International Scientific Committee

Prof. Dr. Hafize Keser  Ankara University
Prof. Dr. Steven M. Ross  John Hopkins University, USA
Prof. Dr. Mehmet Demokan  Bahcesehir University, Turkey
Prof. Dr. Senol Bektas  Near East University
Prof. Dr. Fahrettin Sadikoglu  Near East University
Prof. Dr. Dogan Ibrahim  Near East University, UK
Prof. Dr. Mohammad S. Obaidat  Monmouth University, USA
Prof. Dr. Adnan Kashman  Near East University
Prof. Dr. Angel Garido  UNED, Spain
Prof. Dr. Mehmet Karamanoglu  Middlesex University, UK
Prof. Dr. Nizamettin Aydin  Yildiz Technical University, Turkey
Prof. Dr. Huseyin Uzunboylu  Near East University, North Cyprus
Prof. Dr. Meltem Ozturan  Bogazici University, Turkey
Prof. Dr. Oya Kalpaz  Yildiz Technical University, Turkey
Prof. Dr. Rozhan M. Idrus  Universiti Sains, Malaysia
Assoc. Prof. Dr. Adem Karahoca  Bahcesehir University, Turkey
Assoc. Prof. Dr. Eddie YK Ng  Nanyang Technological University, Singapore
Assoc. Prof. Ergun Gide  CQUniversity Sydney, Australia
Assoc. Prof. Dr. Mehmet Erdem  University of Nevada, USA
Assist. Prof. Dr. Hany F. E.L. Yamany  Suez Canal University, Egypt
Assist. Prof. Dr. Havva Basak  Near East University, North Cyprus
Assist. Prof. Dr. Murat Tezer  Near East University, North Cyprus
Assist. Prof. Dr. Orhan Okcol  Bahcesehir University, Turkey
Assist. Prof. Dr. Sanjay K. Dhurandher  Netaji Subhash Institute of Technology, India
Assoc.Prof. Dr. Sevinç Gülseçen  İstanbul University, Turkey
Assist. Prof. Dr. Mustafa Ilkan  Eastern Mediterranean University
Dr. Simon Vogl  Studio Pervasive Computing Applications, Austria
Dr. Gregorio Hernandez-Zamora  National University of Mexico, Mexico
Dr. Sakip Kahraman  Bayburt University, Turkey
Suhas J. Manangi  Microsoft India, India
## Contents

A. Karahoca and S. Kanbul  
Message from the Guest Editors  
International Scientific Committee  

A. Marzban  
Improvement of reading comprehension through computer-assisted language learning in Iranian intermediate EFL students  

E. Asfoura, R. Neumann, G. Kassem and R. Dumke  
The identifying and adapting of FERP mall form and roles for more trust by marketing of distributed FERP components  

S. Chatvichienchai  
WCourEva: Web-based course evaluation system using XML technologies  

M. Kolli and Z. Boufaida  
A description logics formalization for the ontology matching  

D.S. Michele and L. Daniela  
Decision-support tools for municipal infrastructure maintenance management  

M.R. Jalilvand, S.S. Esfahani and N. Samiei  
Electronic word-of-mouth: Challenges and opportunities  

T.T. Olofintoye and F.F. Akanle  
The effects of e-mail, video and lecturing methods on sexual risk reduction among adolescents: Counselling for Hiv/Aids prevention  

G. Sendur, Ö. Özbayrak and M.A. Uyulgan  
A study of determination of pre-service chemistry teachers’ understanding about acids and bases  

M. Khajvand, K. Zolfaghari, S. Ashoori and S. Alizadeh  
Estimating customer lifetime value based on RFM analysis of customer purchase behavior: Case study  

S.A. Mostafavi and A. Afshar  
Waste load allocation using non-dominated archiving multi-colony ant algorithm  

E-survey (surveys based on e-mail & web) Analysis and identification of cold responsive proteins in Kohdasht spring wheat (Triticum aestivum)  

E. Kilic and E. Alpaydin  
Learning the areas of expertise of classifiers in an ensemble  

A comparative study of common and self-adaptive differential evolution strategies on numerical benchmark problems  

M. Keyvanpour and F. Merrikh-Bayat  
An Effective chaos-based image watermarking scheme using fractal coding  

T. Cevik, D. Yiltas and A. Halim Zaim  
Delay efficient STEM by pipelining
<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>K. Maleknejad, M. Nosrati Sahlan and P. Torabi</td>
<td>104</td>
</tr>
<tr>
<td>Low memory requirement and computational time method for solving a class of integral equations</td>
<td></td>
</tr>
<tr>
<td>M.M.I. Awad, M.S. Abdullah and A.B.M. Ali</td>
<td>110</td>
</tr>
<tr>
<td>Extending ETL framework using service oriented architecture</td>
<td></td>
</tr>
<tr>
<td>A.M. Abdalla, I.A. Saroit, A. Kotb and A.H. Afşari</td>
<td>115</td>
</tr>
<tr>
<td>Misbehavior nodes detection and isolation for MANETs OLSR protocol</td>
<td></td>
</tr>
<tr>
<td>F. Hamidi, M.K. Rostami and M. Rahimi</td>
<td>122</td>
</tr>
<tr>
<td>Comparing barriers to using learning resources among Iranian University students and instructors</td>
<td></td>
</tr>
<tr>
<td>F. Merrikh-Bayat and S.B. Shouraki</td>
<td>128</td>
</tr>
<tr>
<td>Memristor-based circuits for performing basic arithmetic operations</td>
<td></td>
</tr>
<tr>
<td>B.F. Klimova</td>
<td>133</td>
</tr>
<tr>
<td>Making academic writing real with ICT</td>
<td></td>
</tr>
<tr>
<td>F. Hamidi and N.N. Roohi</td>
<td>138</td>
</tr>
<tr>
<td>Manufacture and Validation of Paced Visual Serial Addition Test (PVSAT) for an Iranian Population</td>
<td></td>
</tr>
<tr>
<td>F. Hamidi, Z.M. Kharamideh and F. Ghorbandordinejad</td>
<td>144</td>
</tr>
<tr>
<td>Comparison of the training effects of interactive multimedia (CDs) and non-interactive media (films) on increasing learning speed, accuracy and memorization in biological science course</td>
<td></td>
</tr>
<tr>
<td>V. Paliktzoglou and J. Suhonen</td>
<td>149</td>
</tr>
<tr>
<td>Part-time online PhD reflection: Train of thoughts</td>
<td></td>
</tr>
<tr>
<td>A. Karouni, B. Daya and S. Bahlak</td>
<td>155</td>
</tr>
<tr>
<td>Offline signature recognition using neural networks approach</td>
<td></td>
</tr>
<tr>
<td>I. Semradova</td>
<td>162</td>
</tr>
<tr>
<td>Designing E-learning courses in humanities and their use in the interuniversity study programmes</td>
<td></td>
</tr>
<tr>
<td>M. Rahimi and S. Yadollahi</td>
<td>167</td>
</tr>
<tr>
<td>Foreign language learning attitude as a predictor of attitudes towards computer-assisted language learning</td>
<td></td>
</tr>
<tr>
<td>M. Rahimi and S. Yadollahi</td>
<td>175</td>
</tr>
<tr>
<td>Success in learning English as a foreign language as a predictor of computer anxiety</td>
<td></td>
</tr>
<tr>
<td>M. Rahimi and S. Fatemeh Hosseini K.</td>
<td>183</td>
</tr>
<tr>
<td>The impact of computer-based activities on Iranian high-school students’ attitudes towards computer-assisted language learning</td>
<td></td>
</tr>
<tr>
<td>Y. Hamidi, Y. Hamidi and S. Mehrbabak</td>
<td>191</td>
</tr>
<tr>
<td>Localization versus globalization of social networks</td>
<td></td>
</tr>
<tr>
<td>M. Rahimi and F. Asadollahi</td>
<td>197</td>
</tr>
<tr>
<td>Iranian students’ readiness for using podcasting in higher education: Access, familiarity, and experience</td>
<td></td>
</tr>
<tr>
<td>M. Rahimi and S. Yadollahi</td>
<td>203</td>
</tr>
<tr>
<td>Computer anxiety and ICT integration in English classes among Iranian EFL teachers</td>
<td></td>
</tr>
<tr>
<td>F. Merrikh-Bayat</td>
<td>210</td>
</tr>
<tr>
<td>Time series analysis of parkinson’s disease, huntington’s disease and amyotrophic lateral sclerosis</td>
<td></td>
</tr>
<tr>
<td>S. Khawandi, B. Daya and P. Chauvet</td>
<td>216</td>
</tr>
<tr>
<td>Implementation of a monitoring system for fall detection in elderly healthcare</td>
<td></td>
</tr>
</tbody>
</table>
Y. Hamidi
Rayeshgar: a calculator for prime numbers 221

