SCHOOL OF INFORMATION & COMMUNICATION TECHNOLOGY
FEDERAL UNIVERSITY OF TECHNOLOGY

MINNA, NIGER STATE, NIGERIA

PROCEEDINGS

2ND INTERNATIONAL CONFERENCE ON INFORMATION AND COMMUNICATION TECHNOLOGY AND ITS APPLICATIONS (ICTA 2018)

CONFERENCE THEME:

DIGITAL ECONOMY: HARNESSING THE BENEFITS AND TACKLING THE CHALLENGES FOR SUSTAINABLE DEVELOPMENT

DATE: SEPTEMBER 5 - 6, 2018

EDITORS

Mr. Oluwafemi Osho Dr. Shafi'i M. Abdulhamid
Mrs. Fatimah J. Abduldayan Dr. Shefiu O. Ganiyu
Dr. Hamza O. Aliyu Dr. Sulaimon A. Bashir Dr. Olawale S. Adebayo

Proceedings of the

2nd International Conference on Information and Communication Technology and Its Applications (ICTA 2018)

5th – 6th September, 2018
School of Information and Communication Technology
Federal University of Technology, Minna, Nigeria

Editors

Mr. Oluwafemi Osho
Dr. Shafi'i M. Abdulhamid
Mrs. Fatimah J. Abduldayan
Dr. Shefiu O. Ganiyu
Dr. Hamza O. Aliyu
Dr. Sulaimon A. Bashir
Dr. Olawale S. Adebayo

FOREWORD

On behalf of the School of Information and Communication Technology, Federal University of Technology, Minna, Niger State, I cordially welcome you to the 2nd International Conference on Information and Communication technology and its Applications (ICTA 2018).

This is a biennial conference which debuted in 2016. The inaugural edition witnessed a huge success such that all accepted papers were indexed and abstracted in Scopus via CEUR Workshop Proceedings.

The theme of this year's conference is Digital Economy: Harnessing the Benefits and Tackling the Challenges for Sustainable Development. The theme is premised on the increasing dependence on digital technologies for the attainment of the sustainable development goals. Hence, this conference provides a boundless and veritable forum for researchers and practitioners from diverse fields to explore their innovative ideas in the numerous areas of Information and Communication Technology (ICT), as both a backbone of and medium for societal developments.

We have the honour to have in our midst speakers and experts who will be sharing with us intellectually in this two-day long conference.

Because this conference seeks ideas from diverse fields, a total of 82 papers will be presented under the various conference tracks which include: Information Systems, Security and Privacy, Mathematics and Theory of Computing, Intelligent Computing Methodologies, Emerging Technologies, Applied Computing, and Legal Aspects of Computing. The total number of papers submitted was 158. Each paper was subjected to plagiarism check. After rigorous review of the papers with acceptable plagiarism score, 87 papers were accepted.

As part of the events in this year's conference, a preconference workshop was organised on the 4th of September 2018, with the theme: "Writing Techniques and Publishing in High Impact Factor ISI WoS-Indexed Journals.

The conference will also feature undergraduate student innovation exhibition, which will showcase the various creations of software, hardware, and many more, of undergraduate students from different institutions.

On behalf of the Conference Organizing Committee, I wish to acknowledge the efforts all the reviewers, and others who have contributed towards making this conference a reality.

We trust you would have a truly engaging time at this conference.

