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Presentación

En su segundo año de vida, se publica la cuarta edición del Boletín *Inteligencia Tecnológica* que tiene como objetivo difundir los resultados y experiencias que se obtienen en el mundo científico y empresarial que día a día aportan a los procesos de innovación. Además, constituye una vía de divulgación e intercambio de información entre empresas, centros de investigación, sociedades técnicas e instituciones gubernamentales, y se centra en temas de interés para el desarrollo de infraestructura en México.

Es producto del trabajo de los participantes en el tercer Programa de Aceleración del Conocimiento en Inteligencia Tecnológica de la ahora Unidad de Inteligencia Tecnológica Competitiva de la Alianza FiiDEM, A.C. En esta ocasión se enfoca en: Metodologías para la Gestión de Riesgos en Centrales Hidroeléctricas.

Presenta una recopilación de artículos publicados o desarrollados entre febrero y agosto 2012 y patentes que fueron publicados de 2007 a 2012, así como eventos a realizarse en los próximos meses en torno a dicho tema.

Para nosotros es muy importante contar con su retroalimentación de manera que podamos seguir integrando un producto a la medida de sus necesidades.

Unidad de Inteligencia Tecnológica Competitiva
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ARTÍCULOS

Estado del arte para la evaluación de riesgo en la infraestructura eléctrica

Método de solución del modelo de riesgo de desbordamiento para presas de tierra

Hydrologic risk analysis relies on a series of probabilistic analyses, and it is a complex problem in estimating the probability distributions of multiple independent and random variables. The goal of this study is to presents the procedure and application of a probability-based risk analysis methodology to evaluate earth dam overtopping risk that induced by concurrent flood and wind. The uncertainty arising from initial water surface level, flood, wind velocity, and dam height are discussed in this research. The improved Monte Carlo simulation and mean-value first-order second-moment method are used to solve the proposed dam overtopping risk model, respectively. The nonparametric kernel density estimation method, which can better learn the complex multimodal characteristic of probability density function than that of traditional parametric estimation method, is employed to improve the probability density function of initial water surface level. The latin hypercube sampling is introduced to generate uniform random number, which improves the efficient and stability compared with simple random sampling. Afterward, an application to the Dongwushi Reservoir in China illustrates that the dam overtopping risk computed using the improved Monte Carlo simulation is lower than that using mean-value first-order second-moment method. Furthermore, the sensitivity analysis show that initial water surface level is more sensitive to overtopping risk than wind velocity.

Taranis: redes neuronales y agentes inteligentes en la alerta temprana contra inundaciones

The following article proposes the implementation of a system based on neural networks of CounterPropagation type and intelligent agents for analysis and assessment of the risk of flood caused by rain, in addition to the implementation of agents in mobile devices for the presentation of alerts. Because as is known, natural phenomena have always existed, but in recent years as a result of global warming we have seen that floods are becoming more frequent, which has forced the creation of specialized agencies and intelligent mechanisms to prevent the loss of human lives due to these phenomena.

Predicción de riesgo de falla en presas para la sustentabilidad de las cuencas de retención de inundaciones: Un caso de estudio en la amplia área metropolitana de Manchester

This study aims to provide a rapid screening tool for assessment of sustainable flood retention basins (SFRBs) to predict corresponding dam failure risks. A rapid expert-based assessment method for dam failure of SFRB supported by an artificial neural network (ANN) model has been presented. Flood storage was assessed for 110 SFRB and the corresponding Dam Failure Risk was evaluated for all dams across the wider Greater Manchester study area. The results show that Dam Failure Risk can be estimated by using the variables Dam Height, Dam Length, Maximum Flood Water Volume, Flood Water Surface Area, Mean Annual Rainfall (based on Met Office data), Altitude, Catchment Size, Urban Catchment Proportion, Forest Catchment Proportion and Managed Maximum Flood Water Volume. A cross-validation R2 value of 0.70 for the ANN model signifies that the tool is likely to predict variables well for new data sets. Traditionally, dams are considered safe because they have been built according to high technical standards. However, many dams that were constructed decades ago do not meet the current state-of-the-art dam design guidelines. Spatial distribution maps show that dam failure risks of SFRB located near cities are higher than those situated in rural locations. The proposed tool could be used as an early warning system in times of heavy rainfall.