F. Merrikh-Bayat
Low-cost numerical algorithm to find the series solution of nonlinear fractional differential equations with delay 227

F. Merrikh-Bayat and S.B. Shouraki
Programming of memristor crossbars by using genetic algorithm 232

M. Keyvanpour and F. Merrikh-Bayat
Robust dynamic block-based image watermarking in DWT domain 238

S. Hubackova and M. Ruzickova
Experience in foreign language teaching with ICT support 243

H. Saripan and Z. Hamin
The application of the digital signature law in securing internet banking: Some preliminary evidence from Malaysia 248

H. Bakhshizadeh, M. Hosseinpour and F. Pahlevanzadeh
Rural ICT interactive planning in Ardabil province: Sardabeh case study 254

M.F. Aqda, F. Hamidi and F. Ghorbandordinejad
The impact of constructivist and cognitive distance instructional design on the learner’s creativity 260

M.F. Aqda, F. Hamidi and M. Rahimi
The comparative effect of computer-aided instruction and traditional teaching on student’s creativity in math classes 266

A. Shokripour, M. Othman, H. Ibrahim and S. Subramaniam
A new method for job scheduling in a non-dedicated heterogeneous system 271

C.-C. Lin, H.-Y. Wu and Y.-F. Chang
The critical factors impact on online customer satisfaction 276

S. Kulluk, L. Ozbakir and A. Baykasoglu
Self-adaptive global best harmony search algorithm for training neural networks 282

V.M. Sivagami, N. Revathi and Dr.G. Sumathi
VoteGrid: A mobile ballot system for decision making in grid environment 287

M. Zeynali, A. Mollanejad and L.M. Khanli
Novel hierarchical routing protocol in wireless sensor network 292

R. Mohamad and T.S. Chong
An adaptive multimedia courseware for the students’ different cognitive styles: a pilot study for history subject 301

G. Şendur, M. Toprak and Esin Şahin Pekmez
An analysis of analogies used in secondary chemistry textbooks 307

H. Mohelska and M. Sokolova
The creation of the qualitative scenarios in the virtual three-dimensional environment second life 312

TELMA: Technology enhanced learning environment for Minimally Invasive Surgery 316
<table>
<thead>
<tr>
<th>Authors</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>M.Z. Jafarlou and P.Y. Fard</td>
<td>Heuristic and pattern based Merge Sort</td>
</tr>
<tr>
<td>P. Salvador and A. Nogueira</td>
<td>Analysis of the internet domain names re-registration market</td>
</tr>
<tr>
<td>M.B. Imani, M.R. Keyvanpour and R. Azmi</td>
<td>Semi-supervised Persian font recognition</td>
</tr>
<tr>
<td>F.L. Önkol, R. Zembat and G.U. Balat</td>
<td>Computer use attitudes, knowledge and skills, habits and methods of preschool teachers</td>
</tr>
<tr>
<td>M. Pitocco</td>
<td>Information technology and management of diagnostics for analysis of seismic vulnerability in buildings</td>
</tr>
<tr>
<td>K. Maleknejad and M. Alizadeh</td>
<td>An efficient numerical scheme for solving Hammerstein integral equation arisen in chemical phenomenon</td>
</tr>
<tr>
<td>A. Hamidi and M. Safabakhsh</td>
<td>The impact of information technology on E. marketing</td>
</tr>
<tr>
<td>F. Hamidi, M. Meshkat, M. Rezaee and M. Jafari</td>
<td>Information technology in education</td>
</tr>
<tr>
<td>F. Hamidi, F. Ghorbandordinejad, M. Rezaee and M. Jafari</td>
<td>A comparison of the use of educational technology in the developed/developing countries</td>
</tr>
<tr>
<td>G.A. Sathish Kumar, K. Bhoopathy Bagan and V. Vivekanand</td>
<td>A Novel algorithm for image encryption by integrated pixel scrambling plus diffusion [IISPD] utilizing duo chaos mapping applicability in wireless systems</td>
</tr>
<tr>
<td>F. Behrouzi and K.Y. Wong</td>
<td>Lean performance evaluation of manufacturing systems: A dynamic and innovative approach</td>
</tr>
<tr>
<td>A.A. Yıldırım and C. Özdoğan</td>
<td>Parallel wavelet-based clustering algorithm on GPUs using CUDA</td>
</tr>
<tr>
<td>A. Hamidi, H. Salimi and M. Sharifi</td>
<td>A transparent virtual machine monitor level packet compression network service</td>
</tr>
<tr>
<td>F. Hunka, M. Hucka, J. Kasik and D. Vymetal</td>
<td>Detail REA production planning model using value chain</td>
</tr>
<tr>
<td>Irfanullah, N. Aslam, J. Loo, Roohullah and M. Loomes</td>
<td>Adding semantics to the reliable object annotated image databases</td>
</tr>
<tr>
<td>N. Aslam, I. Ullah, J. Loo, RoohUllah and M. Loomes</td>
<td>SemRank: ranking refinement strategy by using the semantic intensity</td>
</tr>
<tr>
<td>E. Guresen and G. Kayakutlu</td>
<td>Definition of artificial neural networks with comparison to other networks</td>
</tr>
<tr>
<td>H. Mohelska</td>
<td>Mobile devices and localization</td>
</tr>
<tr>
<td>K.J. Kachiashvili and D.I. Melikdzhanian</td>
<td>Modern software for the environmental modeling and statistical data analysis</td>
</tr>
<tr>
<td>M. Vahedi and F. Nejad Haji Ali Irani</td>
<td>Information technology (IT) for knowledge management</td>
</tr>
</tbody>
</table>
F. Hakimiyan and V. Derhami
Design of quantum dot semiconductor optical amplifier by intelligence methods

A. Bashah Mat Ali, A. Yaseen Ibrahim Shakhatreh, M. Syazwan Abdullah and J. Alostad
SQL-injection vulnerability scanning tool for automatic creation of SQL-injection attacks

A. Deniz Helvaciglu Kuyucu
The playground of cloud computing in Turkey

N. Mohammadi, V. Ghorbani and F. Hamidi
Effects of e-learning on language learning

Ö. Önder and H. Gümüşkaya
Architectural platform: A social network site for architects

B. Oancea, I.G. Rosca, T. Andrei and A.I. Iacob
Evaluating Java performance for linear algebra numerical computations

B. Oancea, T. Andrei, I.Gh. Rosca and A.I. Iacob
Parallel algorithms for large scale econometric models

M. Okhovvat, M. Sharifi and H. Momeni
Task allocation to actors in wireless sensor actor networks: an energy and time aware technique

I. Onden and E. Guresen
Interior design of passenger coaches using fuzzy optimization

C.T. Kuah and K.Y. Wong
Efficiency assessment of universities through data envelopment analysis

E.M. Tas
ICT education for development — a case study

M. Krishnamurthy, A. Kannan, R. Baskaran and M. Kavitha
Cluster based bit vector mining algorithm for finding frequent itemsets in temporal databases

H. Fatemeh, K. Ahmad and D.M. Mohammad
ICMAP: An interactive tool for concept map generation to facilitate learning process

D. Aydın and A. Uğur
Extraction of flower regions in color images using ant colony optimization

M. Shariati, F. Bahmani and F. Shams
Enterprise information security, a review of architectures and frameworks from interoperability perspective

M. Laal
Knowledge management in higher education

G. Lackermair
Hybrid cloud architectures for the online commerce

N. Mir and S.A. Hussain
Secure web-based communication

L.M. Gorgiu, G. Gorgiu, M. Bîzoi and A.M. Suduc
The electronic book - a modern instrument used in teachers’ training process

S. Asboori and S. Mohammadi
Compare failure prediction models based on feature selection technique: empirical case from Iran
M. Munk, M. Vrábelová and J. Kapusta  
Probability modeling of accesses to the web parts of portal 677