Dr. Joseph A. Ojeniyi
Chairman, Conference Organizing Committee

PROFILES OF KEYNOTE SPEAKERS

Prof. Sanjay Misra
Covenant University, Ota, Nigeria

Sanjay Misra is full Professor of Computer Engineering at Covenant University, Ota, Nigeria. He has 25 years of wide experience in academic administration and researches in various universities in Asia, Europe and Africa. He holds a Ph.D. degree in Information and Knowledge Engineering (Software Engineering) from University of Alcala, Spain, and M.Tech. Software Engineering degree from Motilal Nehru National Institute of Technology, India. He is a software engineer and previously held academic positions at Federal University of Technology, Minna, Nigeria (as Head, Department of Computer Engineering and Head, Department of Cyber Security Science); Atilim University, Turkey; Subharati University and UP Technical University, India. He is also visiting/Collaborative professor at the University of Alcala, Spain (since 2011); UCV, Valparaiso, Chile (since 2013); UNICEN, Tandil, Argentina (since 2011); and Atilim University, Turkey (since 2011). He has authored/coauthored around 300 papers (with colleagues from nearly 30 countries) and majority of the publications are in ISI Web of Sciences, and got several awards for outstanding publications, e.g. Institute of Engineering and Technology (IET), United Kingdom awarded him '2014 IET Software Premium Award' for Best Paper published in last two years. He is most productive researcher (No 1) in in whole Nigeria (SciVal-Scopus (Elsevier) analysis) during 2012-2017. He has delivered 41 plenary and keynote speeches (IEEE-, Springer-, and Elsevier-sponsored conferences) and 40 invited talks (workshops/seminars/lecture) in various universities and institutions in more than 50 Countries. He is Editor-in-Chief of the book series on Advances in IT Personals and Project management (IGI Global), author of 1 book and editor (one of) in 31 Lecture Notes in Computer Science (Springer), 6 IEEE conference proceedings. He was General Chair of (IEEE) International Conference on Computing, Networking and Informatics (ICCNI 2017) and 6th IEEE ICAST: 2014 and founder Chair of 3 annual international workshops: Software Engineering Process and Applications (SEPA), Springer (2009-continue), Tools and Techniques in Software Development Process, IEEE (2009-continue), Software Quality, IEEE (2009), LNCS (2011-continue), and Software Metrics and Measurement, IEEE (2009). Presently, he is Editor-in-Chief of International Journal of Physical Sciences (SCOPUS Indexed), founder Editor-in-Chief of Covenant Journal of ICT and International Journal of Computer Science and Software Technology, and also serving as editor, associates editor and editorial board members of more than 20 journals (Including 3 SCIE) of international repute.

His current researches cover the areas of software quality assurance, software process improvement, software project management, object oriented technologies, XML, SOA, Web services, cognitive informatics, artificial intelligence, neural network, health Informatics, e-learning, cloud computing and cyber security. Prof. Sanjay is coordinating/working/collaborating with several research groups (as visiting/adjunct professor/collaborative researcher) in various universities and industry around the world (Spain, Argentina, Turkey, Singapore, Chili, Brazil, Mexico, Norway, France, South Africa, Malaysia, Nigeria, Myanmar, Vietnam, and India).

Mr. Olusegun H. Olugbile
Member, National Cybercrime Advisory Council

Mr Segun is a policy expert on Internet Governance, Cybersecurity, and Information Technology for development. He is UN ambassador on Internet Governance in Nigeria, and a 3rd term Advisor to the UN Secretary General on Internet Governance. Segun is a frontline cybersecurity policy strategist and advocate. He is a member of African Multi-Stakeholders Advisory Group on Internet Governance working group of the Africa Union, an Internet Governance Advisor to ECOWAS, and a co-founder of Nigeria Internet Governance Initiative. He has industry experiences with over 16 years focusing on cybersecurity policy, Internet governance, e-development. He engages in the international, multi-lateral and multi-stakeholders policy process on Global Internet Governance. At UN, he is representing Nigeria and African private sector group in the multi-stakeholders' discourse, negotiations, and best practices on global Internet issues covering Internet infrastructure, cybersecurity, legal, economic, development, digital trade policy, and socio-cultural. He is the coordinator of UN-IGF Communication and Outreach working group responsible for promoting the values of IGF through community awareness, including outreach to over 150 Regional and National IGF initiatives. He co-chaired the UN Best Practices forum on Cybersecurity and co-organized global main session on cybersecurity at the IGF 2017.

In recognition of his decade of contributions to the National Cybersecurity Program, he was appointed by the Nigerian Government as member of Cybercrime Advisory Council established by the Cybercrime (Prevention and Prohibition) Act 2015.

A fellow of the European School of Internet Governance, Germany (2016), recipient of UN nomination for membership of UN MAG (2014), and recipient of the Office of National Security Adviser recognition award for outstanding contribution to the National Cybersecurity (2015), and National IT Champion Award (2009) by WITSA-ITAN-CPN 2009.