Investigación práctica sobre el análisis de riesgo de inundación basada en IIOSM y la técnica difusa α-cut

Flood disasters are one of the most common and destructive natural hazards all over the world. In this paper, improved interior-outer-set model (IIOSM) based on information diffusion theory is introduced in detail to assess flood risk in an effort to obtain accurate analytical results that represent the actual situation. Then fuzzy α-cut technique is applied to calculate the fuzzy expected values under the possibility–probability distribution (PPD) calculated by IIOSM. Taking the value of α through-

out the interval (0, 1], we correspondingly get access to the conservative risk value (RC) and venture risk value (RV). Selection of α, RC and RV is dependent on present technical conditions and risk preference of different people. To illustrate the procedure of IIOSM and fuzzy α-cut technique, we employ them respectively to analyze the flood risk in Sanshui District, located in the center of Guangdong province in China. The results, such as risk value estimations, as well as fuzzy expected values, i.e. RC and RV under the given α-cut level, can reflect the flood risk quite accurately. The outcomes of this research based on IIOSM and fuzzy α-cut technique offer new insights to carry out an efficient way for various flood protection strategies.

Leer completo en: http://www.sciencedirect.com/science/ article/pii/S0307904X11006627

Metodología para la estimación de probabilidad de falla, por deslizamiento, en presas de gravedad de concreto en el contexto de análisis de riesgo

Dam safety based on risk analysis methodologies demand quantification of the risk of the dam-reservoir system. This means that, for a given initial state of the system, and for the several failure modes considered, it is necessary to estimate the probability of the load events and the conditional probability of response of the system for a given load event, as well as estimating the consequences on the environment for the obtained response of the system. The following paper focuses in the second of these probabilities, that is, quantifying the conditional probability of response of the system, for a given load event, and for the specific case of concrete gravity dams. Dam-reservoir systems have a complex behavior which has been tackled traditionally by simplifications in the formulation of the models and adoption of safety factors. The purpose of the methodology described in this paper is to improve the estimation of the conditional probability of response of the dam-reservoir system for concrete gravity dams, using complex behavior models based on numerical simulation techniques, together with reliability techniques of different levels of precision are applied, including Level 3 reliability techniques with Monte Carlo simulation. The paper includes an example of application of the proposed methodology to a Spanish concrete gravity dam, considering the failure mode of sliding along the rock-concrete interface. In the context of risk analysis, the results obtained for conditional probability of failure allow several conclusions related to their validity and safety implications that acquire a significant relevance due to the innovation of the study performed.

Leer completo en:http://www.sciencedirect.com/science/article/ pii/S0167473012000094

Distribución virtual de un sistema geográfico o medio ambiental para la evaluación de riesgo de ruptura de una presa

To improve working efficiency of the risk assessment of Dambreak in Barrier Lake, this paper employs theories and technologies of the distributed virtual reality and geographic information system (GIS) to construct a distributed virtual geographic environment system. The proposed web-based GIS system provides geographically distributed users with a shared virtual space and a collaborative platform in order to implement risk assessment work. A five-layer system framework was firstly designed to integrate and share geographically distributed resources as well as modeling procedures. Meantime some key technologies including distributed virtual scene modeling, mobile agent computing service and simulation analysis of dam-break flood routing, were discussed to offer a shared and interactive virtual collaborative work geographic environment. Finally, a prototype system was implemented to support risk assessment and impact analysis of dam-break in Barrier Lake.

Leer completo en: http://ieeexplore.ieee.org/xpl/login.jsp?tp=&a rnumber=6234374&url=http%3A%2F%2Fieeexplore.ieee.org%2 Fiel5%2F6227654%2F6233707%2F06234374. pdf%3Farnumber%3D6234374

Problemas sociales y de observación en las evaluaciones de riesgo de terremotos, y sus efectos para la mayoría de personas en riesgo

Losses from earthquakes continue to rise despite increasingly sophisticated methods to estimate seismic risk throughout the world. This article discusses five specific reasons why this should be. Loss of life is most pronounced in the developing nations where three factors — poverty, corruption and ignorance — conspire to reduce the effective application of seismic resistant codes. A fourth reason is that in many developing nations the application of seismic resistant construction is inadvertently restricted to wealthy, or civil segments of the community, and is either unobtainable or irrelevant to the most vulnerable segment of the public — the owner/occupiers of substandard dwellings. A fifth flaw in current seismic hazard studies is that sophisticated methodologies to evaluate risk are inappropriate in regions where strain rates are low, and where historical data are short compared to the return time of damaging earthquakes. The scientific community has remained largely unaware of the importance of these impediments to the development and application of appropriate seismic resistant code, and is ill-equipped to address them.