R.S. Tabrizi, N. Ebrahimi and S.A. Al-Marwai  
On the comparison of KM criteria classifications 684

R.S. Tabrizi, N. Ebrahimi and M. Delpisheh  
KM criteria and success of KM programs: an assessment on criteria from importance and effectiveness perspectives 691

M. Rajabzadeh, F. Adibniya and M. ghasemzadeh  
Condition aware robust routing algorithm with cross layer technique for ad hoc situations 698

V.M. Weng  
Re-imagining painting in digital fiction time, colour, and space in recent experimental moving images 706

P.Z. Zahariev and G.V. Hristov  
Performance evaluation of data delivery approaches for wireless sensor networks 714

G. Ulutas, M. Ulutas and V. Nabiyev  
Distortion free geometry based secret image sharing 721

A. Çavuşoğlu and I. Kurnaz  
Developing a parameterized simulation platform with intelligent synthetic agents for training driver candidates 727

C. Pagliari, E. Bucciarelli and M. Alessi  
Interdependence of world markets: Economic growth and social well-being 732

B.G. Emiroglu  
Cognitive networks with trainable adaptive radio systems 742

L. Malita  
Social media time management tools and tips 747

M. Ruzickova and S. Hubackova  
Specialities of income taxing according to the Czech legal frame in HR systems 754

A.S. Bozkir and E.A. Sezer  
Predicting food demand in food courts by decision tree approaches 759

A. Pakgohar, R.S. Tabrizi, M. Khalili and A. Esmaeili  
The role of human factor in incidence and severity of road crashes based on the CART and LR regression: A data mining approach 764

C. Perumalla, J. Mak, N. Kee and S. Matthews  
Integrating web applications to provide an effective distance online learning environment for students 770

Y. Batch, M. Mohd Yusof, S.A. Mohd Noah and T.P. Lee  
MTag: A model to enable collaborative medical tagging in medical blogs 785

A. Assareh and M. Hosseini Bidokht  
Barriers to e-teaching and e-learning 791

F. Hamidi, M. Khoshbakht and S. Abdolmaleki  
Application of reigeluth instruction design model in virtual education 796

T. Huseyin and E. Kerem  
Password management difficulties in system and network management 801
V. Dilmurad, E. Kerem, Ç. Murat and S.B. Sami
Open source software usage on municipalities; a case study: Çankaya municipality 805

K.A. Seydi and E. Kerem
Characteristic usage of Turkish internet users in office environment 809

G. Rasool, P. Maeder and I. Philippow
Evaluation of design pattern recovery tools 813

P.G. Rossi and S. Carletti
MAPIT: a pedagogical-relational ITS 820

P. Abbasi, B.S. Bigham and S. Sarencheh
Good’s history and trust in electronic commerce 827

K. Zolfaghar and A. Aghaie
Evolution of trust networks in social web applications using supervised learning 833

S. Sarencheh and B.S. Bigham
An applicable master plan to develop city’s information technology infrastructure 840

D. Abate, R. Ciavarella, G. Furini, G. Guarnieri, S. Migliori and S. Pierattini
3D modeling and remote rendering technique of a high definition cultural heritage artefact 848

D. Ibrahim
Engineering simulation with MATLAB: improving teaching and learning effectiveness 853

A.M. Kızrak and F. Özen
A new median filter based fingerprint recognition algorithm 859

M. Drlík, M. Munk and J. Skalka
Usage analysis of system for theses acquisition and plagiarism detection 866

M. Keyvanpour, M. Javideh and M.R. Ebrahimí
Detecting and investigating crime by means of data mining: a general crime matching framework 872

H. Tohidi
The role of risk management in IT systems of organizations 881

T. Liška, T. Sochor and H. Sochorová
Comparison between normal and TOR-anonymized web client traffic 888

M.Y. al-Tarawneh, M.S. Abdullah and A.B.M. Ali
A proposed methodology for establishing software process development improvement for small software development firms 893

R. Matsuoka and A. Rahimi
The positive effect of conference participation on reducing L2 communication apprehension 898

K. Maleknejad and E. Hashemizadeh
Numerical solution of the dynamic model of a chemical reactor by Hybrid functions 908

A. Iranbakhsh and S.H. Seyyedrezaei
The impact of information technology in biological sciences 913

H. Tohidi
Review the benefits of using value engineering in information technology project management 917

H. Tohidi
Human resources management main role in information technology project management 925
T. Sochor
Efficiency comparison of greylisting at several SMTP servers 930

H. Kalantari D., E. Kalantari D. and S. Maleki
E-survey (surveys based on e-mail & web) 935

A. Ta’a and M.S. Abdullah
Goal-ontology approach for modeling and designing ETL processes 942

S. Sukaphat
An implementation of location-based service system with cell identifier for detecting lost mobile 949

P. Joshi
Security issues in routing protocols in MANETs at network layer 954

Y. Asadollahi, V. Rafe, S. Asadollahi and S. Assadollahi
A formal framework to model and validate event-based software architecture 961

F. Önder, P. Çelik and İ. Silay
Attitude of teacher candidates toward making computer supported education 967

V. Rafe and F. Mahdian
Style-based modeling and verification of fault tolerance service oriented architectures 972

M. Okhovvat and B. Minaei Bidgoli
A hidden Markov model for Persian part-of-speech tagging 977

F. Juárez
Applying the theory of chaos and a complex model of health to establish relations among financial indicators 982

S. Raza and S. Haider
Suspicious activity reporting using dynamic bayesian networks 987

R. Sahraeian, M. Mohammadi, A. Akbari and A. Ayatollahi
Evolutionary eigenvoice MLLR speaker adaptation 992

M. Zahedi and S.M. Salehi
License plate recognition system based on SIFT features 998

N. Akkuzu and H. Akçay
The design of a learning environment based on the theory of multiple intelligence and the study its effectiveness on the achievements, attitudes and retention of students 1003

H.F. Ameen
Computer simulation and mathematical modelling of static rotor resistance chopper control of WRIM by reference frame theory 1009

S. Tabibian, A. Shokri, A. Akbari and B. Nasersharif
Performance evaluation for an HMM-based keyword spotter and a large-margin based one in noisy environments 1018

D.R. Sulaiman
Microprocessors thermal challenges for portable and embedded systems using thermal throttling technique 1023

H. Erdinc Kocer and K. Kursat Cevik
Artificial neural networks based vehicle license plate recognition 1033

D. Akbaş and H. Gümüşkaya
Real and OPNET modeling and analysis of an enterprise network and its security structures 1038
R. Ezzati and K. Shakibi
Using adomian’s decomposition and multiquadric quasi-interpolation methods for solving Newell–Whitehead equation
1043

M. E. Dalkilic, E. Acar and G. Tokatli
A simple shuffle-based stable in-place merge algorithm
1049

M. Zahedi and S. Eslami
Farsi/Arabic optical font recognition using SIFT features
1055

E. Gide and S. M. Riad Shams
The role of web-based promotion on the development of a relationship marketing model to enable sustainable growth
1060

E. Gide and S. M. Riad Shams
A study for the implementation of web-enhanced relationship marketing focused sustainable growth model on Bangladesh cricket board
1074

E. Gide and S. M. Riad Shams
The use of e-CRM database to promote a value-breeding bond network: the case of Hawthorn football club of Australian rules
1083

M. Zahedi, H. Mashal and S. M. Salehi
An online community for the deaf
1089

F. K. Ahmad, S. Deris and M. S. Abdullah
Synergy network based inference for breast cancer metastasis
1094

H. Tohidi
E-government and its different dimensions: Iran
1101

H. Tohidi and M. M. Jabbari
The main requirements to implement an electronic city
1106

A. Altay and G. Kayakutlu
Fuzzy cognitive mapping in factor elimination: A case study for innovative power and risks
1111

M. Sadiq and A. Pirhonen
Design time, run time, and artificial intelligence techniques for mobility of user interface
1120

M. A. Uyulgan, Ö. Özbayrak, S. K. Alpat and Ş. Alpat
Opinions of teachers and students on secondary education chemistry textbooks
1126

P. L. Teh, Y. Batch and M. L. Ji
Generation of a template for usage point determination in Facebook
1131

H. Tohidi
Teamwork productivity & effectiveness in an organization base on rewards, leadership, training, goals, wage, size, motivation, measurement and information technology
1137