PROGRAMME OF EVENTS

Day 1 Tuesday, September 4, 2018 Pre-Conference Workshop Venue: PTDF Lecture Theatre, Chemical Engineering Complex	
Time	**Activities**
08.00 – 10.00	Registration
10.00 – 10.05	Opening Prayer
10.05 – 10.10	Introduction of Workshop Speaker by Dr. Joseph A. Ojeniyi (Chairman, COC, ICTA 2018)
10.10 – 10.15	Welcome Address: Prof. N. S. Iwokwagh (Dean, SICT, FUT, Minna)
10.15 – 11.00	Session 1: Academic Databases and Search Techniques
11.00 – 11.30	Group Photograph & Tea Break
11.30 – 12.15	Session 2: Conducting High Impact Research and Publishing the Results in Top Tier ISI WoS-Indexed Journals
12.15 – 13.00	Section 3: General Overview of Authorship, Collaborations, Performance Metrics, and Scholar/Research Visibility
13.00 – 14.00	Snack Break
14.00 – 14.45	Session 4: Editorial: Editor's Backend, Editor's Hot Search Topics, What Editors are Looking For in a Research Manuscript
14.45 – 15.45	Question and Answer
15.45 – 15.50	Vote of Thanks: Dr. Joseph A. Ojeniyi (Chairman, COC, ICTA 2018)
15.50 – 15.55	Closing Prayer

Day 2 Wednesday, September 5, 2018		
Time	**Activities**	**Venue**
08.00 – 10.00	Registration	SICT Lecture Hall
10.00 – 10.05	Opening Prayer	
10.05 – 10.10	Opening Remarks: Dr. J. A. Ojeniyi (Chairman, COC, ICTA 2016)	
10.10 – 10.20	Goodwill Messages	
10.20 – 10.30	Welcome Address by Chief Host: Prof. A. Bala (VC, FUT, Minna)	
10.30 – 11.00	Keynote Speech 1: Mr. Olusegun H. Olugbile (President, Global Network for Cybersolutions)	
11.00 – 11.30	Group Photograph & Tea Break	SICT Lecture Hall Gallery
11.30 – 12.00	Tour of Exhibition Stand	SICT Lecture Hall
12.00 – 12.30	Guest Speech: Dr. Isa Ali Ibrahim Pantami (DG, NITDA)	
12-30 – 13.00	Keynote Speech 2: Prof. Sanjay Misra (Covenant University, Ota)	
13.00 – 14.00	Lunch Break	SICT Lecture Hall Gallery
14.00 – 17.00	Parallel Session 1: Tracks: ▪ Information Systems ▪ Security and Privacy ▪ Intelligent Computing Methodologies ▪ Applied Computing	SICT Labs I – IV

Day 3 Thursday, September 6, 2018		
Time	**Activities**	**Venue**
08.00 – 09.00	Registration	SICT Lecture Hall
09.00 – 10.00	Panel Discussion	
10.00 – 10.40	Tea Break	SICT Lecture Hall Gallery
10.40 – 13.00	Parallel Session 2: Tracks: ▪ Information Systems ▪ Security and Privacy ▪ Intelligent Computing Methodologies ▪ Emerging Technologies	SICT Labs I – IV
13.00 – 14.00	Lunch Break	SICT Lecture Hall Gallery
14.00 – 16.00	Parallel Session 3: Tracks: ▪ Information Systems ▪ Security and Privacy ▪ Intelligent Computing Methodologies ▪ Mathematics and Theory of Computing	SICT Labs I – IV
16.00 – 17.00	Closing Ceremony: ▪ Presentation of Certificates/Awards ▪ Vote of Thanks: Prof. N. S. Iwokwagh (Dean, SICT, FUT, Minna)	SICT Lecture Hall
17.00	Cocktail Party	SICT Lecture Hall Gallery

TABLE OF CONTENTS

Information Systems

Customers' Intension to Change Mobile Communication Networks Regarding Quality of Information Services Provision in Zaria Metropolis 1
Hadizatu Hassan, Rhoda Wusa Goshie, Aisha Jimada, Roseline Oyewumi, and Sadiya Amata

Development of an Android Based Mobile Application for the Design and Detailing of Isolated Pad Foundations According to Eurocode 2 6
A. Yusuf, A. Isiaka, M. Abubakar, H. O. Aminulai, A. Abdullahi, and T. A. Alayande

A Simulation Model for Cardless Automated Teller Machine Transactions 12
O. S. Adewale, J. O. Mebawondu, M. N. Suleiman, and O. J. Mebawondu

Use And Effects of Radio Frequency Identification (RFID) Technology on Theft Detection For Library Resources Management In Two Private Universities In Abuja, Nigeria 18
Yusufu Shehu Amanyi, Philip Usman Akor, and Everest C. Madu

Knowledge Management Resources and Techniques Used to Enhance Knowledge Management Initiatives in Nigerian Agricultural Research Institutes 27
Kabiru Dahiru Abbas

