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Book of Abstracts

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Numerical Analysis of Manifold: A Case Study of Phukot Karnali Hydroelectric Project

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Bikki Chhantyal^d, Sunil Bista^e*

Abstract:

Numerical analysis is widely used in designing, optimizing, and predicting the influence of different parameters where the geometry, load, and materials are complex. The need for this analysis is significant in hydropower because components of hydropower projects have been designed by classical approaches. This reduces the chance of having the least head loss and better structural strength. In this article, computational simulations have been performed to study the hydraulics and structural strength in the manifold of the Phukot Karnali Hydroelectric Project (480 MW). The head loss, velocity distribution, pressure distribution, deformation and stress in the manifold have been observed. For hydraulic analysis, the effects of branch angle, cone length and sickle plate are studied. For structural analysis, the strength of the pipe is checked. Results show that head loss is decreased with the reduction of branching angle and cone length. The best branching angle is 30 degrees and the best cone length is 9000 mm. It is found that the head loss in the manifold with the combination of best branch angle, the best cone length and sickle plate at outlet 1, outlet 2 and outlet 3 is 0.13 m, 0.46 m and 0.31 m. Thickness of the pipe is increased for better strength. The Equivalent (von-Mises) Stress at first bifurcation and second bifurcation is 166 MPa and 161 MPa.

Keywords:

Bifurcation, Deformation, FVM, FEM, Head loss, Manifold, Sickle Plate, Stress

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A Review on the Behavior of Composite Well-Pile Foundation (CWPF) under Static and Dynamic Loading

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Abstract:

Despite the numerous benefits, practitioners are hesitant to adopt well foundations due to sinking issues caused by complicated geology. To address this peculiar scenario by utilizing well foundations, a composite well-pile foundation (CWPF) has been developed recently as an innovative type of deep foundation. Additionally, this technique may also be utilized to retrofit existing well foundations. CWPF can be loaded in a variety of ways, including vertical loads imposed by the superstructure, lateral loads caused by water current, ground pressure and seismic loads, and moments induced by eccentric loading. Numerous research has been undertaken on the behavior of composite foundations when these loading are applied independently or in combination. The purpose of this article is to summarize these state-of-the-art efforts to provide an overview of the behavior of composite well-pile foundations.

Keywords:

Composite well-pile foundation, CWPF, performance, static loading, dynamic loading, review

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SWAT Analysis for Investigating River Discharge and Operation Curve on Kulekhani Reservoir

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Abstract:

Discharge data for inflow to a reservoir is a major factor for the determination of the capacity of a reservoir, its operating policy. The SWAT model has been implemented in the Kulekhani watershed for the calibration and validation of the reservoir inflow data. First applicability of SWAT model is checked for Kulekhani watershed by calibration and validation of river discharge for period (1972 AD to 1975 AD) and (1976 AD to 1977 AD) respectively. In a motive to generate the monthly river flow in the Kulekhani area up to 2017 AD, further SWAT model is calibrated for period 1972 AD to 1977 AD and, by using the parameter values from this calibration period, data of river discharge is calculated from SWAT CUP for period 1978 AD to 2017 AD. Using the calculated discharge, the reservoir water levels for 5 hypothetical net water requirement scenarios for no spilling condition, maximum reservoir level at end of October months, and minimum possible drawdown at end of June month is calculated for period 1972 AD to 2017 AD, and extended up to 2025 AD by increasing sedimentation level. The reservoir level has been decreased to minimum level during the wet years period and the reservoir is also able to fill up to maximum capacity due to enough rainfall. But during the dry and average years, the reservoir will not be able to maintain its full capacity from bottom of minimum level. So, for dry and average years reservoir is not emptied to minimum level.

Keywords:

Kulekhani-I, Reservoir, River Discharge, SWAT, Calibration, Validation, Operation curve

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A CNN-BGRU Method for Stock Price Prediction

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Abstract:

With the rapid development in technology and digitization of financial market in recent years, an increasing number of people have begun to invest in the stock market. Accurately anticipating the change in stock price can reduce stock investors' investment risk while also increasing their investment return. Stock price prediction is frequently a nonlinear time series prediction due to the stock market's volatility.

This paper presents a CNN-BGRU (Convolutional Neural Network - Bidirectional Gated Recurrent Unit) model for stock price prediction. The presented model includes a 1-D CNN followed by bidirectional GRU to predict stock price. This model is used to predict stock price for short-term (next trading day), mid-term (closing price after 15 days) and long term (closing price after 30 days). The proposed model has been compared with unidirectional RNN (Recurrent Neural Network) model such as: LSTM (Long Short Term Memory) and GRU and bidirectional models such as: BLSTM (Bidirectional Long Short Term Memory) and BGRU in terms of MAPE (Mean Absolute Percentage Error) and training time.

Keywords:

CNN, BGRU, Stock price prediction

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Architectural Response Towards Healthcare Design

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Abstract:

Globalization has brought people, culture, technology, economy, public health and many other closer. The aging of earth has witnessed the technological development, urbanization, overcrowding, climate change, pandemic, catastrophe, social inequality and many more which has direct and indirect effect on the human health. These bigger problems have to be looked both locally and globally in order to be settled. The increasing and ageing population demand the quality health care and environment which is influenced by human behavior and the decision taken by designers, architects and policy makers. Architecture being creative tool addresses the material form of the world within a changing environment considering both the functional needs of humans for healthy living and the impact on ecology. The objective of this article is to assert the potential of architecture in order to address the ongoing global health issues which is done through reviewing journal articles and other documentations that were influenced by rethinking the design process to cope the root causes of the challenges. The article also poses demonstration of how the challenges can be mitigated while benefiting the inhabitants from strategic designs. Findings and discussion highlights the reshaping of design process in order to elucidate strategies within the context, encouraging the designers to reorient the architectural practice concerning the current realities.