H. Tohidi
Modelling of business services in service oriented enterprises
1147

A. A. Jalali, M. R. Okhovvat and M. Okhovvat
A new applicable model of Iran rural e-commerce development
1157

S. Fathi, A. S. Barzoki, E. Makinian, H. Ghorbani and S. S. Esfahani
Designing a model for the acceptance of electronic stock exchange by individual investors
1164
M. Khodabin
Some properties of ADK entropy and ADK entropy rate 1170

V. Zolfaghari Mashhadi and M. Reza Kargozari
Influences of digital classrooms on education 1178

A. Alibaygi, M. Karamidehkordi and E. Karamidehkordi
Effectiveness of rural ICT centers: A perspective from west of Iran 1184

E. Hashemizadeh, K. Maleknejad and B. Basirat
Hybrid functions approach for the nonlinear Volterra–Fredholm integral equations 1189

N. Tavakoli, M. Jahanbakhsh, H. Mokhtari and H. Reza Tadayon
Opportunities of electronic health record implementation in Isfahan 1195

M. Jahanbakhsh, N. Tavakoli and H. Mokhtari
Challenges of EHR implementation and related guidelines in Isfahan 1199

I. Soukal and M. Hedvicaková
Retail core banking services e-banking client cluster identification 1205

S.M. Allameh, S.M. Zare and S.m.r. davoodi
Examining the impact of KM enablers on knowledge management processes 1211

M. Allameh, M. Zamani and S.R. Davoodi
The relationship between organizational culture and knowledge management 1224

M.N. Mohammad, N. Sulaiman and O.A. Muhsin
A novel intrusion detection system by using intelligent data mining in weka environment 1237

M.H. Moshref Javadi and Z. Azmoon
Ranking branches of System Group company in Terms of acceptance preparation of electronic Customer Relationship Management using AHP method 1243

T. Pourhabibi, M.B. Imani and S. Haratizadeh
Feature selection on Persian fonts: A comparative analysis on GAA, GESA and GA 1249

E. Parvinnia, M.R. Moosavi, M.Z. Jahromi and K. Ziarati
Overfit prevention in adaptive weighted distance nearest neighbor 1256

C. Ivan
Experiences on implementing a QoS-aware architecture on a DHT based broker overlay 1262

M. Sarkar, S. Roy and N. Mukherjee
Prediction of resource requirement using feedback on job execution performance 1271

R. Khayyami
Qualitative characteristics of enterprise architecture 1277

C. Ivan and V. Dadarlat
A tool for evaluating event based middleware 1283

M.H. Moshref Javadi and M. Delshad Dastjerdia
Evaluation effect of management information system implementation on personnel resistance causes in Isfahan power plant management corporation in Iran 1296

S.M. Babamir and M. Borhani Dehkordi
An event based formal specification method to diabetic’s behavior monitor system 1304
E. Akarsu and A. Karahoca
Simultaneous feature selection and ant colony clustering

I. Yengin, A. Karahoca, D. Karahoca and H. Uzunboylu
Is SMS still alive for education: Analysis of educational potentials of SMS technology?

M. Hosseini Bidokht and A. Assareh
Life-long learners through problem-based and self directed learning

N.S.H. Nik Ahmad, T.R. Wan and P. Jiang
Health course module in virtual world

R. Fojtik
Extreme Programming in development of specific software

N. Cavus
Investigating mobile devices and LMS integration in higher education: Student perspectives

N. Cavus and M.M. Al-Momani
Mobile system for flexible education

F.H. Jabali, S.M. Sharafi and K. Zamanifar
A quantitative algorithm to select software architecture by tradeoff between quality attributes

B.F. Klimova and P. Poulova
Tutor as an important e-learning support

R. Rafeh
Proposing a new search template for modelling languages

T. Allahviranloo and S. Salahshour
Bounded and symmetric solutions of fully fuzzy linear systems in dual form

V. Ghaffarian
The new stream of socio-technical approach and main stream information systems research

H. Yousefipour and Z. Jafari
Using neural search approach for resource discovery in P2P networks

M.E. Damavandi, Z. Bagherzadeh and S. Shahmir
The analysis of correlation between Information Technology (IT) and educational planning

E. Kerem and K. Aydin
The problems of public accessed computer laboratories and a suggestion for these problems’ solution

F.M. Singer and D. Stoicescu
Using blended learning as a tool to strengthen teaching competences

S.G. Ghosshch, S. Kameli and M.K. Jahromi
The effect of sport activity and gender differences on self-perception in adolescents

Q. Rajput and S. Haider
A comparison of ontology-based and reference-set-based semantic annotation frameworks

Cross-use pattern language: cross-cultural user interface development tool

G.A. Ahmadi, S. Abdolmaleki and M. Khoshbakht
Effect of computer-based training to increase creativity and achievement science, students in fourth grade of elementary
<table>
<thead>
<tr>
<th>Authors</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>N. Cevher-Kalburan, Ö. Yurt and E. Ömeroğlu</td>
<td>The use of interactive CD-ROM in early childhood education: Teachers’ thoughts and practices</td>
<td>1555</td>
</tr>
<tr>
<td>Ö. Yurt and N. Cevher-Kalburan</td>
<td>Early childhood teachers’ thoughts and practices about the use of computers in early childhood education</td>
<td>1562</td>
</tr>
<tr>
<td>İ. Özbilgin and M.Y. Imamoğlu</td>
<td>The impact of dynamic purchasing systems in the electronic public procurement processes</td>
<td>1571</td>
</tr>
<tr>
<td>S.H.S. Rezaie and G. Barani</td>
<td>Iranian teachers’ perspective of the implementation of audiovisual devices in teaching</td>
<td>1576</td>
</tr>
<tr>
<td>J. Al Dallal</td>
<td>Transitive-based object-oriented lack-of-cohesion metric</td>
<td>1581</td>
</tr>
<tr>
<td>A.A. Seman, A.R. Ahmad, Z. Aziz and A.R. Ayudin</td>
<td>The effectiveness of teaching and learning history based on multicultural towards national integration in Malaysia</td>
<td>1588</td>
</tr>
<tr>
<td>J. Zacek and F. Hunka</td>
<td>CEM: Class executing modelling</td>
<td>1597</td>
</tr>
<tr>
<td>M. Teymouri and M. Ashoori</td>
<td>The impact of information technology on risk management</td>
<td>1602</td>
</tr>
</tbody>
</table>
Message from the President of the Conference

Welcome to the 19th World Conference on Information Technology, which is hosted by Bahcesehir University in Istanbul, Turkey. This privileged scientific event has contributed to the field of information technology and research for a year. It has created the opportunity to bring together academicians, researchers, engineers, system analysts, software developers, graduate and undergraduate students with government and non-government organizations to share and discuss both theoretical and practical knowledge about information technology in the scientific environment.


Furthermore, the conference will be gotten more international each year, which is an indicator that it is getting worldwide known and recognized. Scholars from all over the world contributed to this unique event. We would like to express our sincere thanks to all involved in the organization of this International event. Special thanks are to all the reviewers, the members of the international editorial board, the publisher, and those involved in technical processes. We would like to thank all, who contributed to the organization and helped to realize the conference with their generous intellectual support. A total of 528 abstracts or full papers were submitted for the conference and each paper has been peer reviewed by the reviewers specialized in the related field. At the end of the review process, a total of 431 high quality research papers were selected and accepted for paper presentation.

I would like to express my appreciations to the Board of Trustees of Bahcesehir University, Enver Yücel who is an important leader in education in Turkey. He has given full support and encouragement to us to organize this conference at Bahcesehir University. I would also like to thank to the Rector of Bahcesehir University, Prof.Dr. Yılmaz Esmer, who allowed us the opportunity to organize our conference at Bahcesehir University. Also many thanks to Dean of the Engineering Prof. Dr. Süleyman Demokan, General Secretary of Bahcesehir University Ziya Alpay. Special thanks to Ahmet Yücel, who played an active role in the organization of this event at Bahcesehir University.