Development of a Road Surface Condition Monitoring and Database System 33
H. Bello-Salau, A. M. Aibinu, A. J. Onumanyi, S. Ahunsi, E. N. Onwuka, and J. J. Dukiya

Design and Implementation of a Computer-Based Visitors' Record Management System for Niger State House of Assembly Complex, Minna 39
Isaiah Michael Omame and Solomon Anibe Tijani

Research Data Management and Information Security: Role of Library and Information Technology Service (ITS) Units in Federal Universities of Technology in Nigeria 47
Fatimah Jibril Abduldayan, Fasola Petunola Abifarin, Georgina Uchey Oyedum, and Jibril Attahiru Alhassan

Development and Validation of e-Content in Teaching and Learning of Automobile Lighting System in Technical Colleges in Niger State, Nigeria 53
Abdullahi Kutiriko Abubakar, Aliyu Mustapha, and Abdullahi Egigogo Raji

An Enhanced BRAZ (E-BRAZ) Android App for Monitoring PMS in Gas Stations 58
S. Aliyu, W. M. Audu, M. Okwori, M. Saidu, U. Abdullahi, and J. Eneze

Development of Pre-Admission Learning and Practicing Software for Prospective Students of Federal University of Technology, Minna 65
O. A. Abisoye, B. A. Thomas, and B. O. Abisoye

Design and Implementation of an Android Mobile Library Management System for Federal University of Technology, Minna, Nigeria 71
Kolo Silas, Fasola P. Abifarin, and Shaka A. Imavah

Integrated Usability Evaluation Framework for University Websites 77
Solomon A. Adepoju, Ishaq O. Oyefolahan, Muhammad B. Abdullahi, and Adamu A. Mohammed

Development of Food Informatics Software: A Mineral Deficiency Disease - Food Guide System 83
R. B. Salau and M. N. Hasan

ReQueClass: A Framework for Classifying Requirement Elicitation Questions based on Kipling's Technique and Zachman's Enterprise Framework 89
Salihu Abdulkadir and Hamzat Olanrewaju Aliyu

Application of Geographic Information Systems in Creating Smart Campus Map of Federal University of Technology, Minna Bosso Campus 96
M. O. Odekunle, E. K. Odo, I. Sule, and A. A. Adenle

Mobile Based Appointment and Scheduling Management System for Makeup Artist 101
Oluwaseun Adeniyi Ojerinde, Mariam Folakemi Asanlu, Solomon Adelowo Adepoju, and Olaronke Iroju

Design and Implementation of an Android Nigerian Recipe Generating System 107
Faiza Babakano Jada, Ishaq O. Oyefolahan, Stella O. Etuk, Hussein A. Zubairu, and Farida Suleiman

An Online Lecturer Evaluation System: A Case Study of FUT Minna 114
Sulaiman Sufyan Danmalan, Adeoluwa David Apata, Oluwaseun Adeniyi Ojerinde, Segilola Ifeoma Mustapha, and Olawale Surajudeen Adebayo

Examination Eligibility Verification and Attendance System Using Quick Response Code 120
Muhammad Bashir Abdullahi, Zahra'u Musa Nura, and Lawal Musa Jiya

A Survey of Research Trends on University Websites' Usability Evaluation 127
Solomon A. Adepoju, Ishaq O. Oyefolahan, Muhammad B. Abdullahi, and Adamu A. Mohammed

Evaluation of Mobile Banking Services Usage (Case Study of Niger State) 133
Meshach Baba, Noel Moses Dogonyaro, Victor Legbo Yisa, and Olatunde Majeedah Omobolanle

Security and Privacy

Effect of Feature Ranking on Credit Card Fraud Detection: Comparative Evaluation of four techniques 140
John Awoyemi, Adebayo Adetunmbi, and Samuel Oluwadare

Computer-Based Local Area Authentication System 148
O. S. Omorogiuwa and G. O. Aziken

A Survey of the Ultimate Security Solution in Opportunistic Network: Trust Management 153
Basira Yahaya, Mohammed Bashir Muazu, Emmanuel Adewale Adedokun, and Ime J. Umoh

Effect of Mental State and Personality on Password Selection among Mobline Phone Users: A Case Study of IBB University Lapai Students 158
Abdullahi Abubakar Kawu, Idris Muhammad, Aisha Awal, and Muhammad Bashir Abdullahi

A Framework for Physical Home Security Using Mobile Intrusion Detection System 163
Shefiu Olusegun Ganiyu1, Abideen Ismail, Joseph A. Ojeniyi, and Toheeb Adediran