Keywords:

architecture, design process, healthcare

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Economic Dispatch in Electric Grid Considering Demand Response using Dynamic Consensus based ADMM Approach

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Abstract:

Increasing switching type and plugged in hybrid electric vehicle (PHEV) load makes the energy consumption pattern more complex. Proliferation of highly intermittent Distributed Energy Resources(DER) and complex energy consumption pattern add more complexity for the power management units. This paper proposes a dynamic consensus Alternating Direction Method of Multiplier(ADMM) based dynamic Economic Dispatch algorithm for finding optimal real time price and optimal generation/demand. In this proposed algorithm, each agent estimates their average of the total power mismatch of the network and dual variable from the dynamic average consensus, which eliminates the traditional ADMM of finding dual variable in centralized way. Two aspects of ED is taken into account. First, economic dispatch algorithmic solution for non-responsive demand units is designed considering generation limit (generation limit and ramp rate limit) as constraints. Second, economic dispatch is integrated with Demand Response (DR) and a algorithm is designed for finding the optimal real time price and optimal generation and optimal demand for responsive demand units. Finally, it is tested upon standard IEEE 30 test bus system to find the effectiveness of proposed algorithms. Also, the effect of renewable energy source (photo-voltaic energy sources) to the conventional generation units and responsive demand unit is analysed, which shows that shifting of controllable load form other time period to low energy cost renewable energy sources available time.

Keywords:

ADMM, Dynamic Consensus, Economic Dispatch, Controllable load, Demand Response

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Impact Analysis of PV Grid Inverters and EV Inverters in Medium Voltage Distribution System

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Abstract:

An impact of grid inverter is studied for low voltage distribution system. The proposed model uses an iterative technique of load flow and multiple PV system location is proposed in this paper. The impact of Grid inverter power flows situation analyses with electric vehicle(EV) as load. The proposed methodology discussed and demonstrated for modified 37 bus system of Lahan Feeder. The comparative chart is proposed and very useful for PV allocation in distribution system. The EV load varies at different time with multiple frequencies and the grid inverter also follows the same.

Keywords:

Distribution System, Grid Inverter

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Social Dimension for Evaluating Urban Public Spaces- a case of Bhaktapur City Core

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Abstract:

Urban public space performs a substantial role in nourishing the socio-cultural public realm. It is also essential for the social and human behavioral well-being of communities. Besides, good urban public space depicts the characteristics of reactivity, communality and purposefulness. Thus, based on literature review and empirical work, this paper evaluates the salient features of urban public space by observation through social dimension viz. activities, safety and accessibility. Urban public space (particularly square) in Bhaktapur city core namely Golmadhi is examined through its activities, safety and accessibility. In order to learn from historical precedents this case study is conducted because this traditional urban public space reveals a constructive design with their excellent capacity, not only to support the daily life but also the socio-cultural and religious events during special occasions throughout the year. Such traditional characters of urban public spaces are being lost in contemporary urban neighborhood settlement. Therefore, this study attempts to explore the historic urban public space particularly square with regards to its activities, safety and accessibility in order to learn from it and attempts to put forward some applicable suggestions for the new urban public space design.

Keywords:

Urban public space, socio-cultural public realm, historical precedents, contemporary urban neighborhood, social dimension

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Social Dimension for Evaluating Urban Public Spaces - A case of Bhaktapur City Core

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Abstract:

This article is based on case studies from different heritage sites and some literature oriented to heritage tourism. In this research, six different sites with amazing and interesting tangible and intangible heritages are studied. Most of the sites are inscribed in World Heritage Site by UNESCO in different periods. Every site continues to have its own developing patterns and historical significance to tourism since being inscribed in WHS or national heritage. In this research, the comparative studies of these cases have been done as theoretical and qualitative analysis to draw some conclusions that may help other WHS oriented towards tourism development for economical growth of the area or country.

In this research, there are some cases where sites were developed as tourism centers which helped uplift the economical status for their surrounding areas, but this was done at the expense of loss of their heritage value due to careless disregard for intangible heritage directly related to local people and their culture.

Developing tourism in WHS may either serve as a risk or a benefit to heritage development. It can be harmful to heritage if plans are completely handed over to business stakeholders for short-sighted profit without regard for long term planning. Despite this being beneficial in the short-term, this approach may cause harm to the heritage sites and impact the historical and cultural significance for the future. For optimal economical development through heritage tourism in any location, the process employed should be sustainable with long term planning in partnership with local involvement and with local cultural interests in mind. The planning should include capacity building, training and education to locals for longer term sustainability and maintenance.

Keywords:

intangible heritage, world heritage site, national heritage, sustainable, stakeholder

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Performance Evaluation of 8.5 MW Grid-Connected Solar PV Plant in Butwal, Nepal

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Abstract:

The rising energy demand in Nepal has prompted the matter of energy security. Further, in order to maintain energy mix it is essential to use the alternative renewable resources. Grid connected megawatt scale PV systems possibly be the best alternatives. Performance analysis of such megawatt scale PV plant could help in designing, operating and maintenance of upcoming plant. The performance analysis of a 8.5 MW grid connected PV power plant installed at Butwal, Nepal is worked out. By analyzing plant first year operation performance it is found that final yield, reference yield, Capacity Utilization Ratio (CUF) and Performance Ratio (PR) are vary from 2.33 to 3.80 kWh/kWp-day, 3.87to 6.20 kWh/kWp-day, 9.7 to 15.8 % and 54 to 77 % respectively. The annual average final yield, CUF and PR are found to be 1140.4 kWh/kWp, 13 %, 64.2 % in close agreement to PVSYST estimated outcomes 1372 kWh/kWp, 15 % and 72 % respectively. The performance of the plant is compared with PV systems installed various part of world and found comparable. Financial analysis shows that plant discounted payback period is 6.9 years with proper return of NRs. 58.88 million in its useful life. The LCOE is found to be 6.7 NRs/kWh. Carbon emission balance analysis shows that 952 tCO_2 emission is replaced in plant useful life. The findings give insight on the solar power plant's long-term performance in Nepal's Terai area under real working circumstances. This research also intends to encourage IPP to develop more megawatt scale solar power plant to maintain energy mix target. In order to maximize power generation, the need for proper maintenance against array capture loss is highlighted. Additional, supplement research studies are also recognized.