Assoc. Prof. Dr. Adem Karaboea
President of the WCIT 2010
akaraboea@bahcesehir.edu.tr

II
Sponsor of the Conference
Evver Yücel
Bahcesehir University, Board of Trustees President

Honorary President
Prof. Dr. Yılmaz Esmer
Bahcesehir University, Rector

Presidents of the WCIT 20:0
Assoc. Prof. Dr. Adem Karahoca

Executive Board
Prof. Dr. Süleyman Demirokan
Bahcesehir University, Turkey
Prof. Dr. Doğan Ibrahim
Near East University, UK
Prof. Dr. Mehmet Karamanoglu
Middlesex University, UK
Prof. Dr. Angel Garrido
Universidad Nacional de Educación a Distancia, Spain
Assoc. Prof. Dr. Huseyin Uzunboylu
Near East University & Bahcesehir University, North Cyprus
Assoc. Prof. Dr. Adem Karahoca
Bahcesehir University, Turkey
Assist. Prof. Dr. Şirin Karadeniz
Bahcesehir University, Turkey
Ahmet Yücel
Bahcesehir University, Turkey

Local Organization Committee
Assist. Prof. Dr. Havaa Başpak
Barış Yılmaz
Batahan Gülloğlu
Deniz Öncan
Dilek Karahoca
Duygu Çakur
Evren Arifoğlu
Hüseyin Bicen
Sezer Kanbal
Tamer Uçar
International Scientific Committee

Prof. Dr. Hafize Keser
Prof. Dr. Steven M. Ross
Prof. Dr. M. Süleyman Demokan
Prof. Dr. Serol Bektas
Prof. Dr. Fahrettin Sakkoglu
Prof. Dr. Dogan İleşim
Prof. Dr. Mohammad S. Obaidat
Prof. Dr. Adnan Kashman
Prof. Dr. Angel Garrido
Prof. Dr. Mehmet Karanmanoglu
Prof. Dr. Nizamettin Aysel
Prof. Dr. Meltem Özçan
Prof. Dr. Oya Kalıpçı
Prof. Dr. Rozan M. Idrus
Assoc. Prof. Dr. Adem Karahoca
Assoc. Prof. Dr. Eddie YK Ng
Assoc. Prof. Ergun Göktürk
Assoc. Prof. Dr. Huseyin Uzunboylu
Assoc. Prof. Dr. Mehmet Erdem
Assist. Prof. Dr. Hany F. El Yamany
Assist. Prof. Dr. Harova Basak
Assist. Prof. Dr. Murat Tezcan
Assist. Prof. Dr. Orhan Okcol
Assist. Prof. Dr. Saroj K. Dhurandher
Assoc. Prof. Dr. Seviş Gültekin
Assist. Prof. Dr. Mustafa Ilkan
Dr. Simon Vogl
Dr. Gregorio Hernandez-Zamora
Şuhas J Manangi

Ankara University
John Hopkins University, USA
Bahcesehir University, Turkey
Near East University
Near East University, Turkey
Monmouth University, USA
Near East University
UNED, Spain
Middlesex University, UK
Yıldız Technical University, Turkey
Bogazici University, Turkey
Yıldız Technical University, Turkey
Universiti Sains, Malaysia
Bahcesehir University, Turkey
Nanyang Technological University, Singapore
CQUUniversity Sydney, Australia
Near East University, North Cyprus
University of Nevada, USA
Suez Canal University, Egypt
Near East University, North Cyprus
Near East University, North Cyprus
Bahcesehir University, Turkey
Netaji Subash Institute of Technology, India
İstanbul University, Turkey
Eastern Mediterranean University
Studio Pervasive Computing Applications, Austria
National University of Mexico, Mexico
Microsoft India, India
217. Knowledge management in higher education .................................................. 72
Maryam Fadl

218. Use of income tax evasion according to the Czech legal frame in HR systems ....... 73
Marek Petrášek, Sarka Nahárová

219. Systematization of system for three-dimensional plagiarism detection ............. 73
Martin Drlik, Michal Masák, Jan Skala

220. Semi-supervised Persian font recognition .................................................... 73
Maryam Bahah, Imran, Mohammed Reyaz, Reza, Reza Reza

221. A multi-channel cross-payment solution for branches banking ...................... 73
Maryam Bayat, Farahnak Mirza, Moeinou Fadavi

222. The impact of information technology on risk management ......................... 74
Maryam Taymouri, Maryam

223. Improved bounds for wireless localization: Vertex gated placement ............... 74
Marinca Ekmek, Taha Shafi, Ali, Mehdi, Bahram Sadeghi, Bighan

224. Enterprise information security, review architecture/standard frameworks from interpretable perspective .................................................. 74
Marinca Sbarai, Farshad Bahmani, Farshad Shami

225. Information technology management of diagnostics/analysis of seismic vulnerability in buildings .................................................. 75
Massimo Pirozzi

226. Comparison of usability evaluation methods for multiplatforms/ampliaation in term of test factors .................................................. 75
Mahdi Sadegh, Amini, Paramesh

227. Design time, run time artificial intelligence techniques for mobility of user interfaces .................................................. 75
Mahdi Sadegh, Amini, Paramesh

228. A simple shuffle-based stable in-place merge-sort algorithm ......................... 76
Mehrez Eran Galklty, Editor, Gizhim Tukal

229. A symmetric algorithm for software architecture selection by trade-off between quality attributes .................................................. 76
Moham Sharifi, Kanem S. Samanli, Fazliam Hossaini

230. A proposed methodology for establishing software process development improvement framework for small software development firms .................................................. 76
Mehrez Tounen Tounen, Mohed Sajandallah, Shahla Bakhz Mathi

231. An example of poor (prediction-observation-explanation): prediction of vitamin C in different fruits .................................................. 77
Melis Arsl Ustal, Ozge Ozyay, Mehmet Karal

232. Opinions of teacher-students on secondary–chemistry textbooks .................... 77
Melis Arsl Ustal, Ozge Ozyay, Sinan Kirci, Alper, Semra Alper

233. A description logics formalization for the ontology matching ......................... 77
Mevi Kefi, Zekiye Basic

234. New process pattern-based model (ontoverthecities) ...................................... 78
Manwachele Zadzimbash, Ali, Zavina, Parisioc Tounenbo Fard

235. The necessity of innovation in thepromotion of “Knowledge Management” in “Management Information Technology” in developing countries .................................................. 78
Manwachele Makosi, Mohamed MAK

236. The use of SMS encryption method to scornascramble letter machine .............. 78
Marygol, Dervin Serah

237. A calibrated task based language teaching model for pre-intermediate level language learners .................................................. 78
Mohsen Saeed Oskou, Kamal Tashl

238. Iranian Mother’situdes towards Educational Economic Benefits of Computer-Assisted Language Learning .................................................. 79
Mehdi Rahim, Manwachele

239. Iranian students’ readiness for using podcasting in higher education: ccess, familiarity,ad experience .................................................. 79
Mehdi Rahim, Fatemeh Aseidzlah

240. The impact of computer-based activities on Iranian high-school students attitudes towards computer-assisted language learning .................................................. 79
Mehdi Rahim, Fatemeh Aseidzlah

241. Computerized ICT integration in English classroom among Iranian EFL teachers .................................................. 80
Mehdi Rahim, Samran Tadzalah

242. Foreign language learning/attitudes predict future attitudes towards computer-assisted language learning .................................................. 80
Mehdi Rahim, Samran Tadzalah

243. Success in learning English foreign languages predictor of computerservitecy .................................................. 80
Mehdi Rahim, Samran Tadzalah

244. Correlation matrix of five personality traitTom condition management stykson multiphysical education teachers in Yezd-iran .................................................. 81
Mehdi Rahim, Hamid, Delgahi Firoozh, Ali, Salmi Shamsi, Ahtah Heidery

245. Functional cognitive maps .................................................. 81
Mehdi Rahim

246. Probability modeling services to the web parts of portal .................................. 81
Michal Meik, Mari Fralhlova, Josep Kaponas

XII
Real and OPNET modeling and analysis of an enterprise network and its security structures

Deniz Akbay ⁴, Halik Gümüskaya ⁴

¹ Hacettepe University, Department of Computer Engineering, Istanbul, Turkey
² Google University, Department of Computer Engineering, Menemen, Izmir, Turkey

Abstract

In this research study, first, a prototype network design as real modeling and using the OPNET software as virtual modeling of a typical enterprise network are constructed and analyzed. On these real and virtual network models, the effects of Firewall and VPN (Virtual Private Network) on network performance are studied. Then a more complex and realistic model than the first simple OPNET model is designed, and on this second model similar analysis work is performed. In this study, another research topic is to investigate application areas and uses of OPNET in communication networks education.