Privacy Preserving Classification over Encrypted Data Using Fully Homomorphic Encryption Technique 168
Abdullahi Monday Jubrin, Victor Onomza Waziri, Muhammad Bashir Abdullahi, and Idris Ismaila

Design of a Framework for Computer-Based Examination Invigilation Using Fingerprint and Iris Technologies 177
Gabriel Babatunde Iwasokun, Taiwo Gabriel Omomule, and Olufemi Rapheal Akinyede

A Soft Computing Approach to Detecting E-Banking Phishing Websites using Artificial Neural Network 184
Shafi'i Muhammad Abdulhamid, Mubaraq Olamide Usman, Oluwaseun A. Ojerinde, Victor Ndako Adama, and John K Alhassan

Ensemble Learning Approach for the Enhancement of Performance of Intrusion Detection System 190
Musbau Dogo Abdulrahaman and John K. Alhassan

Secure University Network Architecture, Vulnerabilities, Risk Priority Level Classification and Countermeasures 197
Ismaila Idris, Muhammad Umar Majigi, Shafi'i Muhammad Abdulhamid, Morufu Olalere, Muhammad Bashir Abdullahi, and Vivian O. Nwaocha

An Intelligent Crypto-locker Ransomware Detection Technique using Support Vector Machine Classification and Greywolf Optimization Algorithm 205
Abdullahi Mohammed Maigida, Shafi'i Muhammad Abdulhamid, Morufu Olalere, and Idris Ismaila

Market Dealers or Perpetrators of Cybercrimes? Investigating Cybercriminal Activities in Information Technology Markets in Nigeria 212
Oluwafemi Osho and Benjamin M. O. Eneche

Android Malware Classification using Whale Optimization Algorithm 218
Salamatu Aliyu Sulaiman, Olawale Surajudeen Adebayo, Idris Ismaila, and Sulaimon A. Bashir

Password Knowledge versus Password Management Practice: A case Study of Federal University of Technology, Minna 225
Victor N. Adama, Noel Moses Dogonyaro, Victor L. Yisa, Baba Meshach, and Ekundayo Ayobami

Development of Blowfish Encryption Scheme for Secure Data Storage in Public and Commercial Cloud Computing Environment 231
Shafi'i Muhammad Abdulhamid, Nafisat Abubakar Sadiq, Mohammed Abdullahi, Nadim Rana, Haruna Chiroma, and Dada Emmanuel Gbenga

Fingerprint Based Driver's Identification System 238
O. C. Inalegwu, D. Maliki, J. Agajo, L. A. Ajao, and A. D. Abu

Evaluation of Classification Algorithms for Phishing URL Detection 243
Ayanfeoluwa Oluyomi , Oluwafemi Osho, and Maryam Shuaib

Development of a Predictive Model for the Detection of CAPTCHA Smuggling Attacks using Supervised Deep Learning based Approach 250
Moses O. Omoyele, Joseph A. Ojeniyi, and Olawale S. Adebayo

Development of a secured e-voting system with OTP as second order authentication 256
Habu J. Salami, O. S. Adebayo, A. O. Isah, K. H. Lawal, and John K. Alhassan

The Framework for the Military Information Gathering via Entanglement and Teleportation using Wireless Sensor Network Systems 262
Victor Onomza Waziri and Francisca Nonyelum Ogwueleka

Forensic Analysis of Mobile banking applications in Nigeria 272
Andrew A. Uduimoh, Ismaila Idris, Oluwafemi Osho, and Shafi'i M. Abdulhamid

Inter-agent Coordinated Security Model for Cloud Based Virtual Machines 280
E. C. Onuoha and O. P. Akomolafe

Intelligent Computing Methodologies

On the Development of a Novel Smell Agent Optimization (SAO) for Optimization Problems 287
A. T. Salawudeen, M. B. Mu'azu, Y. A. Sha'aban, and E. A. Adedokun

Brightness Enhancement Technique for Video Frame Improvement Based on Pixel Intensity Analysis 298
H. A. Abdulkareem, A. M. S. Tekanyi, I. Yau, K. A. Abu- Bilal, and H. Adamu

Development of a Deep Learning Based Framework for Fingerprint Liveness Detection Using Support Vector Machine Optimized by Genetic Algorithm 304
Yusuf Ibrahim, Muhammed B. Mu'azu, Emmanuel A. Adedokun, and Yusuf. A. Sha'aban