Keywords:

Grid-connected PV system, Performance parameters, PVSYST, Techno-economical analysis

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Distribution System Fault Detection and Classification using Wavelet Transform and Artificial Neural Networks

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Abstract:

The detection and classification of fault and its location in electric power distribution systems is a complex task due to availability of large number of buses/nodes and laterals in the distribution system. This paper presents a methodology for automatic fault detection and classification in electrical power distribution systems using the concept of signal analysis, wavelet transform, pattern recognition and artificial neural networks. In order to extract the characteristic features of the faulty signals, discrete wavelet transform was used on the collected data of phase currents and neutral currents. From the high frequency component signals that occurs during the fault, signals information are extracted and used as an input data to train the artificial neural networks for fault detection and classification. After the fault classification is done, different Neural Networks can be trained for fault location in the network separately. Thus, the fault detection and classification algorithm becomes the base for the fault location technique. The training data are selected in such a way that the differences in data are achieved and the neural networks clearly identify the fault types and fault location in the distribution system. A standard IEEE 15 bus distribution system, with 11 KV, 50 Hz supply at the substation with total feeder load of 1126.5 KW and 1251.182 KVAR was used to test the proposed algorithms, providing the good performance result for all fault types at various location for low fault resistances. The fault detection and classification algorithms work effectively for the ground resistances of 20 ohms and less. The single point current measurement at the sub-station and then extracting the features of fault signals using Discrete wavelet transform to train the neural networks require less memory and reduces the computational time. Thus, this paper is able to detect the fault occurred and classify the type of fault in any distribution network.

Keywords:

Fault Classification, Fault Detection, Artificial Neural Networks, Pattern Recognition, Distribution Network, Wavelet Transforms, Multiresolution Analysis

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Evaluation of Performance of Hot Asphalt Mix by Partially Replacing Stone Dust by Brick surkhi as a Filler Material

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Abstract:

Filler material in asphalt concrete is one of the important constituents which provides additional stability by filling up the voids and providing denseness. However, researches show that asphalt concrete behaves differently with different fillers. This work takes a step to evaluate the performance of asphalt concrete with brick Surkhi used as partial replacement of conventional fillers. Aggregate and bitumen were collected and checked for their physical properties with reference to standard specification. The aggregate gradation was obtained by combining various size aggregate and fillers. The mix proportion were finalized. The Marshall test with stone dust was done at various bitumen content as a control mix. The Marshall test with varying brick surkhi content partially replacing stone dust as filler was done at various bitumen content. The test results showed that brick surkhi can be used as partial replacement of conventional fillers without much decrease in strength properties. Brick surkhi will be helpful in obtaining standard aggregate gradation and reduce use of stone dust.

Keywords:

Brick Surkhi, Stone Dust, Marshall Stability, Marshall Flow value

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Power Sharing Among Parallel Connected Photovoltaic Inverters with Droop Control in Microgrid

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Abstract:

Microgrids are considered as the major part of the modern power plant where the power from different distributed generations are accumulated and provides supply to specific local communities rather than vast regions. Microgrid removes the necessities of large transmission lines and huge protection devices with better control and greater security. Microgrid increases reliability of the system and makes design flexible. Renewable energy sources such as photovoltaics and wind energy are more preferable due to depletion of fossil fuels and global warming. Photovoltaic energy source is becoming best choice world wide among other renewable energy sources due zero emission, absence of fuel cost and little maintenance despite of its initial high investment. In this paper an islanded mode of operation of two parallel connected photovoltaic inverters with battery storage system is modeled. Different power electronic interfacing circuits are used such as; DC-DC boost converter with MPPT, charge controller and voltage controller which provide quick response to the system. Conventional droop controller with proportional integrator compensation is used for the proper power sharing among the parallel connected inverters. Common Load is given to parallel connected inverters through the point of common coupling. Maintaining the voltage and frequency within the acceptable limit at point of common coupling when both resistive and inductive load is supplied to the system is given major concern. MATLAB/Simulink is used for the simulation of the microgrid and the controllers.

Keywords:

Photovoltaic energy, Microgrid, Droop controller ,PID controllers,Islanded mode

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Effect of Photovoltaic Penetration on Radial Distribution Network: A Case Study of Rajgadh Feeder, Anarmani Distribution System, Jhapa, Nepal

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Abstract:

Solar photovoltaic penetration to a local distribution network is one of the best ways to improve voltage profile and meet the power demand of consumers without the requirement of building a new transmission network. However, the penetration level should not be exceeded in order to prevent from serious power issues like power outage, reverse power flow, voltage fluctuations and voltage unbalance. This paper presents a simple method to obtain best location for PV penetration to improve voltage profile and reduce system loss without affecting the power factor of the supply grid. The maximum value of product sum of probability density function and voltage ratio of the distribution system with and without solar PV gives the best location for PV penetration. The effect of PV penetration on the ETAP modelled IEEE-10 Bus system is initially studied and later on again applied on 11kV Rajgadh Feeder of Anarmani distribution system, Jhapa, Nepal is analysed. The result shows, at 20% and 40% penetration, voltage at minimum voltage bus can be improved from 0.74 pu to 0.86 pu and 0.9 pu with 52% and 76.4% loss saving respectively. According to finding, 40% PV penetration at bus number 30 gives best result for Rajgadh feeder. The use of inverter that offer both active and reactive power can solve the problem of low power factor in the supply grid, also capacitor bank can aid in the improvement of reactive power.

Keywords:

penetration level, probability density function, voltage ratio

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Kinetics of Manganese Removal using Different Proportion of BIRM and Katalox

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Abstract:

Research shows that long exposure to manganese from drinking water may cause problems with memory, attention, and motor skills and also may result in learning and behavior problems in infants. According to NDWQS the maximum limit of manganese concentration in drinking water must be below 0.2 mg/l. Drinking water with high concentration of manganese can severely stain fixtures and laundry as well as increase turbidity and foul tastes. In some event when the concentration is very high it can cause a decrease in consumer confidence in the quality of water provided to their taps. Currently, there is no other treatment method that can remove manganese efficient and economical way as the oxide coated media filtration.

