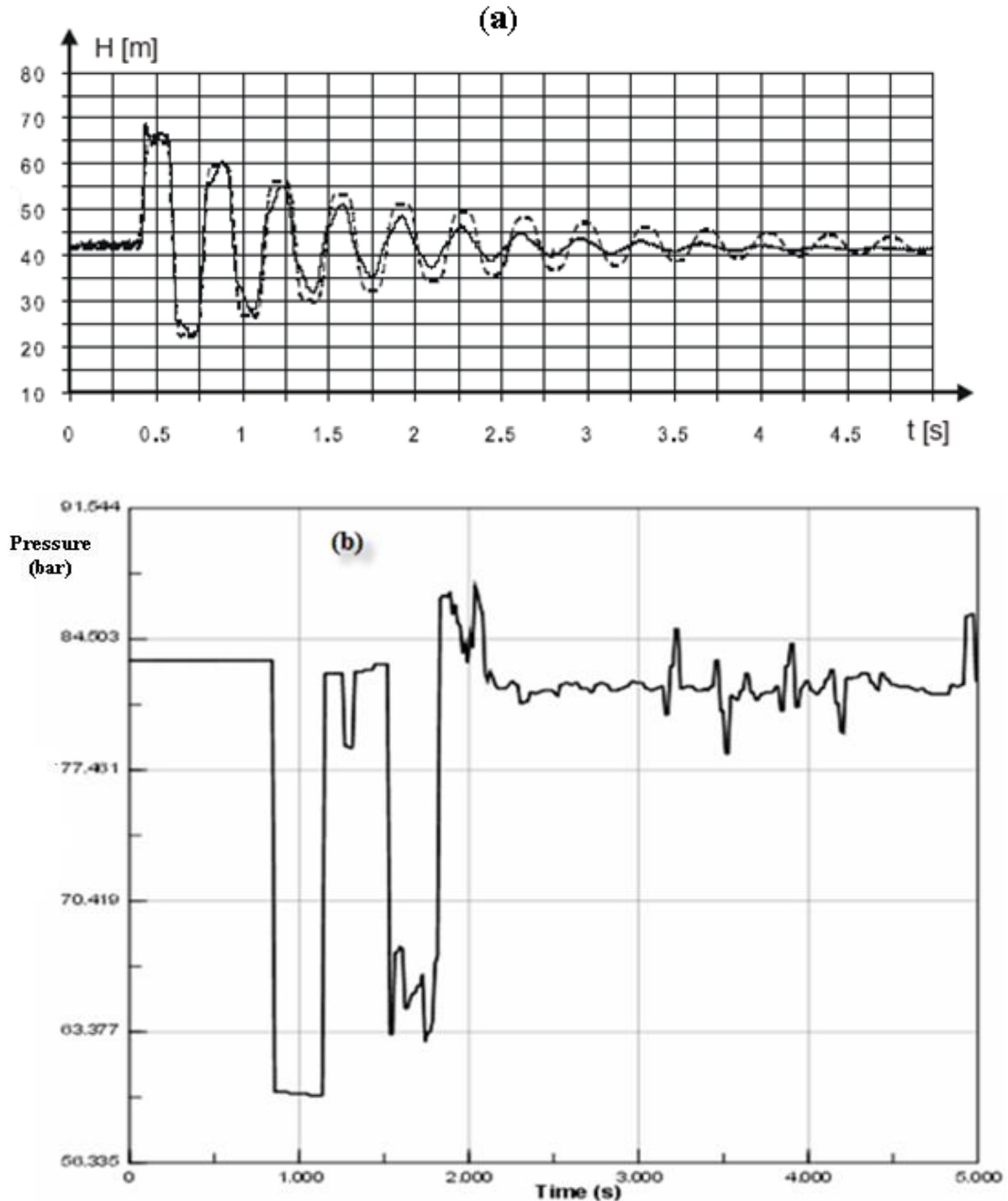


Fig. 6. Experimental observed and calculated results for (a) Kodura and Weinerowska research, (b) present research.

Detailed conclusions were drawn on the basis of experiments and calculations for the pipeline with air entered. Hence the most important effects that have been observed were as the flowing: at first, the influences of the ratio of air have been appointed. Then the total discharge related to the periodic wave oscillations has been investigated. The outflow to the overpressure reservoir from the leak was effected the value of wave celerity. The pipeline was equipped with the valve at the end of the main pipe, which was joined with the closure time register. The water hammer pressure characteristics were measured by extensometers, and recorded in computer's memory. The supply of the water to the system was realized with use of reservoir which enabled inlet pressure stabilization, was illustrated by Apoloniusz et al. 2005, Figure (6) [7-19].

C. Application of Achieved Results

Pressure at the beginning of pipeline remains constant. After shock wave generation, flow moves with the same velocity C at the reverse direction of the shock wave. This leads to the generation of high pressure drop due to the wave. At the same time fluid moves in the direction of the initial section of the pipe. As long as the shock wave reaches to the pressure reducing valve, liquid pressure reduces to vapor pressure. By the way, again and again, the wave of pressure drop moves conversely in the direction of start point on the water pipeline. As long as damping of shock wave, these cycles of increase and decrease of pressure will be continued. It is iterated at time intervals equal to time for dual-path of the shock wave along the length of the pipeline (from the pressure reducing valve prior to the start point of pipeline).

IV. CONCLUSIONS

The hydraulic impact of the liquid in the pipeline will perform oscillatory motion. The hydraulic resistance and viscosity cause the oscillatory motion. It absorbs the initial energy of the liquid as long as overcoming the friction and therefore it will be damped. Water hammer is manifested in hydro-machines various purposes. In most cases this is undesirable; leading to the destruction of pipelines was illustrated by Hariri Asli et al., 2010, [8,9]. Maximum amount of air infiltration which was calculated based on the simulation results of nonlinear heterogeneous model can be removed by the system (Table 1). Geography Information

System "GIS" can eliminate water hammer during abnormal operations. Abnormal operations include things like initial startup and power out conditions in Earthquake. For these abnormal circumstances it is important to have safety equipment installed. Equipment that will help during a power outage includes surge tanks, gas vessels, surge anticipator valves, and pressure relief valves. Variable speed pumps have computerized electronic controls and are only as dependable as other electronic devices such as computers, cell phones, and monitoring link to GIS. By application of pipeline geo reference coordination in database under GIS management and data exchange between receiver and transducer from pipeline to Programmable Logic Control "PLC", all of the system can be on-line controlled by transmitting pulse to control valves, surge tank and all of controllable instruments at transmission pipeline and pump station. By the way urban system will be protected from water hammer disaster.

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Modeling for energy saving by Web-based GIS

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Abstract

Quick turn-based georeferenced information is a new technology that has a positive impact on the performance and efficiency of facility systems including Heating, Ventilating, Air-Conditioning & Refrigeration (HVAC&R's). The technology of signal detection through remote reading system, provide the management of facility HVAC&R through the geo-reference world area network (Web-based GIS) based on geographic information system (GIS). This method as a new concept in the control science and optimize energy consumption can be an effective factor in design, maintenance, energy consumption management, and commissioning of the facilities and building industry. Also, this method provides online control of energy consumption of the facilities and building industry. So in this work, the model of control of HVAC&R in the context with GIS and Web-based GIS were investigated. The empirical results besides the regression mathematical analysis show that this model is able to predict and evaluate energy consumption.