An Adaptive Personnel Selection Expert System to Support Organization's Personnel Recruitment Decision Process 311
Muhammad Ahmad Shehu, Abdulwahab Ahmed Jatto, Haruna Abdu, and Umar Hussein

Infant Cry Recognition System Using Autoregressive Model Coefficients 317
S. R. Fatimah and A. M. Aibinu

Quantum Cost Reduction in Reversible Logic Circuit Synthesis Using Evolutionary Algorithm 322
Mustapha Yusuf Abubakar

Machine Learning Approach to Sentiment Analysis of Users Movie Reviews 327
Adebayo Adetunmbi, Oluwafemi A. Sarumi, Oluwayemisi Olutomilola, and Olutayo Boyinbode

Effects of Data Normalization on Water Quality Model in a Recirculatory Aquaculture System Using Artificial Neural Network 333
Taliha A. Folorunso, Abiodun M. Aibinu, Jonathan G. Kolo, Suleiman O.E. Sadiku, and Abdullahi M. Orire

Upright FAST-Harris Filter 338
Abdulmalik Danlami Mohammed, Adam Muhammed Saliu, Idris Mohammed Kolo, Adama Victor Ndako, Shafi'I Muhammed Abdulhamid, Abdulkadir Baba Hassan, and Abubakar Saddiq Mohammed

A Fuzzy based Method for Diagnosis of Acne Skin Disease Severity 343
Femi Emmanuel Ayo, Joseph Bamidele Awotunde, Sakinat Oluwabukonla Folorunso, Ogundokun Roseline Oluwaseun, P. S. Idoko, Jimoh Isiaika Adekunle, and Oladipo Idowu Dauda

An Architectural Framework for Ant Lion Optimization-Based Feature Selection Technique for Cloud Intrusion Detection System using Bayesian Classifier 351
Haruna Atabo Christopher, Jimoh Yakubu, Shafi'i Muhammad Abdulhamid, and Abdulmalik D Mohammed

Optimized Video Compression using Intelligent Behaviour of Firefly Algorithm 357
H. A. Abdulkareem, A. M. S. Tekanyi, I. Yau, K. A. Abu- Bilal, and H. Adamu

Comparative Evaluation of Nature-based Optimization Algorithms for Feature Selection on Some Medical Datasets 364
Ali Muhammad Usman, Ali Usman Abdullah, Alhassan Adamu, and Musa M Ahmed

Artificial Neural Network-Based Pelvic Inflammatory Disease Diagnosis System 370
Yahaya Mohammed Sani, Dere, Boluwatife Adesola , Hussaini Abubakar Zubairu, and Ilyasu Anda

Comparative Study of Various Machine Learning Algorithms for Tweet Classification 378
Umar Abubakar, Sulaimon A. Bashir, Muhammad Bashir Abdullahi, and Olawale S. Adebayo

Alcohol Detecting and Notification System for Controlling Drink Driving 386
Oloyede Mukhtar Abiodun, Michael David, and Waheed Moses Audu

Adaptive Traffic Control System using Modified Round Robin and Genetic Algorithm 391
Nasir Mohammed Sadiq, Oluwaseun Adeniyi Ojerinde, and Solomon A. Adepoju

Gabor Based MultiSpectral Palmprint Recognition System using Feature Fusion 397
Abubakar Sadiq Muhammad, Auwal Sani iliyasu, Abubakar A. Umar, Bello A. Imam, Shehu H.Ayagi, and Muhammad A. Babballe

On the Use of Extreme Learning Machines for Detecting Anomalies in Students' Results 402
Hamza O. Salami and Mohammed O. Yahaya

Performance Evaluation of Cultural Artificial Bee Colony and Cultural Artificial Fish Swarm Algorithm 409
B. H. Adebiyi, A. T. Salawudeen, and R. F. Adebiyi

Emotion Recognition from Facial Expressions 415
Ortil Msugh and Twaki Koko Grace

Applied Computing

Frequency Sharing between Satellite and Terrestrial Networks 424
S. A. Mikail, M. Abdelrahim, B. G. Evans, and Y. Ibrahim

On the Issues of Communication in FANET: A Light Fidelity Based Approach 431
B. O. Sadiq, E. A. Adedokun, M. B. Mu'azu, and Y. A. Sha'aban

Design of a Wireless Network for Rural Communities 439
Okoro Osahon and Azom E. Edim

Analysis of Mixed Strategies for P2P-TV Networks with Buffering Mechanism 446
Adamu Aminu and Y. V. Gaidamaka