The removal of soluble manganese in sub surface water by catalytic oxidation while passing through the manganese dioxide coated media is carried out in various drinking water schemes, although the kinetics of removal of manganese using BIRM and katalox light has not been investigated. Proportionate depth of BIRM and katalox light for effective removal of manganese was determine using three pilot scale non pressures down flow reactor column. The water with constant discharge of 0.1 lps passing through the layer of BIRM and katalox with effective size 1.24 mm and 1.23mm respectively, the efficiency of removal for three combination of media from higher to lower depth was found to be 100%, 98.46% and 45.68% respectively. But the filter run time before the clogging and overflowing of reactor was found out to be 180 min 270 min and 315 min from higher to lower depth respectively.

Keywords:

BIRM, Katalox Light, Manganese, Catalytic Oxidation, Manganese dioxide

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GIS Modelling for Optimal Alignment Selection: A Case Study of Karputar to Yamdi Section, Midhill Highway

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Abstract:

Selection of highway alignment involves a number of technical issue, economic issues, environmental issues, interest groups, and agendas that are frequently observed during road alignment selection. This research work considers slope, aspect, geology, land cover, conservation area, existing roads, drainage order, land use such as agricultural land, settlement area, water or stream bodies as governing criteria for alignment selection which are further divided into three themes i.e. Technical, Economical and Environmental. Weightage assigned to the criteria map is based on expert questionnaire survey and is derived from Analytical Hierarchy Process (AHP). Search for the optimality of alignment is from the Least Cost Path Analysis (LCPA) using Geographic Information System (GIS) application. The shortest route connecting two points Karaputar and Yamdi is obtained when Technical theme is preferred.

Keywords:

Alignment, Analytical Hierarchy Process , Least Cost Path, Geographical Information System

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Optimal Techno-Commercial Analysis on Electricity Consumption of Industry by Grid Integrated Hybrid Power System

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Abstract:

This paper presents modeling, simulation, optimization and sensitivity analysis of renewable energy-based hybrid power system in confectionery product manufacturing industry. Two different models configured by considering grid/PV/diesel generator as model-I and grid/PV/BESS/diesel generator as model-II for particular industry site. Homer grid software tool is used for simulation optimization analysis by investigating techno-economic and environment performance of proposed system. The optimal simulation results reveal that hybrid model with BESS is feasible techno-commercially with total annualized cost (TAC) and levelized cost of energy (LCOE) NRs. 1,10,38,088 and NRs. 9.23/KW hr respectively. The optimal designed components added with existing grid transformer 630 kva, diesel generator 580kva are PV rated size 316kW, useable BESS nominal capacity 326 KW hr and hybrid converter size 293kW with inverting/rectification operation time 76 and 24% respectively. Different sensitivity variables considered as grid interruption frequency/duration, renewable energy fraction (REF), battery state of charge (SOC), and autonomy hour to make model selection decision. Financially model accepted with simple payback period (SPP) and discounted payback period (DPP) 1.7 year and 1.9 year respectively with return on investment (ROI) 49.4%, Internal rate of return (IRR) 57.8%. From an environment point of view, hybrid model with BESS showing best performance with total carbon emission saving 135114.7kg/year equivalent to 23.21%. The paper highlights significant role of battery-based PV hybrid renewable energy system (HRES) to deliver reliable electricity supply in product manufacturing industry by considering quality power, plant productivity and product waste recovery.

Keywords:

Total annualized cost, levelized cost of energy, renewable energy fraction, state of charge, hybrid renewable energy system

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Flood Map Delineation of Narayani River Using HEC-RAS, HEC-GEORAS and ARC-GIS

Krishna Aryal^a, Mukesh Regmi^b

Abstract:

This paper is based on the one-dimensional hydrodynamic model simulation of flood map of one of the largest river basins i.e. Narayani River floodplain, located in the Central zone of Nepal. The study area covers around twenty kilometers of the flood area located at the upper stream of the bridge section in East West Highway of Narayani River. The Trishuli and the Kaligandaki are thus considered as our tributaries to calculate the catchment and for the flood model analysis. The precipitation data collected from Department of Hydrology has been used to calculate the four scenario (100, 200, 500 and 1000 years) flood analysis from Gumbell method. Contour lines were plotted in the Google Earth and the maps were extracted using ARCGIS by downloading terrain file from ASTER DEM website. The digital model is then developed through ARCGIS by feeding the Gumbell analyzed flood data using flood depth as a hydraulic characteristic factor of flood.

The hydrodynamic model for mapping were developed using the Hydrologic Engineering Center River Analysis System (HEC-RAS) in concert with HEC-GeoRAS. HEC- GeoRAS set procedures, tools, and utilities for processing Geographic Information Systems (GIS) data by using a graphical user interface on a GIS platform. Automated GIS processing procedures in HEC-GeoRAS provided a useful and expeditious method for repetitive hydraulic model development during analysis of the Narayani River Flood Plain. Reach length, stream centerline, main channel bank, flow path lines, cross drainage structures and cross sections have been determined using HEC-RAS. The resultant water depth exported from HEC-RAS simulations has been processed by HEC-GeoRAS for flood inundation delineation and hazard map generation. Finally, as per the discharge taken for four scenario (100, 200, 500 and 1000 years) different flood Map zone has been prepared and the inundation area has been identified.