Keywords: Geographic Information System, Energy Saving, HVAC&R Facilities.

1. INTRODUCTION

The country's mapping organization is the first entity to formally use GIS in our country, in accordance with a resolution adopted by the Islamic Consultative Assembly.

The project for the creation of the GIS began in April 2004 and is currently widely used in connection with its activities. The National Council of Geographic Information System Users was established in January 2008 with the aim of policy making, planning and coordinating GIS activities, needs analysis and utilizing the scientific, technical and human resources capacity to create and deploy GIS in accordance with the responsibilities of the country mapping organization specifically, the creation of national GIS systems.

In the 21st century, the international energy-saving attitude of the international community necessitated the use of GIS in the management of various industries including the thermal, refrigeration and air-conditioning industries:

The Heating, Ventilating, Air-Conditioning, and Refrigerating (HVAC & R) engineering emphasizes on intelligent operation method. So that the installations have the right time, proper operation, useful efficiency and minimum cost. The purpose of operation is to make proper use of the equipment over their useful life. Scientific utilization of the facilities requires updating the facility's map information in the form of GIS. Due to the large volume of exploitation information, while updating the facility map

information in GIS format, different data can be extracted in the least amount of time. A robust, efficient database of servers as the primary server can solve many of the problems of social life. If the information about the facility is in the memory of experienced people, it will be out of the system over time. GIS is not just software, but a science that classifies and locates geographic and urban information by different software. This science has recently found its place in urban sciences and is being used by urban sciences and urban planners. The use of GIS in urban development plans by employers is also on their agenda, and the Iranian Urban Development Association has for the first time used GIS in urban development plans, providing training to urban professionals and urban utilities. Therefore, experts should first prepare scanning, editing, and layered facility maps. It also needs to reflect subsequent changes to these maps so that they do not lose their performance over time. Up-to-date facilities and equipment components are reflected in GIS maps, mainly including:

- Pipes: In the computer maps prepared, the pipes in the grid are carefully updated and reflected on the maps by gender and diameter in GIS format.
- Valves: The location of the valves in GIS format is reflected on the facility maps.
- Meters: The location of metering equipment such as barometers and flowmeters, etc. Are reflected in the GIS in the facility maps.

Facility maps are updated to suit GIS requirements and are implemented as follows:

- Exchange graphical information from CAD space to GIS space
- Fixes errors in CAD space
- Convert graphics data from DWG format to SHP
- Completing the descriptive and spatial information layers and fixing the errors in the GIS space (descriptive and spatial).
- Eliminate tolls that are in the wrong place.
- Create primary and external keys for the toll table.
- Creating appropriate tolerances and exchanging effects from spaghetti to topology.
- Preparation of conceptual model for modeling network in GIS space
- Creating a proper ground database.
- Establishment of traceability and execution of facility analysis.

In the management of heat and cooling facilities based on metadata management, the development and application of new and advanced technologies in all areas of software and hardware in the facility can have a positive impact on system performance and efficiency. The application of state-of-the-art technologies such as IoT can also provide scientific guidance and enhance the technical and hygienic safety factor of the installation systems. IoT is a new concept in the world of technology and communications, but IoT was first used by Kevin Ashton in 2007, describing a world in which everything, including inanimate objects, is used to Have a digital identity and allow computers to organize and manage them. The Internet now connects all people, but with the Internet of Things all things are connected. Prior to that, however, Kevin Kelly in his book *The New Economic Law in the Age of Networks in the Year 4* addressed the issue of small smart nodes (such as open and closed sensors) that are connected to the World Wide Web. The present study shows that the management of HVAC & R HVAC & R air conditioning installations in the GIS field is a new topic in the field of control and optimization of energy consumption internationally, and awareness of this is especially important for facility engineers [1-5].

2. RESEARCH METHOD

In this research, the role of the rapid flow of location-based information in the management and analysis of data related to the control and optimization of energy consumption through remote reading technology was investigated. Therefore, identifying the types of complications, classes, and subclasses of facilities was on the agenda of this research. Finally, the implementation of these operations led to the

introduction of the intelligent facility management model as follows [6].

GIS is a GIS system consisting of data, hardware, software, methods and algorithms, human resources and networks capable of input, management, analysis and display of "spatial information". GIS components include:

- Information - Displays the processed data.
- Personnel - Dynamic thinking is the key to GIS power.
- System - Establishes the relationship between software, hardware and data.
- Spatial feature - is a spatial phenomenon.

The World Wide Web is a Web-based GIS, a type of GIS that enables the distribution, sharing, and exchange of data at any time, anywhere, and for any person through the World Wide Web. Therefore, on-line engineers, analyzing on-line data and advanced technology, receive signal error in ozone through remote reading sensor systems and manage thermal and cooling facilities through the World Wide Web. Energy consumption in utility systems (Figure 1-2). Energy management is the science of controlling and optimizing energy consumption through the integration of internet-connected sensor and drive systems and is used to optimize energy consumption.

The IoT devices (switches, power media, television, etc.) are integrated and capable of communicating with the utility company to balance power generation effectively and energy consumption. They also give users the chance to remotely control their equipment. The equipment is centrally managed by an equal text interface while enabling advanced programming functions (such as turning on and off the remote heating appliances, controlling the stove, changing lighting conditions, etc). IoT devices can be used for surveillance and the mechanical, electrical and electronic systems used in a variety of buildings (eg public and private, industrial, industrial and residential) in home and building automation systems. There are three main areas covered in this area:

- Integrate the Internet with building energy management systems to create energy efficient and IoT-based "smart buildings".
- Possible ways of real-time monitoring to reduce energy consumption and monitor resident behavior.
- Integrate smart devices into the built environment and how to use them in future applications.