Agricultural e-Extension Services: A Hybrid of Multilingual Translation Text-to-Speech - A Framework 455
Yahaya Mohammed Sani, Stella Oluyemi Etuk, Ilyasu Anda, and Mamman Adamu

Knowledge and Use of Data Driven Journalism among Media Reporters in Minna, Niger State. Nigeria 461
Gloria Eneh Omale and Daniel Ofomegbe Ekhaerafo

Emerging Technologies

Enhancing wordNet Against Overlapping Returns of Senses for Efficient Polysemy Representation in Ontology Development 466
Enesi Femi Aminu, Qasim Adewale Fajobi, Ishaq Oyebisi Oyefolahan, Muhammad Bashir Abdullahi, and Muhammadu Tajudeen Salaudeen

An Extended Min-Min Scheduling Algorithm in Cloud Computing 472
J. Y. Maipan-uku, A. Abdulganiyu, A. Abdulkadir, and A. Mishra

Blockchain 3.0: Towards a Secure Ballotcoin Democracy Through a Digitised Public Ledger in Developing Countries 477
E. M. Dogo, N. I. Nwulu, O. M. Olaniyi, C. O. Aigbavboa, and T. Nkonyana

Data Quality Evaluation Framework for Big Data 485
Grace Amina Onyeabor and Azman Ta'a

An IoT Based Smart Campus Architecture for Institutions in Developing Countries 491
Barroon Isma'eel Ahmad, Muhammad Aminu Umar, Mohammed Yahaya Tanko, Sheidu Salami Tenuche, Aminu Ahmad Sambo, Aminu Onimisi Abdulsalami, and Abdulrazak Abdulrahim

Enhanced Query Expansion Algorithm: Framework for Effective Ontology Based Information Retrieval System 496
Enesi Femi Aminu, Ishaq Oyebisi Oyefolahan, Muhammad Bashir Abdullahi, and Muhammadu Tajudeen Salaudeen

Mathematics and Theory of Computing

Visualization and Heuristic Optimization of Bifurcation Scenarios of a 4D Hyperchaotic Flow 503
Edwin A. Umoh and Ogechukwu N. Iloanusi

Application of Machine Learning to the Diagnosis of Lower Respiratory Tract Infection in Paediatric Patients 510
Olufunke C. Olayemi, Olumide S. Adewale, Olayemi O. Olasehinde, Bolanle A.Ojokoh, and Adebayo O. Adetunmbi

Requirement Formalization for Model Checking Using Extended Backus Naur Form 516
E. O. Aliyu, O. S. Adewale, A. O. Adetunmbi, and B. A. Ojokoh

Adaptive Synchronization and Parameters Estimation of a 5D Hyperchaotic System with Unknown System Parameters 521
Edwin .A. Umoh and Omokhafe J. Tola

Trajectory Analysis and Dynamic Simulation of a 6 DOF Industrial Manipulator 528
Abubakar Umar, Zhanqun Shi, Zulfiqar Ibrahim Bibi Farouk, and Wei Wang

2nd International Conference on Information and Communication Technology and Its Applications (ICTA 2018)
Federal University of Technology, Minna, Nigeria
September 5 – 6, 2018

Application of Geographic Information Systems in Creating Smart Campus Map of Federal University of Technology, Minna Bosso Campus

M. O. Odekunle, E. K. Odo, I. Sule, and A. A. Adenle
Department of Geography, Federal University of Technology, Minna, Niger State, Nigeria
odemary@futminna.edu.ng

***Abstract*—This project aimed at creating a smart campus map of Federal University of Technology, Bosso Campus, Minna Niger State, Nigeria. The advancement of technology with an attendant emergence of digital maps is gradually phasing out obsolete paper maps. One of the problems inherent with paper maps is the difficulty visitors face in navigating the campus. The study utilized ArcGIS as the main digital mapping software. It was used for digitization and simulation of map features. Google Earth pro 7.1 was used to extract and download satellite image of Bosso campus, which was geo-referenced to have the actual earth projection of the campus. The procedures employed include digitization, assignment of attributes to features, creation and editing of the map and finally, conversion of the map to KML format (the format that can be read by ArcGIS software), the utilization of Android Studio as an interactive software. The converted map is imported and overlaid with Google API 21. The Smart map is interactive software between users and various objects in the visual environment which further provides great convenience for the users to understand geographical environment and campus information of Bosso campus. The study demonstrates the potentials of digital mapping using GIS software and Android studio in creating and managing spatial data. Smart digital map can be used as a tool to formulate development plans not only in the campus but also for wider coverage areas.**

Keywords-digital mapping; geographic information systems; google earth; Android studio; campus map; digitization; smart map.