Leer completo en: http://www.sciencedirect.com/science/ article/pii/S0040195112001783

Evaluación de la vulnerabilidad física multi-riesgo utilizando una metodología basada en indicadores

Globally, many built-up areas are threatened by multiple hazards which pose significant threat to humans, buildings and infrastructure. However, the analysis of the physical vulnerability towards multiple hazards is a field that still receives little attention although vulnerability analysis and assessment can contribute significantly to risk reduction efforts. Indicator-based vulnerability approaches are flexible and can be adjusted to the different hazards as well as to specific user needs. In this paper, an indicator-based vulnerability approach, the PTVA (Papathoma Tsunami Vulnerability Assessment), was further developed to be applicable in a multi-hazard context. The resulting multi-hazard version of the PTVA consists of four steps: the identification of the study area and relevant hazards as well as the acquisition of hazard information, the determination of vulnerability indicators and collection of data, the weighting of factors and vulnerability assessment and finally, the consideration of hazard interactions. After the introduction of the newly developed methodology a pilot application is carried out in the Faucon municipality located in the Barcelonnette basin, Southern French Alps. In this case study the vulnerability of buildings to debris flows, shallow landslides and river flooding for emergency planning and for general risk reduction purposes is assessed. The implementation of the methodology leads to reasonable results indicating the vulnerable buildings and supporting the priority setting of different end-users according to their objectives. The constraints of the presented methodology are: a) the fact that the method is not hazard-intensity specific, thus, vulnerability is measured in a rather qualitative and relative way and b) the high amount of data required for its performance. However, the advantage is that it is a flexible method which can be applied for the vulnerability analysis in a multi-hazard context but also it can be adjusted to the user-specific needs to support decision-making.

Fuente: *Applied Geography*, vol.32, issue 2, March 2012, pages 577–590. M.S. Kappes, M. Papathoma-Köhle, and M. Keiler, Austria.

Leer completo en: http://www.sciencedirect.com/science/article/pii/S0143622811001378

Cálculo de la probabilidad de falla de la estructura hidráulica para una hidroeléctrica rural

The failure probability is one of the two elements of risk; the correct calculation of failure probability is a premise that risk management of Rural Hydropower is implemented in China. The operational status of hydraulic structures for Rural Hydropower was firstly evaluated comprehensively; then the correlation between operational status and failure probability of hydraulic structures was used to complete a calculation of failure probability. Indices which are closely related to behaviour of hydraulic structure for Rural Hydropower were selected to establish a comprehensive evaluation index system; and the operational status of hydraulic structures was evaluated by using linear weighted comprehensive evaluation model.

Fuente: *Procedia Engineering,* International Conference on Modern Hydraulic Engineering, vol. 28, February 2012, pages 161–164. Jiang Chao, Sheng Jinbao, Zhang Guodong, and Xu Guanglei.

Leer completo en: http://www.sciencedirect.com/science/article/pii/S1877705812007096

Análisis de incertidumbre de inundaciones de ríos y riesgos de falla de presas usando cálculos locales de sensibilidad

This paper assesses the potential of Local Sensitivity Analysis (LSA) for uncertainty analysis with respect to two major types of risk in river hydrodynamics: flash flood and dam failure. LSA is com – pared to a Global Uncertainty Analysis (GUA) consisting in running Monte Carlo simulations with the hydrodynamic model of a hypothetical river reach. The local sensitivity is assessed using an equation – based method in which the sensitivity equations of the flow problem are first derived and then solved for nominal values of the parameters. For a given statistical distribution of the model input parameters, the first two statistical moments (mean and standard deviation) of the output variables are estimated with the two methods and compared. For all the test cases, LSA provides very similar results to GUA while requiring only one simulation instead of several hundreds or thousands. For the flood propagation problem, the uncertainty analysis is performed with respect to the maximum intensity of the flood, that is the maximum value of the upstream input discharge. For variations in maximum input discharge of up to $\pm 80\%$, it is shown that the differences between results obtained from LSA and GUA remain smaller than 1.6% of GUA estimates for output mean and than 4.5% for output standard deviation. For the challenging dam-break problem, a one-at-a-time analysis is first performed for the main three parameters separately (initial water depth in the reservoir, bottom slope and friction coefficient). In this case again, the mean and standard deviation estimated with LSA are close to GUA in the whole domain except at the flow discontinuity (moving shock due to the breaking of the dam) where it is over-estimated. For example, the relative error on the standard deviation of output water depth as assessed by LSA with respect to GUA is less than 35% even when the input water elevation in the reservoir varies by up to ± 8 m (i.e. $\pm 80\%$), and remains smaller than 9% when excluding 4 m of length across the discontinuity. When all three parameters are considered uncertain concurrently, the relative error remains smaller than 4.5% even when the parameters are allowed to vary by as much as $\pm 40\%$. This paper shows that, although the equations are not linear, the first order, local approach remains valid for uncertainty analysis of these hydrodynamics risks, even in the case of large parameter uncertainty. This approach also allowed to evidence the contrasts in importance of the various parameters on both sides of the shock.