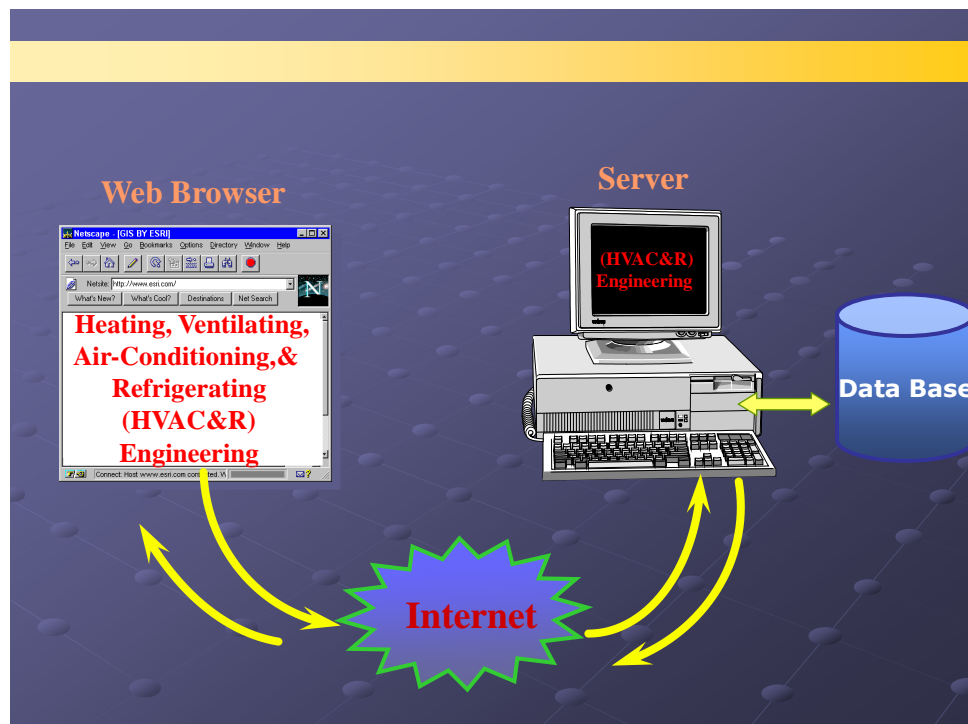


Fig. 1. Managing HVAC & R Facilities through the World Wide Web

Creating Extensions in HVAC & R Installation Software under ArcGIS9-ArcMap software enables troubleshooting and control and optimization of power consumption through the on-line control model and under the World Wide Web (Figure 2-1).

On-line control model to optimize energy consumption while providing the information needed to determine energy intensity: (EUI) Energy use intensity under Web-based GIS can include other features including better visualization of system components; ease of change, ability to filter data for the design (Table 1) provides maintenance, energy management and commissioning of the building and thus compares the intensity of the building's energy consumption while optimizing its energy consumption (Figure 3). The on-line control model for HVAC & R heating, cooling and air conditioning using its and technique information reading techniques and remote control instruments in GIS base for lighting, cooling, heating system, protection system. This operation is at its simplest possible by remote control over a very long distance through the telephone line, mobile phone and internet, tablet and computer. In addition, smart building makes the home

modern and comfortable. Constructs will also help save energy if properly designed and used with standard equipment Rejected. With the Industrial Internet of Things in a smart home all the following smart and automatic installations are performed:

- Ability to define intelligent scenarios.
- Load management and energy consumption of buildings.
- Ability to control and execute commands remotely via phone, internet.
- Control of HVAC & R heating, cooling and air conditioning systems

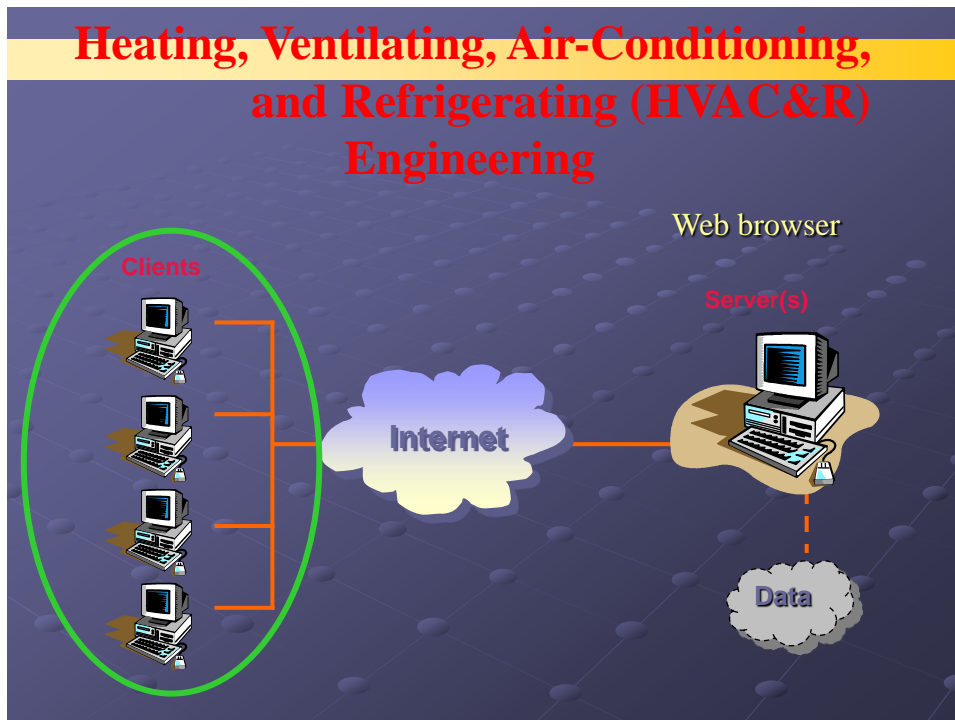


Fig. 2. Troubleshooting Troubleshooting Facilities under the Web Web-Based GIS

Industrial Internet of Things (hereinafter IIOT) is one of the most important and widely used areas of IoT deployment in the HVAC & R HVAC system. The IOT Industrial Objects Internet means using the technology in industrial fields and using it as a smart industrial network. Using IIOT in industrial units, all objects can be connected on-line, creating an integrated network for information exchange, control and monitoring. This technology is one of the five major technologies that will greatly affect the future of industrial automation in all industries as well as in HVAC & R air conditioning, refrigeration and air conditioning systems. The technology will be developed to the extent that it is projected by year 5, and with the entry of large and active industrial automation companies, the market value of the technology will reach more than \$ 2 billion [11-13]. In this study, factors such as thermal resistance of walls (Table 1), temperature factor, energy consumption unit were investigated. Taking into account consumption data, temperature and power consumption factors on energy consumption intensity (EUI) factors such as:

Input; Outputs; Efficacy was evaluated by regression model. Factors such as total heat power, occupancy rate, unit income level and unit energy income can increase energy consumption and temperature factor can lead to energy consumption decrease (1-2). In addition, mathematical analysis of the regression model can provide a model for managing energy consumption and saving energy consumption through multi-factor analysis method:

Data Envelopment Analysis (DEA) (Table 1).