What we have done different than the previous research studies and projects in our study is constructing both a real enterprise network prototype and virtual OPNET simulation model, and competing network models and network analysis results. The effects of Firewall and VPN on these models are studied in both real network devices and virtual OPNET environment. Additionally, practical use of both developed real and virtual models in university education is also taken into consideration.

Keywords: network security; architectural platform

E-mail address: Deniz.Akbay@etu.edu.tr

Decision-support tools for municipal infrastructure management

Di Sivo Michelè ³, Ladiana Danieli ³

¹ Universita' degli Studi di Cosenza, Italy
² Department of Technologies for Built Environment Viale Pindaro 42, Pescara, 65127, Italy

Abstract

Sewers, waste pipes, and streets are elements of our civil infrastructure, the supporting structure of society. Infrastructure is a complex technical system that provides us with a varied range of essential services; a storehouse of resources and wealth that each generation inherits, uses, and passes on to succeeding generations.

The asset management has a big influence on infrastructure development and use: undertaken and executed without fully recognizing the complexity, diversity, and social and technological evolution of the system almost inevitably squander economic, environmental, social, and cultural resources.

The challenges of managing these assets most effectively are substantial: the efficiencies are widespread and really easy to see: jammed traffic on roads designed to carry only a fraction of the current demand, newly-redeveloped city streets open to repair aged subsurface pipes, basements flooded in case of modest heavy rain, etc.

In existing asset management systems often information is not efficiently used in decision process, which results in much waste in time and effort. It is necessary to develop life-cycle management systems of infrastructure to overcome this problem. The system must integrate geographic information, design data, inspection and maintenance data. Emphasis is placed on development of decision-support tools for municipal infrastructure management. The study identifies the challenges for maintenance, repair and renewal planning faced by asset owners and managers. Integration with existing systems such as Computerized Maintenance Management Systems, Geographic Information Systems, and decision-support tools are the largest challenge for developing and using decision-support tools in the area of asset management.

Keywords: Infrastructure; asset management, maintenance, decision-support tools, Computerized Maintenance Management System, Geographic Information Systems, integration, interoperability

E-mail address: michele@infpol.it

E-mail address: ladiana@uniroma1.it
Information technology and management of diagnostics for analysis of seismic vulnerability in buildings

Massimo Pitocco

Abstract

Evaluating the safety of a building in the event of an earthquake requires analysis of its vulnerability. The analysis is undertaken to evaluate the damage expected in the building, for a possible earthquake of pre-established energy. To achieve this, a calibration model has to be prepared, referred to structural and typological characteristics in order to define a cause and effect relationship. This is possible either with depth design details or by undertaking diagnostic investigation of existing structures. At the moment, state-of-the-art technology offers detectors, instruments and diagnostic methods, above all for non-destructive testing, which is user-friendly and will produce extensive information and large amounts of data in a short time. The risk is that excessive amounts of data produced by cutting-edge technology are not followed up with a useful and adequate interpretation of the actual data. It is clear that digital support for optimising the diagnostic process and, simultaneously, meeting the time fundamental requirements of a diagnostic campaign for the assessment of seismic vulnerability in buildings must: gather and systematize a large number of data; put together a reasoned collection of recorded data and decisions apted to be useful in the future; guide diagnostic towards the most appropriate investigation method for the specific case. In short, the use of a digital platform for managing and interpreting recorded data appears applicable to the quality system for a diagnostic campaign, above all if considering the non-destructive type that allows for methodical, systematic knowledge of building heritages so as to obtain the model's timely correspondence with the real world. A digital platform will be useful in the management of a quality system when applied to action planning (that is to say a set of methods and instruments) within the system, aimed at its definition, achievement, substantiation, demonstration and management.

Keywords: construct, diagnosis, safety, seismic, software, quality, vulnerability.

E-mail address: lebanon@nacht

Comparison of usability evaluation methods for mobile application and devices in term of test factors

Mazhar Sadiq1, Aasti Pirhonen1

Abstract

Usability evaluation of mobile application is still difficult because of the context of use. Many evaluation methods for mobile application and devices have been discussed in literature. Those methods are classified into user base, inspection base and inquiry base evaluation methods. By taking different test factors like cost effectiveness we have defined different mobile evaluation methods. Then comparison study is done with each other methods and the relationship is one to one and one to many. It is concluded that the heuristic evaluation method is the most cost effective as compared to others.

Keywords: usability, usability evaluation methods, test factors

E-mail address: mazhar14@gmail.com

Design time, run time and artificial intelligence techniques for mobility of user interface

Mazhar Sadiq1, Aasti Pirhonen1

Abstract

Advancement in technology provides opportunities to user as well as challenges for application development organization. User interfaces which were design for specific device tend to be developed for various devices. Users are busy people, when they move among different context would like to move application with them. The current trend of users demanding mobile graphics user interface to support their daily life and work has led to a new generation of techniques. Design time technique provides better usability as compare to run time technique. On the other hand artificial intelligence technique like agent provides better flexibility and stability as compare to others. In this paper we have compared these techniques in the context of mobility of user interface.

Keywords: Design time technique, run time technique, mobile agent technique

E-mail address: mazhar14@gmail.com
WCIT 2010

Information technology and management of diagnostics for analysis of seismic vulnerability in buildings

Massimo Pitocco

Università degli Studi “G. d’Annunzio” – Facoltà di Architettura - Dipartimento IDEA sezione TAC
Viale Pindaro n° 42, Pescara 65127, Italia

Abstract

Ensuring the safety of a building in the event of an earthquake requires analysis of its vulnerability. The analysis is undertaken to evaluate the damage expected in the building for a possible earthquake of pre-established energy. To achieve this, a calculation model has to be prepared, referred to structural and typological characteristics in order to define a cause and effect relationship. This is possible either with in-depth design details or by undertaking diagnostic investigation of existing constructs. At the moment, state-of-the-art technology offers detectors, instruments and diagnosis methods, above all for non-destructive testing, which is user-friendly and will produce extensive information and large amounts of data in a short time. The risk is that excessive amounts of data produced by cutting-edge technology are not followed up with a useful and adequate interpretation of the actual data. It is clear that digital support for optimizing the diagnostic process and, simultaneously, meeting the three fundamental requirements of a diagnostic campaign for the assessment of seismic vulnerability in buildings must:

- gather and systemize a large number of data;
- put together a reasoned collection of recorded data and decisions applied that will be useful in the future;
- guide diagnostics towards the most appropriate investigation method for the specific case.

In short, the use of a digital platform for managing and interpreting recorded data appears applicable to the quality system for a diagnostic campaign, above all if considering the non-destructive type that allows for methodical, systematic knowledge of building heritage so as to obtain the model’s timely correspondence with the real world. A digital platform will be useful in the management of a quality system when applied to action planning (that is to say a set of methods and instruments) within the system, aimed at its definition, achievement, substantiation, demonstration and maintenance.

Keyword: construct, diagnostics, safety, seismic, software, quality, vulnerability

1. Seismic vulnerability and diagnostic procedure

The safety of a building in the event of an earthquake disaster relies on the analysis of its vulnerability. The analysis is undertaken to predict building damage subsequent to a possible earthquake of pre-established energy and it is quantified as a value known as “Index of Seismic Vulnerability.” The assessment of seismic vulnerability, independently of the interventions that will subsequently be performed, serves as a survey of existing buildings to forecast the results of a telluric event. To obtain an Index of Seismic Vulnerability a calculation model has to be prepared, applicable to both structural and typological characteristics, to define a cause and effect relationship.
calculation model can be obtained either by using technical drawings or by conducting diagnostic \textsuperscript{b} observations of buildings by means of destructive or non-destructive tests \textsuperscript{c}. Data obtained with destructive tests are more directly related to quantity parameters of structural behaviour, while data obtained with non-destructive tests are not directly comparable to these parameters.

Fig. 1. Castelnuovo di San Pio delle Camere, L’Aquila, Italy (image by author).
(a) Effects of the earthquake on the façade of a residential building in stone and masonry; (b) Effects of the earthquake on the façade of a residential building in stone and masonry.

Fig. 2. San Pio delle Camere, L’Aquila, Italy (image by author).
(a) Effects of the earthquake on the side wall of a stone church; (b) Effects of the earthquake on the end wall of a stone church.