Keywords:

Hydrodynamic Model, Narayani River Floodplain, Flood Map, Gumbell Method, ARCGIS, HEC-RAS, Inundation Area

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Residential Satisfaction of post-disaster resettled communities: A Case of Thakle Integrated Settlement

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Abstract:

Nepal being one of the most disaster-prone countries followed by the demographic spread of the settlements, the need for resettlement in safer areas is prominent. Contrary to the popular belief that resettlement would improve the well-being of the people, the resettlement projects have largely failed to meet the long-term aspirations of the community ignoring their physical, socio-cultural, and economic needs. Despite huge investment and policy provision, the resettlement approach after Gorkha Earthquake has met with controversies and limited outcomes, and the residents have either abandoned or modified the housing provided to them. Various stakeholders such as the Local Government, Users Committee, and also National Reconstruction Authority claim Thakle Integrated Settlement to be a successful resettlement approach. However, there is a need to carry out the assessment of long-term user satisfaction of the resettled households over a period of time to determine the extent of its success. Thus, the study seeks to examine the residential satisfaction of the housing provided in the resettlement site to the displaced community and explore factors influencing housing modifications. Using 5 - point Likert scale, the residential satisfaction of 30 resettled households in Thakle Integrated Settlement was examined which was analyzed and compared with the resident's response through modifications evident from direct observation or Interviews. Findings from the study revealed that the residents were highly satisfied with Planning and design; Construction quality and technology; Plot Size; Building Material; and Architecture Style; while the reverse is true for the number of rooms; and Thermal comfort. The high satisfaction for Planning and design; Construction quality and technology; Building material can be attributed to the resident consultation in the planning and construction phase by the implementing agency. The low thermal satisfaction is due to the lack of consideration of climate-responsive building materials and construction technologies suitable to the local context. Despite greater plot satisfaction expressed, housing modification is an evidence of response to the dissatisfaction of the residents with the plot size, which largely failed to meet their physical, social, and cultural needs. The study concludes that the mismatch between the actual need of the resident and the houses provided resulted in the housing modifications by the households.

Keywords:

Resettlement, Residential Satisfaction, Housing Modification

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Power Quality Improvement Using Shunt Active Power Filter

Nimesh Risal^a

Abstract:

Shunt Active Power Filters are widely used for the reduction of harmonics in the power system caused by nonlinear loads. This document presents the design and simulation of Shunt Active Power Filter (SAPF) MATLAB/Simulink . The SAPF designed operates on the principle of the instantaneous power strategy or the p-q strategy and also serves to provide reactive power compensation and eliminate the neutral current.

Keywords:

Voltage control, Voltage Support, optimal control, microgrid

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Comparative study of Reinforced Concrete Structure by Non-Linear Static Pushover Analysis considering Behaviour of Fixed-Base and LRB-Base Isolator

Pradeep Ramtel^a, Bikal Bastakoti^b

Abstract:

The present study focuses on the seismic performances of mid-rise Reinforced Cement Concrete (RCC) frame buildings using Non-linear Static Pushover Analysis. All frame buildings were modeled, analyzed, and assessed for seismic loading using ETABS software. The building models were evaluated while considering changes in three building characteristics: Aspect ratio, Storey height, and Base support. ASCE-41 code provided auto-generated hinges for the structural members and was also used to project displacement monitored base shear curve for target displacement of 250mm. Moreover, Uniform Building Code (UBC) was used to model and design the Lead Rubber Bearing (LRB) system for buildings with base-isolation system. The resulting base shears, plastic hinges, and performance points of the analysed building provided the data for evaluating the building's seismic performance.

Keywords:

Base Shear, Lead Rubber Bearing, Plastic hinge, Pushover, Target Displacement

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Nitrification Efficiency Variation of Ground Water by using Sponge Media in Single and Series Reactor

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Abstract:

Groundwater is used as the major source in Kathmandu valley. Groundwater quality is found to be degraded from various anthropogenic and natural sources. Threat to the groundwater remains in the Valley due to over-extraction and population growth. Nitrogen contamination of groundwater has become one of the major issues. This research was conducted to study the efficiency of ammonium nitrogen oxidation in the single and series reactors using sponge media. Nitrification was performed at the varying hydraulic retention time. pH in the range of 6.7 to 8.9 and Dissolved Oxygen (DO) in the range of 2.5 to 5.7 mg/l was recorded throughout the study period. The temperature of all the reactors was maintained constant at $25 \pm 2^\circ\text{C}$ throughout the research. The alkalinity of raw water influent ranges from 882.47 to 980.07 mg/l. The alkalinity of the raw water sample was higher enough to carry out the nitrification. The concentration of ammonium nitrogen varied from 96.81 mg/l to 125.12 mg/l in the initial storage tank. The average ammonium nitrogen conversion efficiency was found to be 99.43% and 66.03% for Series Reactor (RSE), 27.41% and 13.01% for Blank Series Reactor (RSB), 96.55% and 61.72% for Single Reactor (RS) and 24.27% and 9.35% for Single Blank Reactor (RB) at HRT of 9.123 and 1.824 hrs respectively. The maximum conversion of ammonium nitrogen is found to occur at the Hydraulic Retention Time (HRT) of 9.123 hrs as the contact with oxygen and the bacteria is high during this time period as compared to the HRT 1.824 hrs. The ammonia conversion performance is found to be high in the case of series reactors as compared to the single reactor. The series reactors are more effective in the conversion of ammonium nitrogen than single reactors.

Keywords:

nitrification, groundwater, ammonia, sponge, single and series reactors

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Impacts of Photovoltaic Penetration on Transient stability of Power System

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Nawaraj Kumar Mahato^c, *Binod Tamang*^d

Abstract:

The increased penetration of solar generation in the traditional power grid may changes the transient characteristics of it as they are connected to the grid through technologies different than traditional power system. In particular, the Critical Clearing Time (CCT) which is very necessary for performance of protective system during transient period are affected due to the increased penetration of non-synchronous generators. This paper studies transient stability analysis of power system and the impacts of photovoltaic (PV) penetration on it in a standard IEEE 9 bus test system. The Simulink model for the transient stability of IEEE 9 bus test system is prepared in MATLAB and Simulink environment. Three-phase fault is considered in the study and rotor angle stability is analyzed through multiple simulation. CCT is used as index to analyze the transient stability analysis of IEEE 9 bus test system for base case and Transient Stability Index (TSI) is used for the comparison of the transient stability in different cases i.e. with and without PV in the system. It is found that transient stability depends on duration of fault, location of fault as well as power in that location. The transient stability of the power system in critical locations been reduced by the integration of PV in the system whereas it has improved in other locations.