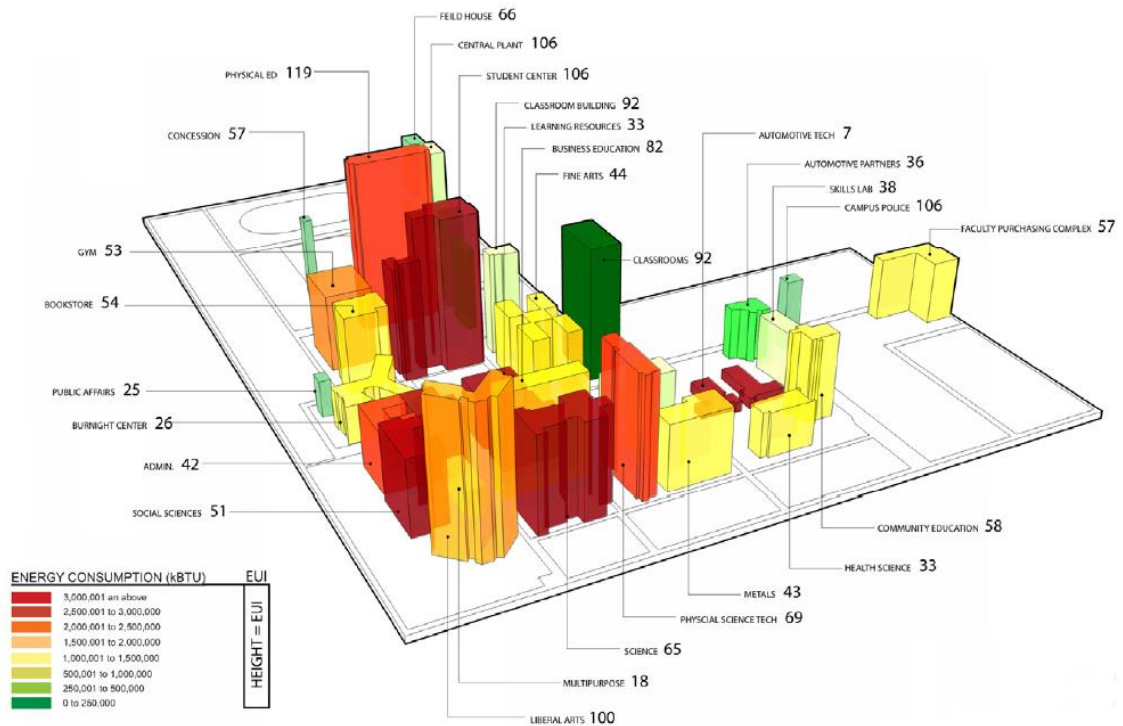


Fig. 3. Comparison of the results of the energy use intensity (EUI) computational model

TABLE 1. MINIMUM HEAT RESISTANCE OF NON-LIGHT TRANSIENT WALL R (M2.K / W)

Group	Group	Group	Building group in terms of energy savings	
1.5	2.1	2.8	Style	Wall
1	1.4	1.9	Heavy	
0.8	1.1	1.5	Adjacent to uncontrolled space	
2.7	3.7	5	Style	ceiling
2.2	3	4	Heavy	
1.7	2.3	3.1	Adjacent to uncontrolled space	
1.6	2.2	3	Style	Floor
1.3	1.8	2.4	Heavy	
1	1.3	1.8	Adjacent to uncontrolled space	
2	2.7	3.7	Peripheral insulation	Floor foam
0.9	1.3	1.7	Insulation all below the surface	

$$U = \Sigma / 1R \quad (1)$$

U (W / m2.K) - Heat Transfer Coefficient
 R (m2.K / W) - Total heat resistance

$$P = U.A.T \quad (2)$$

P - Total thermal power
 U (W / m2.K) - Heat Transfer Coefficient
 A (m2) -Area
 T (K) - Temperature
 P (W) - Total thermal power

Data Envelopment Analysis Method (DEA)

A Multi-Factor Productivity Analysis method for evaluating the relative efficiency of an instance building by decision makers named Decision Making Units (DMUs). DMU decision units contain a homogeneous set of equipment in which objects are evaluated for performance (1). The purpose of this study is to obtain a building energy efficiency score (Table 2) under the name of a DMU. Regression analysis is a statistical technique for examining and modeling the relationship between variables.

This research is a quasi-experimental study and the researcher intends to use Energy Use Intensity (EUI) in GIS space in Rasht city. The research is conducted by field method using regression analysis. In addition to using regression analysis or analysis of variance, ANOVA and T-test are defined for the research model. The parameters of the regression model are:

- Input EUI (kWh / m2)
- Outputs Percentage of dissatisfied (PPD) DEA Score
- Efficiency

The curve of the estimated method, which is the

regression test, was thus identified using these data. The model was calibrated using a set of data without changing the parameter values. The research tools used are: Meters for Metering Gas Meters - Meters for Metering Electricity - Timers for Time Logs - CO2 Measuring Instruments. The statistical population of this study consisted of 12 apartments in Rasht city. Research hypotheses are:
 Hypothesis One: There is a significant relationship between Input (independent variable) and Outputs (dependent variable):

Output = f (Input)
 (Dependent variable):
 Outputs Percentage of dissatisfied (PPD)
 (Independent variable):
 Input Energy Use Intensity (EUI)

Hypothesis Two: There is a significant relationship between DEA and Input (independent variables) and Outputs (dependent variable):

Outputs = f (DEA Efficiency, Input)
 (Dependent variable):
 Outputs Percentage of dissatisfied (PPD)
 (Independent Variables):
 (DEA) Data Envelopment Analysis
 Input Energy Use Intensity (EUI)

3. RESULTS

In this research, the implementation of GIS and GIS Ready implementation of HVAC & R system maps was performed as follows:

TABLE 2. RESULTS OF THE COMPUTATIONAL MODEL OF ENERGY USE INTENSITY (EUI) IN THE PRESENT STUDY

No.	DEA Efficiency Score	Outputs CO2 [ppm]	Outputs Percentage of dissatisfied (PPD) [%]	Outputs Occupancy Density [Person/m2] [%]	Working time [Hours]	Input Energy Use Intensity (EUI) [kWh/m2]	Building Code
1	0.77	799	17.1	0.2	9	78	101
2	1	866	17.5	0.21	11	80	102
3	0.87	777	33.2	0.2	8	80	103
4	0.43	901	34.1	0.24	7	80.8	104
5	0.73	821	20.8	0.18	9	79	105
6	0.88	920	35	0.2	8	81	106
7	0.71	790	19.9	0.19	7	80.4	107
	82%	43%	77%	42%	39%	1.20%	Difference (%)

- Exchange graphical information from CAD space to GIS space
- Fixes errors in CAD space.
- Convert graphics data from DWG format to SHP.
- Completing the descriptive and spatial information layers and fixing the errors in the GIS space (descriptive and spatial).
- Eliminate tolls that are in the wrong place.
- Create primary and external keys for the toll table.
- Creating appropriate tolerances and exchanging effects from spaghetti to topology.
- Preparation of conceptual model (Table 3-4) for modeling network in GIS space.
- Create the right database.
- Ability to track and execute HVAC & R system analyzes.
- Speed up the handling of HVAC & R system accidents.
- Systematically store and use HVAC & R system information using GIS.
- Economical savings due to the rapid flow of information in thermal and refrigeration facilities management.
- Create maps and reporting on all of the above.
- Regression analysis of facility systems.

Regression is needed for estimation and forecasting in almost every field including engineering, physics, economics, management, biological sciences, biology and social sciences. Regression analysis is one of the most widely used statistical techniques. The use of one variable to perform the prediction for another variable is called regression. Regression using one known and predicted variable

predicts the values of another unspecified variable. The rate of change of one variable by the effect of another variable is also called the regression coefficient, which is the amount of change that occurs in the dependent variable by the unit of change in the independent variable. The regression is calculated as one variable and two variables. the door One-variable regression has one independent variable and one function variable, but two-variable regression has one function variable and two independent variables. To begin with, there must be a linear relationship that forms the scatter plot of the original idea. The regression line reflects the trajectory of the total distribution of points in the nominal coordinate system, which can indicate the severity and weakness and the type of correlation between the variables. The regression equation should be used to draw the regression line. In this research, the modeling results (Figure 4-5) are based on the rapid flow of location-based information for the HVAC & R system:

- Designing and implementing an energy module to reduce energy consumption, improve the energy rating of the building and improve the quality of comfort for residents.
- Design and implementation of HVAC module based on simulation of dynamic thermal behavior of building, solar behavior, simulation of central and local control system of mechanical installations.