In existing constructs, knowledge of the structure (geometry and construction details) and the building materials (concrete, steel, bricks, mortar) is crucial, and that is why current Italian legislation introduces the concepts of Confidence Factor (FC) and Level of Knowledge (LC)\textsuperscript{d}.

The Confidence Factor is a safety coefficient that modifies potential parameters according to the level of knowledge of materials properties: the lower the level of knowledge, the greater the weaknesses noted in materials resistance during site testing, reduced because of these factors.

The Level of Knowledge is related to geometry, construction details and materials, classified as:
- LC1, limited knowledge, with typically limited site testing.
- LC2, adequate knowledge, with typically extensive site testing.
- LC3, precise knowledge, with typically exhaustive site testing.

Knowledge levels vary according to available information (readings, crack and deformation situation, load analysis, original structural designs, simulations, visual checks, construction details, etc) and are related to the building materials, which may be in brick, reinforced concrete, or steel.

The LC and FC concepts are aimed at achieving a preliminary reduction of average materials resistance values in

\textsuperscript{b} The term “diagnostic” derives from the Greek “dia-ghighnosko”, meaning “I recognize by means of.
\textsuperscript{c} There are also “slightly destructive” surveys that include surface penetrometer tests, flat jacks and endoscopy, in other words the tests that require small interventions on existing structures.
\textsuperscript{d} Chapter 11 of Ministerial Ruling for Civil Protection (OPCM) nos 3274 and 3431, Annex 2.
the existing construct, to be applied in the design or in the verification; they are closely connected and are obtained by diagnostic investigation.

The main feature of a diagnostic test on existing buildings is an analysis using technological equipment to acquire knowledge of material and component performance disruptions. After obtaining this information, and applying a need/performance methodological approach, the building's state of preservation can be linked to the diagnostic investigation (both destructive and non-destructive types).

Fig. 3. Ignazio Silone School, Pescara, Italy (image by author).
(a) External masonry of a combined-structure school; (b) Survey using an IR thermal camera on the same combined-structure masonry.

Fig. 4. Ignazio Silone School, Pescara, Italy (image by author).
(a) Floor of a school building in combined structure; (b) Survey using an IR thermal camera on the same combined-structure floor.

Supported by recent technological equipment enhancement, the current trend is to use non-destructive investigations, which may be less invasive on one hand, leaving no traces on the structures (preferable above all when dealing with buildings of historical and artistic significance); on the other hand, the result may be an unmanageable quantity of recorded data or – worse still – misinterpretations of actual data if reviewed in an unsuitable manner. A further issue is the lack of direct correlation between data obtained through non-destructive investigations, referred to quality, and structural behaviour parameters, referred to quantity. The assessment of seismic vulnerability in buildings in conformity with the three levels of knowledge is conducted using both non-destructive and destructive tests, applied respectively and for the following reasons:

- rapid intervention;
- building integrity is safeguarded;
- collected data is easily illustrated in graphs;
- quantity and quality data can both be obtained.
- identification of structural elements not directly visible;
- identification of discontinuities in structural elements;
- verification of physical and mechanical materials properties;
- quantification of damages in affected structures;
- charting of building materials and typologies in areas lacking homogeneity;
- checking typology and quality of recovery interventions.
Furthermore, after processing data obtained from non-destructive tests it will be possible to guide any destructive testing that may be required, optimizing the identification of areas for sample taking, thus avoiding the risk of investigating areas that are not typical of the diagnostic scenario envisaged. Moreover, when dealing with an excess of data population deriving from a non-destructive campaign, there is often a failure to follow up with useful and adequate interpretation of this data, so a quality system for diagnostic processes must be adopted to achieve a useful interpretation of recorded data. Thus a campaign of diagnostic investigations must be planned, pursuing a Quality Assurance System, in order to acquire not only organic and systematic knowledge of buildings that offers an accurate association of the model with reality, but also reliable parameters. This will then reduce the various uncertainties and contradictions arising precisely when investigating existing buildings.

The development of a Quality System for diagnostic processes whose aim is to make proper use of data for the assessment of seismic vulnerability is tied to the application of new IT methodologies and solutions for planning and normalized management of the diagnostic campaign.

2. Diagnostic investigation and its support

The preceding arguments make it clear that IT support for optimizing the diagnostic process and, simultaneously, meeting the four fundamental requirements of a diagnostic campaign for the assessment of seismic vulnerability in buildings must:

- gather and systemize a large number of data;
- organize a database of collected results that will be available for consultation at a later date and always be up-to-date;
- assemble a feasible collection of decisions applied that will be useful in the future;
- guide the diagnostician towards the most appropriate investigation method for the specific case.

^ At the moment, the figure of the “diagnostician” has still to be officially defined and is usually the engineer appointed to perform vulnerability assessments, while restoration experts are beginning to call in this professional figure.
IT support will serve the application of correct procedures and methodologies intended to reinstate seismic safety in the construct\(^1\), occurring in two ways: the assessment of seismic vulnerability and the structural intervention plan. The intervention plan starts from the vulnerability index of the building, intending to enhance or adjust its seismic resistance\(^3\). The diagnostic investigation is preliminary to the seismic vulnerability analysis, which is the starting datum for any structural operation: unless there is effective, timely handling of diagnostic data, the seismic vulnerability analysis will be not very reliable or accurate. At the moment, the diagnostic sector makes sporadic, occasional use of IT, while it is to be hoped that this becomes consistent, systematic and standardized, thereby sustaining sector operators requiring storage and management of data related to diagnostic activities and the enhancement/adjustment of the construct's seismic qualities. The first important result of the recourse to IT is precisely the preservation of data. In fact, it is usually very difficult to retrieve information on the diagnostic investigations and structural interventions undertaken in the recent past from the owners or managers of the properties.

To be effective, IT support must first of all be structured in such a way as to distinguish the diagnostic project from the intervention project, as they are distinct in reality, both in timescale and in finance requirements. Moreover, information technology must also embrace historical and static knowledge of the building, and therefore take into account the construction stages, analysis of the original plans, variations in use, morphological modifications (demolitions, superfetations and reconstructions) and detailed surveys (architectural, photographic, material and structural).

Considering the stages of a diagnostic project to be: identification of scope, type of test to conduct, survey campaign, processing of data collected, the IT support must allow optimization of manual procedures and reduction of choice in operations decisions. In particular the support must allow:
- increased efficiency, in other words targeted diagnostic campaigns;
- time saving, in other words faster performance of the survey campaigns;

---

\(^1\) In Italy Circular 617 of 2 February 2009 “Istruzioni per l’applicazione delle Nuove norme tecniche per le costruzioni”, pursuant to Ministerial Decree dated 14 January 2008, classifies seismic safety interventions for buildings as “improvement, adjustment, local intervention or repair”.

\(^3\) In Italy Circular 617 of 2 February 2009 “Istruzioni per l’applicazione delle “Nuove norme tecniche per le costruzioni”, pursuant to Ministerial Decree dated 14 January 2008 states "In particular, it is envisaged that assessment of safety will be undertaken each time structural interventions are performed and the assessment will define the construct’s safety level before and after the intervention. The engineer will draw up a specific report to describe existing safety levels and those obtained with the intervention, as well as any ensuing limitations to apply to the use of the building.”
• saving on resources, in other words avoid duplicating existing research traceable in archives;
• optimization of operations, in other words avoid futile research unsuited to the problem in hand;
• optimization of solutions, in other words development of mindful, verified actions.

These objectives can be achieved if the IT platform is given a methodological structure, which is to say a trail that excludes casual improvisation and includes self-correcting mechanisms to optimize use. The platform database, which will always be accessible and updatable, must comprise data families that communicate amongst themselves “intelligently” via algorithms and matric formulas that interrelate the different variables that characterize a diagnostic investigation. These variables include the type and quantity of material to analyse, the cost of the surveys required, the complexity of the analysis operations, the issues to be faced, the type of construct and the material used to build it.

In the case of diagnostic investigation for assessment of the seismic vulnerability of a reinforced concrete building, the software will consider financial and instrument resources, and connect the following three data matrices:
• reinforced concrete investigation/residual mechanical characteristics
• reinforced concrete/methods for structural recovery
• residual mechanical characteristics/structural recovery methods.