Keywords:

CCT, PV, rotor swing, Transient Stability Analysis (TSA), TSI

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Craft Conservation and Tourism Development (A case of Patan)

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Abstract:

In conservation vs development dilemma, conservation-led development has appeared as a compromised discourse by improving the quality of life and creating economic benefits at one hand and guaranteeing the conservation of cultural heritage, in particular intangible cultural heritage at another hand. In recent years, there is an increase in the concern about understanding the local ways of life and has motivated the conservation of intangible heritage, for example in Lalitpur. The concern has also contributed to the continuity of the declining traditional craftsmanship, as a domain of intangible heritage conservation and supplement discourse of conservation led development.

In Lalitpur, there have been demands for traditional crafts of tourist, and as such is a motivating force to regenerate the traditional craftsmanship. In this regard, the attempts to explore how traditional craft and skills promotion can contribute to conservation, which finally leads to tourism development in Lalitpur core?

The article is based on the case study conducted on four neighborhoods' in Lalitpur: Bhenchebahal, Okubahal Sundhara; Haugal Tichhugally. Both qualitative and quantitative data were collected through sample survey (interviews and questionnaire respectively). The data were analyzed statistically has the discussion; finding and recommendation has come out with the product development; enhance socio-economic and improve the quality of life of craftsman. The research found there is the relation between the intangible heritage conservation, public participation, and tourism has to promote touristy that ultimately lead to the overall local development with craft within the Lalitpur core.

The article concludes that the craft conservation and tourism are constitutive. Tourism can regenerate the organic relationships of crafts with the changing life conditions for conservation by enhancing the local economy, maintaining identity. The article recommends to prioritize the craft conservation as the focal area in developing different development strategies in case of Lalitpur.

Keywords:

Resettlement, Residential Satisfaction, Housing Modification

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Water Quality Calibration of Bagmati River using QUAL2Kw

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Abstract:

Qual2K, a one-dimensional water quality modeling software, was used for calibration of water quality of Bagmati River. The study was done for river stretch of 9.5 km from Khokana to Katuwal Daha. DO, CBOD, pH and Temperature were calibrated using the data collected on 27 October, 2021. The variation in measured data of four selected stations from khokana to katuwal daha were very high. DO increased from less than 1mg/l to 6mg/l and CBOD decreased from 92 mg/l to 14 mg/l. The measured data and model predictions were in reasonable agreement. The coefficient of determination (R^2) between the simulated and observed values for temperature, pH, DO, and CBOD, were 0.758, 0.816, 0.960 and 0.936 respectively.

Keywords:

Water Quality, Qual2K, Calibration, Bagmati River

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Reservoir Sustainability and Sediment Management - Case Study: Kimathanka Arun Hydroelectric Project, Shankhuwasabha, Nepal

Prabesh Kshetri^a

Abstract:

Sediment deposition decreases the storage capacity of a reservoir and affects many project's economy and sustainability. Kimathanka Arun Hydroelectric is proposed as PRoR project located in the north-east part of Nepal. It is located in the Himalayan region with inflow, which has high sediment concentration, coming entirely from Tibet. This study presents sediment management of KAHEP reservoir by passing the sediment through the dam body via hydraulic flushing with 1-D HEC-RAS model. Simulation of 25 years gave an average flushing days of 7.6 days per year. Regular flushing was done at a flood of 800 m³/s whereas force flushing was triggered at 1000 m³/s. The simulation, using the flushing model, showed further increase in flushing days has little impact in sediment deposition.

Keywords:

Sediment deposition, Sediment flushing, HEC-RAS, Reservoir Sustainability

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Study on Effect of Flow Rate and Number of Blades on Sizing of Archimedes Screw Turbine

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Sujan Gurung^d, Sujan Subedi^e, Durga Bastakoti^f,*

Abstract:

The study of Archimedes Screw Turbine (AST) as a micro and Pico hydro turbine is in increasing trend. This turbine is applied to low water flow conditions and for head lesser than 10 meters. The purpose of this study is to assess the effect of flow rate and number of blades on the sizing of an AST. The research is done by reviewing the existing empirical relations relating flow rate with design parameters such as inner radius, outer radius and pitch. It also presents the effect of flow rate on torque and efficiency of an AST through Computational Fluid Dynamics (CFD) simulation in ANSYS software. The highest torque of 5.63 Nm and the highest efficiency of 52.1 % are obtained at the flow rate of 40 litres per second. It is found that the trendline of flow rate vs torque curve is a line with positive slope. The trendline of flow rate vs efficiency curve also is a line but with less positive slope.

Keywords:

Archimedes, Computational-flow-dynamics, Flow-rate, Screw Pump

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Comparative study of Variable Air Volume and Variable Refrigerant Volume for Automotive Workshop

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Sandesh Poudel^d, Divyanshu Kr Shekhar^e, Durga Bastakoti^f*

Abstract:

The purpose of this study is to compare Variable Air Volume (VAV) with Variable Refrigerant Volume (VRV) air conditioning systems, as well as to determine the thermal comfort conditions in a Tyre Retreading Center. The air conditioning systems (AC) are created with OpenStudio software and simulated to determine overall energy usage under various load scenarios. It was found out that VRV system was the most efficient in comparison to VAV system with regards to energy saving. The most suitable system for tyre retreading center was examined, and it was discovered that the VRV system was the most energy efficient. The most suitable system for tyre retreading center was discovered to be the ceiling cassette type VRV system.