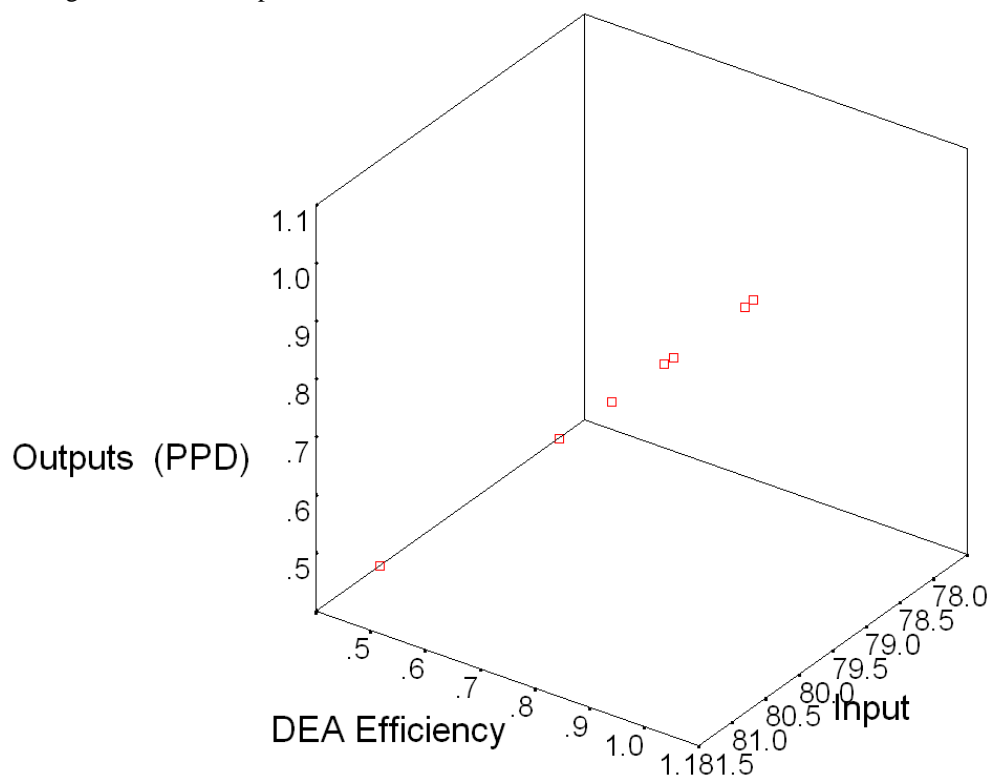


Fig. 4. Energy Intensity (EUI) based on the regression model of the present study

TABLE 3. REGRESSION MODEL IN THE PRESENT STUDY CURVE FIT

Mth	Rsq	d.f.	F	Sigf	b0	b1	b2	b3
LIN	.016	5	.08	.785	2.5086	-.0218		
LOG	.016	5	.08	.788	8.2502	-1.7076		
INV	.015	5	.08	.791	-.9070	133.945		
QUA	.017	5	.08	.783	1.6549	-.0001	-.0001	
CUB	.105	4	.23	.801	-240.06	4.5557		-.0002
COM	.038	5	.20	.677	40.1875	.9514		
POW	.037	5	.19	.680	2.3E+07	-3.9311		
S	.036	5	.19	.682	-4.1690	.0499		
GRO	.038	5	.20	.677	3.6936	-.0499		
EXP	.038	5	.20	.677	40.1875	-.0499		
LGS	.038	5	.20	.677	.0249	1.0511		

TABLE 4. EQUATIONS USING THE OBTAINED REGRESSION MODELS FOR THE PRESENT RESEARCH REGRESSION MODEL

Equation	Model Summary					Parameter Estimates			
	R Square	F	df1	df2	Sig.	a_0	a_1	a_2	a_3
Linear, (3) $y = a_0 + a_1x$	.016	.08	5	5	.785	2.5086	-.0218		
Logarithmic, (4) $\log y = \log(a) - (b) \log x$	.016	.08	5	5	.788	8.2502	-1.7076		
Inverse, (5) $y = f^{-1}(y)$	.015	.08	5	5	.791	-.9070	133.945		
Quadratic, (6) $y = a_0 + a_1x + a_2x^2$	.017	.08	5	5	.783	1.6549	-.0001	-.0001	
Cubic, (7) $y = a_0 + a_1x + a_2x^2 + a_3x^3$	.105	.23	4	4	.801	-240.06	4.5557		-.0002
Compound, (8) $A = Ce^{kt}$	.038	.20	5	5	.677	40.1875	.9514		
Power, (9) $y = cx^p$	.037	.19	5	5	.680	2.3E+07	-3.9311		
S, (10) $y = f_0(T, X, U)$	.036	.19	5	5	.682	-4.1690	.0499		
Growth, (11) $(dA/dT) = KA$	.038	.20	5	5	.677	3.6936	-.0499		
Exponential, (12) $e^x = \lim_{n \rightarrow \infty} \left(1 + \frac{1}{n}\right)^n$	.038	.20	5	5	.677	40.1875	-.0499		
Logistic, (13) $f(x) = \frac{L}{1 + e^{-k(x-x_0)}}$	.038	.20	5	5	.677	.0249	1.0511		

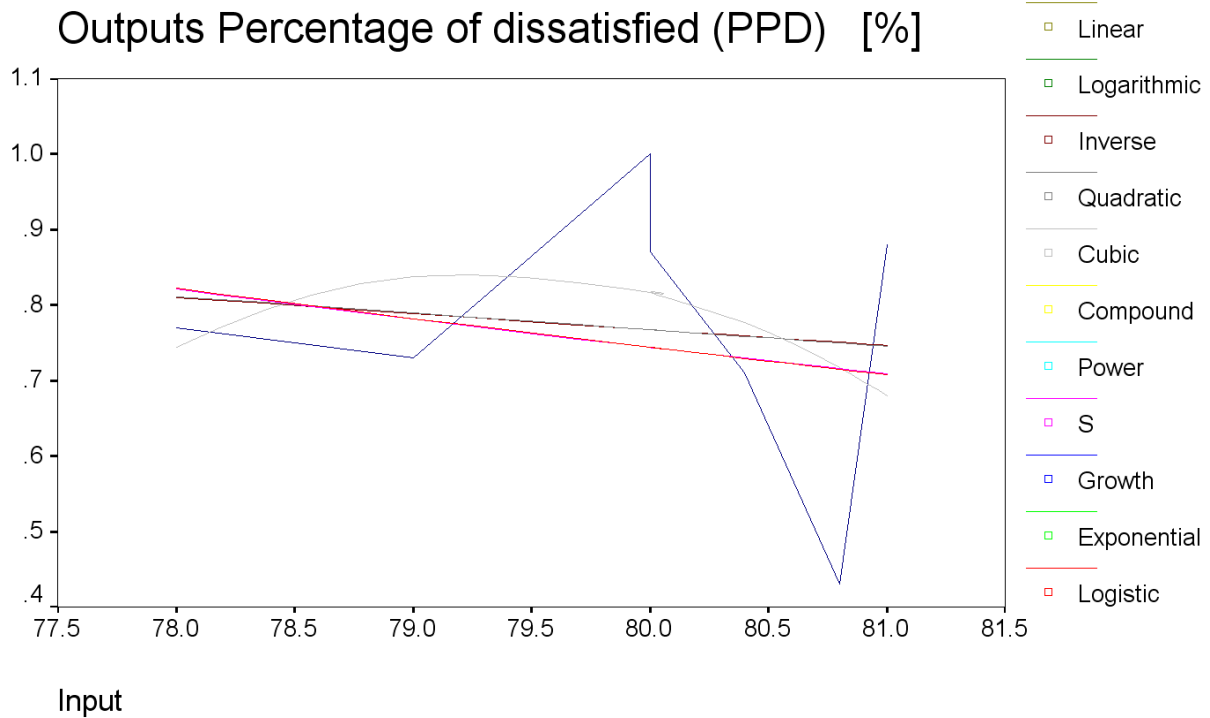


Fig. 5. Disadvantage Percentage (PPD) based on the regression model of the present study