Fuente: *Reliability Engineering & System Safety*, February 2012, Carole Delenne, Bernard Cappelaere, and Vincent Guinot.

Leer completo en: http://hal.archives-ouvertes.fr/hal-00670703/

PATENTES

Detección de peligros para gestión de activos

No de Publicación: 20120134527
Inventores: Culp James R. (Us); Fenhagen IV and Frank D. (Us); Hampapur Arun (Us); Liu Xuan (Us); and Pankanti Sharathchandra U. (Us)
Compañía: International Business Machines Corporation

An approach that detects locations of hazardous conditions within an infrastructure is provided. This approach uses satellite imagery, GIS data, automatic image processing, and predictive modeling to determine the location of the hazards automatically, thus optimizing infrastructure management. Specifically, a hazard detection tool provides this capability. The hazard detection tool comprises a detection component configured to: receive visual media containing asset location data about a set of physical assets, and hazard location data about potential hazards within a vicinity of each of the set of physical assets. The detection component further receives graphical information system (GIS) data containing asset location data about each of the set of physical assets. The hazard detection tool further comprises an analysis component configured to: analyze the visual media to determine if a hazardous condition exists for each of the set of physical assets; and apply the GIS data to the visual media to determine a location of hazardous conditions within the infrastructure.

Fuente: http://appft.uspto.gov/netacgi/nph-Parser?Sect1=PTO1&Sect2=HITOFF&d=PG01&p=1&u=%2Fnetahtml%2FPTO%2Fsrchnum.html&r=1&f=G&l=50&s1=%2220120134527%22.PGNR.&OS=DN/20120134527&RS=DN/20120134527

Método, programa informático, y sistema para la gestión de riesgos

No de Publicación: 8,010,387
Inventores: Porter Keith Alan (Us), and Beck James Leslie (Us)
Compañía: California Institute of Technology

The present invention comprises a method, computer program product, and system for risk management. The present invention includes calculating a statistic of loss per unit time, the statistic being a product of a site loss parameter and a loss given a loss-basis event. The site loss parameter is a site casualty parameter and/or a site economic parameter, while the loss-basis event is a casualty-basis event and/or an economic-basis event, non-limiting examples of which include an earthquake, flooding, wind, and blast pressure.

Fuente: http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO1&Sect2=HITOFF&d=PALL&p=1&u=%2Fnetahtml%2FPTO%2Fsrchnum.htm&r=1&f=G&l=50&s1=8010387.PN.&OS=PN/8010387&RS=PN/8010387

Método y aparato para predecir terremotos y tomar decisiones informadas sobre gestión de riesgos

No de Publicación: 7,280,920
Inventores: Whiteside Lowell S. (Us), and Kozuch Michael J. (Us)
Compañía:

A data-driven method and system to forecast earthquakes worldwide over a broad range of time (from days to years in advance). The system includes the compilation of a diverse set of historical geophysical and environmental databases, a program that determines correlations between earthquake occurrence and the state of other geophysical or environmental phenomenon, and a program to forecast earthquakes. The forecasts allow users to make informed risk management decisions.

Fuente: http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO1&Sect2=HITOFF&d=PALL&p=1&u=%2Fnetahtml%2FPTO%2Fsrchnum.htm&r=1&f=G&l=50&s1=7280920.PN.&OS=PN/7280920&RS=PN/7280920

EVENTOS

Enterprise Disaster Recovery / Business Continuity – Resilient Infrastructure 2012

6 de septiembre de 2012
Illinois, Estados Unidos
http://campconferences.com/events/2012/disaster_ data2.htm

XXV Congreso Latinoamericano de Hidráulica 2012

09-12 de septiembre de 2012
San José, Costa Rica
http://www.lad2012.org/

Jornadas Sudamericanas de Ingeniería Estructural 2012

19-21 de septiembre de 2012
Río de Janeiro, Brasil
www.coc.ufrj.br/jornadas

XVIII Congreso Nacional de Ingeniería Estructural y los Riesgos Naturales 2012

31 de octubre al 03 de noviembre de 2012
Acapulco, Guerrero, México
http://www.smie.org.mx/pdfs/folletoSMIECongresoNacional.pdf