Keywords:

Air-conditioning, Refrigerants, Automotive, Workshop, Variable Air Volume, Variable Refrigerant Volume

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Impact on the radial distribution feeder with optimally located Electric Vehicle Charging Station and PV integrated Energy Storage System

Ananda Sapkota^a, Prabhat Kumar Pankaj^b

Abstract:

With the increasing demand of EVs, requirement for the charging stations at the urban areas is undeniable. With the installation of the fast charging stations, the existing high loaded feeders can face the technical issues with higher voltage drop and losses. So, with the proper planning the optimal location for the installation needs to be determined. This paper studies the impact of the EVCS on the distribution feeder (11kV) with its optimal positioning and sizing with Particle Swarm Optimization (PSO) with the probabilistic evaluation of the EVCS load curve for Devinagar feeder of Yogikuti substation. With the placement of the EVCS on Devsiddha Khanepani there is decrease in the voltage profile from existing 0.919pu to 0.909pu and increase in the system loss by about 10.3kW at peak. Based on the nature of load: residential and commercial, two EVCS locations is determined at Devsiddha Khanepani and Hotel Namu Buddha agadi. Also, the system is analyzed with the optimal positioning for EVCS integrated with ESS to reduce the impact of EVCS at peak. The results shows that both technically and financially the PV system with ESS is more viable with IRR and payback period of 15.79% and 17.51years compared to the previous case with IRR and payback period 10.27% and 22.56years respectively.

Keywords:

EV, EVCS, Forward/Backward Sweep, Monte-Carlo simulation, PSO

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Gender Equality and Social Inclusion(GESI) in Decision Making in DRRM Policies in Nepal

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Abstract:

Disasters do not differentiate but the impact of disasters are. The impact of disaster does not only depend upon its nature but also on the economic, social and cultural factors. Not every member of the society is affected the same way. Women, person with disabilities, gender minorities, LGBTIQ community and other excluded groups are considered vulnerable by the Constitution of Nepal, 2015. Vulnerable people are disproportionately affected by disasters. But their role in decision making is crucial. Government of Nepal has formed various acts, policies and strategies for Disaster Risk Management. GESI provisions in decision making are identified on some of them.

Keywords:

gender, disaster, decision-making

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Seismic Performance of Stone Masonry building of Jumla District

Dewakar Acharya^a, Haridarshan Shrestha^b

Abstract:

Seismic performances of the stone masonry mud mortar building are highly vulnerable as from observation from the Past 2015 Gorkha Earthquake So seismic assessment of present stocks of stone masonry building is very important. Jumla district beings located in the western region of Nepal (where earthquakes of greater magnitudes is expected to occur in near future) consist of huge stocks of stone masonry mud mortar building .Presence of wooden seismic band, large opening in the ground floor ,flexible nature of diaphragm and presence of unsupported gable wall (which act as cantilever in lateral load)is the key characteristics of building found in this region .On performing the seismic analysis of representative building it was found that out plane failure of wall with gables was found to be most critical and governing failure mode of the building .Yielding of such critical wall was found at the pushover load of 0.3g (peak ground acceleration (PGA) for 475 year return period NBC 105) while complete failure of wall at pushover load of 0.586g which conclude that the gable wall are highly vulnerable whose overturning is the governing mechanism of failure.

Keywords:

Out-Plane Walls, In-Plane walls,Concrete Damage Plasticity Model

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Public Private Partnership in the field of Housing for New Settlement Planning and Development: Case of Nepal

Nistha Nakarmi^a, Sushil B. Bajracharya^b, Sangeeta Singh^b

Abstract:

With nearly 50% of its population living in urban area, Nepal now has a pressure to provide access to basic infrastructure and planned urban development (MOUD, 2017). Vision for 2030 for urban development strategy includes 50% of new residential area to be developed through land readjustment process and 15% of the total requirement of housing through organized housing (both private and public sector) and clearly mentioning Private/cooperative sector supplying housing for the poor in large towns. The strategy for which includes encouraging private sector by activities like review and developing relevant incentive and facility package like land / infrastructure so as to provide housing to economically weaker strata (MOUD, 2017). The vision is indicative of incorporating public private partnership (PPP), however, detailed strategies and activities to achieve it is not clear. The paper therefore, aims in presenting Public private partnership as a way to ensure sustainable way for new settlement planning and development. Case study methodology has been used in the research with analysis of cases of public, private and partnership. The study findings reveal deficit upscaling of housing projects and public private partnership as a strategy to effectively address the housing demand in sustainable way. The contextual framework for PPP in housing sector has been proposed for the case of Nepal.

Keywords:

PPP, Planned settlement, Real estate development, Public sector, Private developers

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Characterizing the Hydrologic Response of a Mountainous Basin: A Case Study of Marsyangdi River Basin

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Abstract:

Understanding the hydro-climatic conditions and rainfall-runoff behavior in a data-scarce mountainous river basin has been a challenging issue for hydrologists and planners. In this study, Soil and Water Assessment Tool (SWAT) has been used to characterize the hydrological responses of Marsyangdi basin at spatial and temporal scale, indicated by the water balance components. Flow, climate, topography, land use and soil type data along with their indicator (parameters) are used as model input to simulate the hydrological responses inside the basin. The basin was discretized into 27 sub-basins and 334 hydrological response units (HRUs). Calibration and validation were carried out at two hydrological stations, namely Bhakundebesi and Bimalnagar, using 13 years daily streamflow data. TLAPs (snow related parameter) was found to be most sensitive to streamflow in this snow-fed river basin. The hydrological model performance ranked “very good” during entire simulation period as indicated by the values of three statistical indicators: Nash–Sutcliffe efficiency (NSE), percent bias (PBIAS), and coefficient of determination (R^2). The low flows have been well captured at both station during the entire simulation. Average annual water yield and evapotranspiration of the basin constitutes 65% and 27% of the precipitation (2157.5mm). The maximum and minimum flow occurs at August and March respectively. Higher water yield was observed in the central part of the basin. This study demonstrated the applicability of SWAT in mountainous river basins with complex topography and diverse hydro-climatic conditions. Our results are useful for planners and decision makers in developing strategy for the development of water resource sector of the basin.