4. CONCLUSION

Currently, the building industry accounts for the largest amount of energy consumption, and heating and cooling systems are the largest energy consumers in the building. Therefore, there is a need to improve energy efficiency or optimize energy consumption. In the present study, the role of remote sensing of HVAC & R facilities and energy audit of buildings was investigated. In this regard, consumption patterns in energy were determined. The research method in this research is documentary-analytical and the type of research is based on the presented analytical-practical solutions. Based on the findings and results of the research, the use of remote sensing technology and the necessity of applying GIS in the management of various industries such as thermal, refrigeration and air conditioning industry for energy audit and optimization of energy consumption pattern were emphasized. Therefore, the achievements of utilizing the remote sensing of HVAC & R facilities and the energy audit of buildings in the present research for the facility industry are as follows:

1-Scientific management by analyzing the received data on a variety of hydraulic and thermodynamic parameters by remote reading in the facility systems and creating the following capabilities:

- Hydraulic analysis
- Simulation properties and specifications
- Graphic properties
- Hardware requirements
- Software requirements
- Software capabilities
- Required data
- Cost

2- By identify any qualitative and quantitative changes in the facility set up in least possible time it is possible to analyze the related data at the system outlet.

3- Develop the ability to cope with a variety of hydraulic and thermodynamic instability factors at the facility.

4- By Managing of HVAC & R ON-LINE Thermal, Refrigeration and Air Conditioning facilities while utilizing remote read and fast flow information technology in accordance with GIS.

5-Scientific leadership and upgrading of HVAC & R installation systems' technical and health safety coefficient and the following capabilities:

- Eliminate unwanted usage.
- Fixing and controlling HVAC & R thermal, refrigeration and air conditioning facilities at different times of the day.
- Reduce depreciation and increase efficiency of HVAC & R thermal, refrigeration and air conditioning installations.
- Alert alarms for periodic equipment reviews.
- Control the number of HVAC & R thermal, refrigeration and air conditioning equipment such as in-service burners tailored to the building's thermal load demand and so on.
- Deactivate HVAC & R thermal, refrigeration, and air conditioning installations in office buildings in accordance with work schedules or in accordance with outdoor temperatures.

- Ability to remotely control and monitor the status of HVAC & R thermal, refrigerating and air conditioning installations.
- Alarm system and alarm and event logging.
- Accurate statistical reporting of the performance of various components of the HVAC & R building's thermal, refrigeration and air conditioning installations.
- Cleverly prioritize emergency and peak consumption.

THANKS

We would like to thank all the researchers and practitioners of the HVAC & R facility industry who have used their valuable experiences in this research.

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Studying effective factors on formation of geomorphologic forms in KARKAS Mountain using GIS

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Abstract

KARKAS Mountain is the highest peak in Natanz, Kashan. On the one hand due to the diversity of geomorphologic units for example diversity of heights, tilt of hillsides, valleys, types of faults, and age of rock units, types of units, glaciers, and sediment, on the other hand, due to geomorphic processes such as tectonics, dry and hot to cold period of climate, luxuriant vegetation and some areas without vegetation, landslides, and rock debris it can be described as a place for research in geology sciences. This paper studies geomorphology of KARKAS Mountain and tries to interpret variety of forms and processes by using GIS. Due to the introduction of the gradient of the mountain, evidence and the fact that the slopes are currently active by internal earth activities (the dynamic forces), we conclude that, especially on the northern slopes of the mountains above 1700 meters high, it is very sensitive and its morphologic changes are happening very rapidly.

Keywords: KARKAS Mountain; GIS; Glacier Cirques; Geomorphic.

I. INTRODUCTION

The plateau of Iran is an important morphotectonic area that is located in the middle part of Alps-Himalayas belt. Alborz and Zagros mountain ranges are two wrinkled systems of this belt among the most important heights of Iran [1]. The cause of height and the shape of the distribution of relief and also the latitude have a determining role in climate diversity in this region. These properties had also caused more climate diversity in comparison with other areas in the past [2].

Glaciers, and the governance of glaciers and inter-glaciers periods, had an important role in processing and revolution of relief. During the glacier periods, accumulation of large amounts of snow and ice on the hillsides and then during the inter-glacier periods, the melting of these ice masses had an impressive role in forming hillsides. This has an effect not only on creating shapes of glacier but also on creating series of incidents after itself [3]. The studied area is located in west of central Iran and in a part of tectonic holes in Qom-Ardekan and exactly covers a part of border stripe of morphotectonic unit of central Iran that is mainly formed by output and formation of third period [4]. This stripe in north-west/south-east affected by the flow is stretched by the big thrust of Zagros and Sanandaj-Sirjan zone and is generally known as Karkas mountain ranges [5]. Karkas Mountain is the highest summit in this mountain range. From the geology point of view the studied area is a part of middle tectonomagmatic belt and Urumia-Bazman (Fig.1).



Fig.1. Middle part of Urumia_Bazman and tectonomagmatic belt

From what the researches have done on this, the studies of Spotila et al., (2004) in Chugach Mountain, Alaska, Kirkbride et al., in New Zealand (1997) and in different parts of the world can be mentioned. Demergan in Iran did a survey on cirques of Oshorankooch, Lorestan in 1890 and Boobak (1934), Deviz (1934) and Rite (1983) surveyed the effects of glaciers in mountainous zones in Iran [6]. Karkas in Natanz is one of the most suitable areas for studying the effects of each of five main factors that determine the type of landform including topography, time, material, climate, and vegetation. There exist heights from below 1000 meters to approximately 4000 meters and sediments from Paleozoic to the recent time and climates from hot and dry to cold and dry and from

sedimentary to plutonic and from internal to external plutonic and from acid to base plutonic and from rather rich vegetation in low-pitched high areas to poor ones in low mountainous areas close to a plain.

II. MATERIAL AND METHOD

A. STUDY AREA

Karkas is the highest summit of border stripe of the big desert and among numerous central summits in Iran. This summit is located on $51^{\circ}47'59''$ E and $33^{\circ}27'21''$ N latitude that is limited to Goorabad valley and Hanjen in the north and Bozorgkashe village in the south and Ardehal in Delijan in the west and Natanz in the east. The area studied as vast as 497 square kilometers is covered with high mountains most of their summits more than 2700 meters above the sea level. This area includes a part of Gahrood (kahrood) mountain ranges.