The implementation of seismic safety measures for the building involves multidisciplinary expertise, so it is extremely helpful to be able to use IT support to create a virtual workplace network that fosters cooperation and exchange of information amongst the various figures involved, and where the diagnostic campaign plays a decisive and key role.

At this point there is no doubt that a web-based digital platform is necessary and would serve a dual function as a DP tool and a system tool for managing the intervention.

2.1. IT support as a data processing tool

This function meets the needs of the diagnostician (or the professional undertaking the seismic vulnerability analysis) for recording survey data, optimizing survey operations, analyzing possible operating scenarios and assessing alternative procedures, in line with the financial and instrument resources available, as well as the conditions of the construct being analyzed. The software must foresee an updatable database containing:
• the various construction components in different materials (reinforced concrete, various types of masonry, steel etc);
• specifications for survey methods and procedures, with reference to anti-seismic regulations applicable to buildings and public works enforced in the country of reference;
• methods and procedures specifications applicable to structural interventions required as safety measures for the building’s seismic risk.

The software should use mathematical functions to interconnect the information stored in these databases, and to connect it to other information including types of innovative materials, diagnostic methods for in-depth investigations, costs for in situ and laboratory tests, preferences for appointed professionals, and the building’s social and economic significance. Once these relationships have been developed, the IT support will provide the appointed consultant with indications for choosing the most suitable intervention, which may be accepted, rejected or applied with slightly modified parameters for the overall context. Of course the final choice will be saved in the software and become stored data that is very important for the construct’s on-going life cycle.

2.2. IT support as an intervention management system

This function meets the needs of various players for managing the diagnostic and intervention project, from the

---

3 Traceability of previous surveys, moreover, also affects research and technological innovation, fostering cultural and teaching exchange.
4 In these operations, above all when dealing with public buildings, a geologist, structural engineer, diagnostician, specialist and other enterprises, works accountant, engineering management figures from public authorities, site engineers, etc, will all be involved.
5 Taken to be the state of deterioration or preservation, economic and artistic significance, ease and safety of accessibility.
initial site surveys to the architectural and structural readings, the diagnostic campaign and the completion of works. Thus all the professionals appointed and other staff involved will be informed of decisions taken and kept informed of the tasks they are required to perform.

The software will be web-based and represent an open, implementable system, useful for storing and monitoring past decisions and procedures crucial to the diagnostic campaign and applicable safety measures for the construct, so as to manage the decision-making flow for the entire sequence of operations, as follows:

- site survey reports;
- strategic meeting minutes;
- diagnostic plans;
- intervention plans;
- documents and technical drawings required by current regulations;
- organization of site surveys.

3. IT support structure in accordance with the quality system

Having agreed that an organic and systematic knowledge of buildings is needed if a timely correspondence with reality is to be achieved, the next step is to implement a diagnostic campaign that complies with a quality system, avoiding overproduction of analytical data that will never be used as they are not specific to the targeted requirement.

The IT support structure that guarantees the application of a quality system should be arranged in the actual stages of operation shown below:

- survey protocol;
- diagnostic process;
- restitution of data;
- diagnostic assessment.

The quality of the diagnostic process is not composed simply of the sum of these stages, but derives from an integrated system, which is to say the architectural unit. The diagnostic process with IT support can be directed towards a systematic approach in order to develop a transdisciplinary concept for the choice of the typology of testing to be undertaken, the position and type of samples to be analyzed, the instruments to be used and the technological solutions that should meet not only function logic needs but also those of the future relationship with the design, regulatory framework, economic resources, timeframes and the characteristics of the building. Therefore the software must be streamlined and simple so that it serves as a reliable support to a diagnostic process of a systematic type.

3.1. Survey Protocol

This protocol is the means by which a coordinated system of surveys and diagnostic tests is formalized and managed in order to discover the state of performance for the materials and components that make up the building. The development of a diagnostic protocol is essential for understanding the building because, in addition to further information obtained during a preliminary diagnosis, it also enables programming of the diagnostic campaign’s quality system. In other words, this procedure will support the selection of appropriate technological instruments and types of analysis for avoiding duplication and overlaps that create confusion in the data, with erroneous results, as well as wasting time and economic resources. Finally, since the protocol is a tool for managing and controlling performance characteristics information, it should permit agile communication between the various figures involved, contributing to quality management, not only for the diagnostic investigation, but for the entire operation that follows.

3.2. Diagnostic process

This process comprises three substages: exploratory, pre-diagnostic and diagnostic. The data and information
collected during each step will be used to evaluate the building’s residual performance capabilities, allowing recognition and quantification of the relationship between performance loss and causes.

The exploratory substage is a joint inspection conducted by the engineers and the client, to note the initial impressions, existing documents and limitations, and is useful for understanding how the building operates as an entity, as well as planning subsequent stages. In the event of an earthquake, vulnerability assessment will be required and this inspection is extremely important.

The pre-diagnostic substage is a survey performed by a diagnostician with the assistance of technicians who conduct the elementary building surveys useful for preparing an initial performance quality finding.

The diagnostic substage is a task performed by survey technicians for exploring the performance analysis and retrieving more detailed quantity data for preparing a survey protocol.

### 3.3. Restitution of data

This operation involves all the transcription of information acquired during the diagnostic campaign to correlate symptoms, seen as visible manifestations of a pathology, with the underlying causes. As far as the quality and quantity assessment of symptoms is concerned, the acquired data play a key role for negating or affirming the pathological nature of a phenomenon observed during pre-diagnosis. It is evident that during this stage it is very important to proceed with a clear and immediate graphic rendering, comparable to that produced according to the investigation protocol. To foster data readability and avoid ambiguity and difference in interpretations, the graphic rendering must be characterized by colours and symbols normed as required by UNI and Normal technical standards.

### 3.4. Diagnostic assessment

This operation is the set of considerations and interpretations of data gathered during the survey campaign, as determined by the diagnostic protocol, and recorded with the help of graphics. The assessment begins with the selection of information relevant to determining the performance status of materials and systems involved in the construct, whose characteristics and anomalies were found during pre-diagnosis. The assessment procedure varies depending on the type of building information requested, including:

- analysis of building system deterioration;
- determination of the causes of damage and anomalies;
- determination of the level of damage subsequent to an earthquake;
- planning support for structural recovery;
- determination of seismic vulnerability.

Given the importance of assessing the seismic vulnerability of architectural structures in terms of saving lives and protection of artistic heritage, the use of information technology to promote the adoption of quality systems in diagnostic studies is extremely desirable.

### 4. Conclusions

Obtaining data that will be useful for assessing the seismic vulnerability of buildings can be achieved through safe, coordinated and combined actions performed by the body appointed to conduct the research, with meticulous planning and management of the diagnostic campaign. This pathway should be undertaken bearing in mind the end result, compliance with timeframes, resources available and reliability of results. The last aspect is of fundamental importance because when assessing seismic vulnerability of buildings and developing an intervention plan, a datum misrepresented by a technical error caused by a person or a procedure can lead to inaccurate prediction of a building’s reactions to an earthquake, which would pose a high risk for public safety. So, obviously, it is important to control the diagnostic process, not only for precise assessment of seismic vulnerability, but also for timely implementation of building safety measures.

IT support must be able to guide appointed professionals in the direction of optimal choices and proceed with the most suitable solutions for each case under examination, sidestepping habitual procedures which tend to consider
only what is already familiar. The entire diagnostic investigation, from the survey to the variations during work in progress, will be considered, assessed and shared with all the players involved, who will be checking the advancement of operations, verifying that the diagnostic campaign is conducted appropriately for these aspects: samples taken in situ, laboratory tests, compliance with current legislation, technical operations, contingency controls, data handling, etc.

In short, the use of a digital platform for managing and interpreting recorded data is applicable to the quality system for a diagnostic campaign, above all in consideration of the non-destructive type that allows for methodical, systematic knowledge of building heritage so as to allow for the model to be consistent with reality. A digital platform will be useful in the management of a quality system when applied to action planning (that is to say a set of methods and instruments) within the system, aimed at its definition, achievement, substantiation, demonstration and maintenance.

References

2. M. C. Forlani (eds), L'Università per il terremoto. Castelnuovo e l'altopiano di Navelli, Alinea editrice, Firenze 2009.
7. C. Montagni and A. Pasetti (eds), La diagnostica intelligente, acts of the conference organized by Arkos in partnership and with contributions from Calabria University, Syremont, Space, 2008.