Keywords:

Hydrological model, Marsyangdi, mountainous basin, simulation, SWAT

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The Differentiated Impact of the Gorkha Earthquake on Richer and Poorer Households

John Friberg^a, Sushil Bajracharya^b

Abstract:

This study uses research from the aftermath of the 2015 Gorkha earthquake in Nepal to document and quantitatively compare the differentiated impacts of the disaster on richer and poorer households. The economic impact on a household is taken as the proportion of household wealth lost in the disaster event. Through this measure the implications for affected households can be appreciated more clearly, especially when seen in relation to a level of income and wealth considered minimally necessary for an acceptable standard of well-being in the specific context. Poorer households are seen to suffer greater impacts, with significantly greater proportional losses of their wealth, even though they least of all can afford it. The research methodology used participatory approaches to develop typical profiles of households representing different segments of the community, from those who are least affluent to those who are better-off. In the pressing circumstances of community emergencies, taking local perspectives on the economic environment in this way, through broad-brush, representative input, may often best meet the need at hand. The numerical indication of household economic impact allows for meaningful comparison and consideration of contributing factors. While this straightforward parameter serves the goals of operational disaster-related efforts, it could also lead to further conceptual approaches.

Keywords:

disaster impacts, household economic vulnerability

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Assessing Institutional Involvement and People's Perception towards Urban Greenery: (A case of Lalitpur City)

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Abstract:

The urbanization in the modern age has had a huge impact on the environment, reducing green space and its greenery and threatening human wellbeing. Visual relief, seasonal variation, and a connection to the natural world are all provided by urban vegetation. They are also necessary for a higher quality of life and sustainable development. Also, they are important for the better quality of life and sustainable development. Cities are livable when there are more social interaction, public open spaces provide social space and cultural space, which makes cities livable. Creating greenery and space to foster and inspire a relationship with the environment while also providing essential services. Local authorities are already in promoting and sustaining greenery in cities. The research report further can be used by the municipality office, urban researchers and others as a strong reference to address the problems regarding the urbanization and the demand of urban greenery in the valley. The research's main purpose was to assess the extent of urban greenery in the Lalitpur Metropolitan City. The specific objective was to assess the people's perception towards urban greenery identifying the different institutional involvement responsible for the management of urban greenery. The research was conducted in the Lalitpur Metropolitan city of Lalitpur district.

The study found that not everyone was aware of the benefits of urban greenery, and that people were less likely to participate in urban greenery activities. A survey of city residents and visitors to an urban park was conducted. The majority of respondents held favorable perceptions of urban greenery and were aware of the benefits it provided. The involvement of various government and non-governmental organizations in promoting urban greenery was found in one way or the other. Local government too seemed active in urban greenery programs but still no particularly one section bears the full responsibility. No accompanying legislation or regulations governing urban greenery existed. The research showed that further tangible scientific and professional learning is needed to sustain the city's greenery for its long-term survival.

Keywords:

Greenery, urbanization, institutions, awareness, perception

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Machine Learning based DDoS Detection System in Software-Defined Networking

Divos Karki^a

Abstract:

Software-defined networking (SDN) is a novel networking paradigm that, through an abstraction of network plans, bifurcate the control plane and data plane, and thus providing a flexible, programmable, and dynamic architecture over traditional network. The separation of the control plane and data plane has brought significant network dynamism but still is liable to security vulnerabilities. One of the significant threats is Distributed Denial of Service (DDoS) attack, utilizing the separation of the control plane and data plane, which has been a novel challenge to overcome in SDN. In this paper, a comparative analysis of Random Forest (RF), K-Nearest Neighbor (KNN), Support Vector Machine (SVM), and Naïve Bayes (NB) are done on the basis of accuracy, precision, recall, and execution time on CICDDoS2019 and synthetically generated dataset in the SDN environment. The overall performance of RF and KNN is significantly better but their execution time is higher than other algorithms. SVM performance is better if the tradeoff between the accuracy and execution time is taken into consideration. Thus, machine learning algorithms perform significantly well in detection of DDoS at SDN environment if consideration is given to suitable feature selection.

Keywords:

SDN, Security, DDoS, Machine learning algorithm

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Energy Generation from Speed Breaker

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Abstract:

Energy has become the most essential requirement in human beings' life. So, alternative renewable resources should be properly utilized to harness energy. Energy can also be generated from speed breakers by using spring, crankshaft, chain sprocket, and generator arrangement on vertically movable speed breakers. The reciprocating motion of speed breaker when a vehicle passes over it processes to rotate crankshaft connected with chain sprocket and finally shaft coupled with generator shaft to produce energy. The energy is conserved in the battery. This process involves two-way energy production during speed breaker motion downward and upward direction.

Keywords:

Crankshaft, chain sprocket, reciprocating

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Lubhu a Traditional town - Potential for Conservation and Development

Shova Thapa ^a

Abstract:

Lubhu is the small Newari settlement which is about 6-Km east of Mangal Bazar, Patan. The settlement still shows the strong historical and cultural characteristic. Presently the settlement is facing the same problems of other traditional settlement of Kathmandu Valley. The settlements have various cultural as well as architectural elements which are today degrading due to modernization, negligence and lack of awareness regarding its importance. Apart from that settlement well known for their specialized production of Textile is in a serious degeneration due to decline in economic shift. Also it is under threat of diminishing service center role. In other words, the settlement is under the grip of limited economy. The degrading living condition is reflected by lacking of water supply, sanitation and poor housing.

So in this context the conservation and Development of Lubhu is carried out to preserve the historical and architectural importance and at the same time analyze the possible approaches for its Development. The situation analysis on physical, cultural and economic areas helped to know the settlement from different aspect. Similarly, participatory planning process of conservation brought different areas and stakeholders into policies and conceptual plans for and interrelationships. Finally, the study arrived with the policies and conceptual plans for conservation and development covering capacity building, plans regarding socio-cultural, economic areas and infrastructures. It is hoped that the study will be beneficial to the community and those who want to undertake further research in the area.

Keywords:

traditional settlement, textile city, conservation, development, conceptual plans

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