B. METHOD

After gathering fundamental data from library resources and surveying topographic maps of the area studied, the numeral model was prepared and checked with the two maps 1:100000 of Natanz and Taragh that lead to segmentation of morphologic ponds (Fig2).

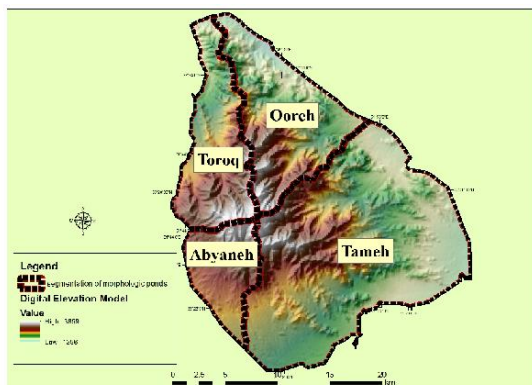


Fig. 2 Segmentation of morphologic ponds

Using the topographic map and high numeral model, the location of glacier circus in Karkas Mountain was characterized and by comparing that with the pictures from NASA, the accuracy of the location was confirmed (Fig.3).

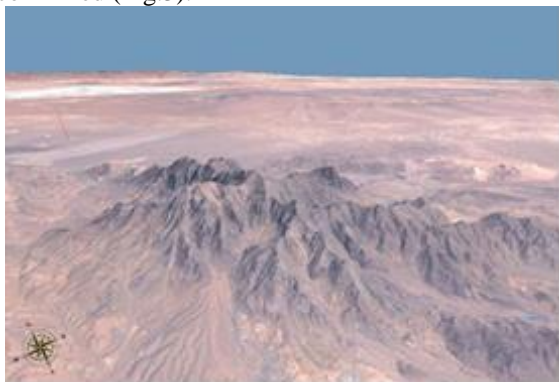


Fig. 3 NASA Image of Karkas Mountain

Using magnetization map from geology organization of the country, the active faults of Karkas Mountain were shown (Fig.4).

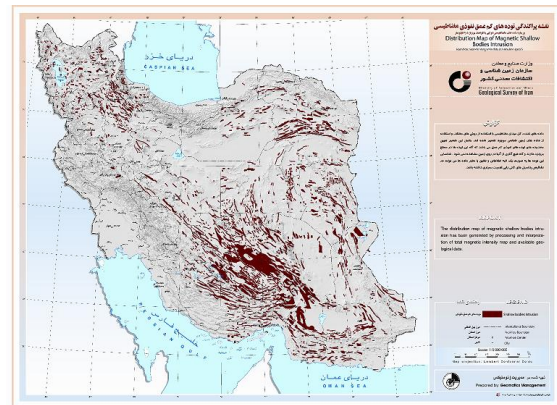


Fig.4 Distribution map of Magnetic shallow bodies Intrinsic

Topographic and other maps were used to indirectly observe landforms and glacier geomorphic phenomenon and geology maps were used for zoning geomorphologic units. This map, after classification in four classes, determined the limits of geomorphic stages (Fig.5).

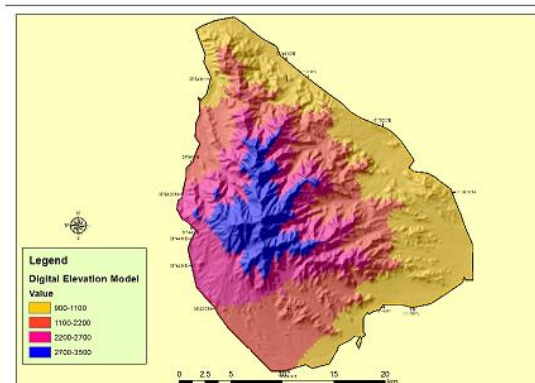


Fig.5 Four stages of erosion or geomorphic

At the end, to make sure about the accuracy of the operation with field studies, glacier evidence in the area were observed and measuring of probable snow borderline and also measuring the heights of the glacier circuses above 2700 meters was done and finally considering the present temperature of the area, the limits and width of the glaciers in that area were followed.

III. RESULTS OR FINDINGS OF THE RESEARCH

Studies show that Karkas mountain, the highest summit in the center of Iran which was formed by collision of two plates of Arabia and Iran, has an almost homogenous and unique morphology because on latitude $33^{\circ} 27' 21''$ temperature doesn't normally reach the freezing level but in Karkas there is enough

glacier evidence that caused a big glacier cirque as vast as 1680 m² on 2700 meters height (Fig.6).

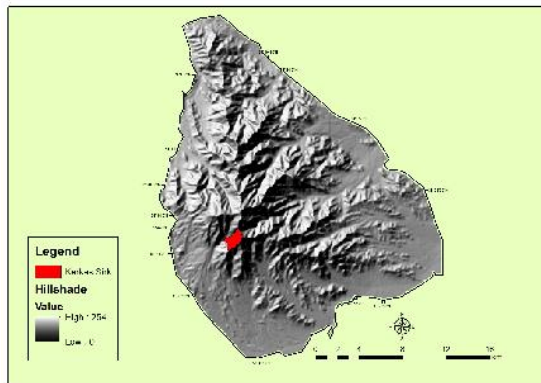


Fig. 6 Location of Karkas Mountain Glaciers Sirk

Dividing parts of Karkas Mountain shows that the south-west valley was formed by glacier erosion and the other three valleys were dug by rivers. The existence of river terrace wherever there is tectonic forces function indicates climate intermittence. This comes from the fact that usually in cold periods more sediments are carried to the river and less materials exit from that therefore in these periods there is sedimentary accumulation and the flow in the contrary in hot periods with the increase of water flow and re-digging the bed of the river is deeper, hence we can relate sedimentation to cold periods and erosion to hot periods and the result of this procedure is observed as river terrace and it is considered as a cold climate [7]. The evidence mentioned above in field surveys were confirmed (Fig.7).



Fig.7 Results as river terrace

In this survey gradients and thresholds caused new division in this mountain which is mentioned as geomorphologic stages. (Fig.5)

IV. DISCUSSION AND CONCLUSION

Researches discuss mountainous stages considering vegetation and slopes, heights, weather and hydrology are neglected and/or brought up as a second matter and in this level also mostly climate, soil, and sometimes hydrology was noticed and

geomorphologic phenomenon were always paid little attention to or considered as not very important. Maybe one of the most controversial geomorphic filed is topics related to quaternary climate changes and their feedbacks. Iran, because of its vast variety in its geomorphic environments and on the other hand because of these shapes being widespread has attracted the attention of many researches so far [8]. In this mountain, considering these disorder and eventually borders and thresholds, different erosion systems which are effectively active before our eyes, we can divide this mountain into four erosion or geomorphic stages (Fig.5) that are as followed:

Upper or high stage: higher than 2700meters

Middle stage: between 2200-2700 meters

Lower stage: between 1100-2200 meters

Very low stage: lower than 1100 meters

Studying gradients and indexes shows that this mountain has a special environment regarding its morphology. Morphology and weather have caused the emergence of different morphoclimatic systems and with the increase in height the impacts of these systems become more effective. Generally the amount of erosion increases in higher altitudes.

Surveying the existing morphologic shapes and especially morphologic evidence related to ser, quaternary and on one hand their location and height state and on the other hand the conditions of present and past climate were used to reach a conclusion.

To make the map of same temperature areas in ser, quaternary period the annual average temperature for the bottom of glacier cirques in the area which are located on 3000 meters height 4 to 6 degrees centigrade was spotted for July [9]. Since the stability of glaciers depends on climatic conditions and the average temperature of the time, to study the expanse limits of glaciers, after making the map of Karkas glacier cirque, field and direct observation of glacier cirque was done to be referred to.

A. PROCESSES GLACIERS

Among suitable factors for formation of glaciers are high amounts of snow and low temperature in summer. Erosion and weathering in form of frost, and mechanical destruction also moderately appear. But chemical destruction in that is low.

A glacier can be considered as a sedimentary system in which material aggregation is either carried, or settled in response to increase or decrease of force.

For the movement of glacier there are three groups of procedures that interfere which are contractually called internal changes of shape, slide of base, and changes of bed. The pace of most glaciers in most part of their route is 3 to 300 meters a year but this pace could reach 1 to 2 kilometers a year in slope frozen hillsides [10].

B. GLACIER EROSION

The period of quaternary is divided to pleistosen and holocene. The first one is in accordance with glacier

period and the second one with post glacier period. The temperature in pleistosen altered many times. In mild zones the average dropped for between 8 to 10 degrees and in tropical zones it dropped for four degrees so in different parts of the earth, glacier zones vastly expanded and the start of the fourth frost was from one million years ago and continued to 100000 years ago [11].

Along with the movement of ice and destructive material in that, the view of the surface of the earth changes.

Shapes that are fundamentally formed by glacier erosion are rare and include two groups. The one that is along the flow and includes whaleback and stone drumlin shapes and the one that is partly along the flow and includes sheepback shapes [12].

According to field observations the effects of glacier morphology in Karkas hillsides are very well recognizable and distinguishable from 2500 meters height. Among the most important ones are glacier cirques on above 2700 meters height. In the upstream of Gavbast in the south of the big village and at the end of these two valleys there are two glacier cirques ending in this village on above 2700 meters height (Fig.6). At the end of each of these cirques there is a stone crag made of cretaceous lime. The bottoms of these cirques are covered with moraine mass between 10 to 15 meters thick. The water nets of this moraine mass are cut paralleled to the slope of the valley, but glacier effects such as subsidence pits caused by melting buried ice cores can still be seen in mountainous heights of the area as enclosed pits. The erosion of the river is directly related to 3 factors of slope, amount of water, and alluvia. The most erosion happens where these three factors coexist [13]. In Karkas Mountain U-shaped valleys in the downstream of the glacial cirques on 2500 meters height is another form Morney shapes that can be seen in mountainous heights.

Beside that at the bottom of most of valleys with glacier origin in these levels of height, a coating of moraine sediments is seen. The expanse of moraine sediments is up to 2500 meters high. In some parts the dimensions of these pieces are so large that it seems impossible for the present drainage net to be able to carry them even in the time of the most amount of water and this is the best reason that they are moraine, especially that they are located in places that from the petrology point of view they show no match with formations around them in the hillsides of the valley and are kilometers far from their origin. The dimensions of some of these moraines are so large that even the possibility of them being carried in heavy flood conditions in the past rain periods is far from imagination. Moraine pieces are spread to 2500 meters heights and this shows that glacier tongues existed up to this height. In downstream, glacier cirques with present moraine pieces on the sides of the valley that is located as a high terrace to present talweg in this valley shows the previous level of

glacier flow on this altitude. Besides that, the bottoms of wide valleys in this area are all made of moraine terraces (Fig.8).



Fig.8 Moraine terraces

The flow of rivers with the origin of winter-snow melt that doesn't have much water flow have dug the surface of this moraine bed and now this moraine bed dominates the present bed of the river as terraces.

In a part of northern hillsides of Karkas mountain and the end of Qamsar valley in a place locally called Meydan on 2200 meters height there is a hill like a drumlin that is the remains of moraine coating erosion at the bottom of this valley. Lower height of this moraine mass in relation to the surface expanse of moraines of the areas shows that it is older and on the other side it shows the end limit of expansion of moraines up to this height.

Therefore, referring to the present evidence during field studies and surveying the temperature in the past, the border of glacier tongues' expansion was definitely 2500 meters and probably 2200 meters high at the end of Qamsar valley. From 2500 downward to about 1000 meters according to the evidence and also previous studies and opinions of other researches it is classified as fluvial 1 morphodynamic zone. Hence, except for shapes of erosion caused by washing drainage net there are no other effects seen. Only in villages' routes and the distance of balance curve 1200 and 1700 meters sedimentation of the river is seen as a sequence of river terrace. There are specifically 4 sequence terraces along some of the rivers of the area. The most distinctive of these terraces are formed in Abyaneh valley route. Because of springs saturated with calcium bicarbonate in hillsides of the valleys and sedimentation between terraces sedimentations of these formations are coherent with Travertine sedimentation.

From 1000 to 1200 meters exactly from where the line of slope changes in Karkas Mountain, it is where the summit of alluvial fan in the level of sides of the floodway pediments forms. From this point a gentle slope generally less than 3 to 5 percent as long as more than 15 to 20 kilometers to the border of Bande-riq that is the lowest point, it has created a flat plain.

The change of base level and the dominance of dry to semidry conditions after glacier period and decrease of river's water flow have caused stability in gully route in the surface of this alluvial fan. This phenomena has caused deep digging of gullies especially in upper parts of alluvial fans so in some parts the formation of the third period in the bed of this gullies and under the coating of alluvial fan sediments are shown. Of course the effect of subsidence of central hole and floodway hole should not be ignored because the digging of the bed of the river is not homogenous in the whole surface of plains in the area. This factor of difference shows the impact of tectonic activity in different parts. While the effect of climate changes in short distances cannot be the origin of these differences, the existence of knolls in the upper part of plains and downstream of the slope change line of the base of the hillside shows the amount of tectonic effect even in periods before the last quaternary glacier period. What is certain is that in the margin of the mountainous area and lower than 2000 meters of height there are many spas with much more water flows that suggests wet periods and the dominance of rain conditions in this area. Considering these geomorphologic evidence it is possible to present specific height levels for the formation of heritages mentioned in a profile of Karkas heights to Bande-rig and floodway pit as shown in table 1.

TABLE 1 HEIGHT DIVISION AND GEOMORPHIC EVIDENCE OF GLACIER PERIOD

Morphoclimatic zone	Height border (meter)	Geomorphologic evidence
Glacier	Above 2700	Glacier Cirques, glacier erosion effects
Solifluction	2500 to 2700	Glacier flows, moraines at the bottom of the valleys, effects of hillside movements and solifluction
fluvial	1200 to 2500	Zone of hillside washing in rain time, shapes of gullies, groove and ditch erosion, river terraces, travertine formations made by active spring sedimentation in rain periods

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