I. INTRODUCTION

Digital mapping (also referred to as digital cartography) is the process by which a collection of data is compiled and formatted into a visual images i.e. the creation and analysis of maps through the use of computers. As such, Geographical Information Systems (GIS) are an integral tool for cartography. The primary function of this technology is to produce maps that give accurate representations of a particular area, detailing major road arteries and other points of interest. The technology also allows the calculation of distances from one place to another and has made it easy to build sophisticated and interactive maps that can be disseminated (online) to a large number of people easily [1]

The roots of digital mapping lie within traditional paper maps. Paper maps provide basic landscapes similar to digitized road maps, yet are often cumbersome, cover only a designated area, and lack many specific details such as road blocks. In addition, there is no way to "update" a paper map except to obtain a new version. On the other hand, digital maps, in many cases, can be updated through synchronization with updates from servers. The development of mobile computing has recently (since about 2000) spurred the use of digital mapping in the sciences and applied sciences. As of 2009, science fields that use digital mapping technology include geology, engineering, architecture, land surveying, mining, forestry, environmental, and archaeology.

While there is a wide spectrum of specializations in digital mapping, the basic premise is that digital maps can accurately portray features as they actually appear to give "life-like experiences. Maps however, must be updated frequently to provide users with the most accurate reflection of a location [2]

FUT Minna Bosso Campus is located, between Latitudes 9°39'3.82"N to 9°39'25.90"N, Longitude 6°31'27.65"E to 6°31'27.65"E within Bosso Local Government Area of Niger State. Bosso Local Government Area is bordered by Shiroro to the North, Paiko to the East, Katcha to the South and Wushishi to the West. Federal University of Technology, Minna is a Federal Government owned University in Nigeria. It was established on 1st February, 1983 with the objective of giving effect to the Nation's drive for the much-needed self-reliance in Science, Engineering and especially Technology. It is a specialized University of Technology currently having two campuses (Gidan Kwano and Bosso) [3]. Figure 1 is showing the location of the study area.

In view of the advancement in technology all over the world, the use of paper maps has been gradually phased out giving rise to digital imagery or maps as the case maybe. Handheld GPS and ground based stations which are used in place of charts, these also coincide with;

- Students and faculty staff on campus having challenge to get around.
- Faculty staff and students finding it difficult when asked by people for direction to some obscure, remote or unfamiliar locations on campus.
- In addition, coming visitors can find difficulty to navigate the campus.

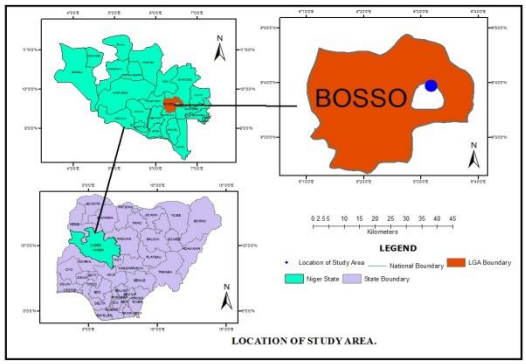

Figure 1. The Study Area

As a result of this, it has therefore become necessary to employ GIS and Remote Sensing for gathering information and data analysis in order to understand our immediate environment (FUT Minna campus). This will result into creating smart Campus map of FUT Minna, and convert to android and web application which can be used both within and outside the campus.

II. LITERATURE REVIEW

This chapter does a review of the various literatures used in this research.

A. Conceptual framework

- One of the most popular digital maps is Google Maps, which is useable for mobile devices and web applications. It offers satellite imagery, street maps, 360° panoramic view of street, real-time traffic conditions, and route planning for travelling by foot, car, bicycle, or public transportation.
- However, with using Google Maps application is not enough for searching or exploring some specific location on campus to get more details of information that user want to know.
- There are numerous researches focusing on creating and developing of FUT Minna smart campus map to benefit the users for exploring the campus.

The level of development in any university depends to a large extent on its state of utilization.

Geographic Information System (GIS) offers itself as a tool for effective mapping and management. It has many applications and promotes collaborations across a wide variety of disciplines. Therefore, mapping analysis and intelligence gathering using GIS have become very relevant today in Universities, as the rate of misallocating of places are much on the rise.

Since it have situational relevance, and hence have a positional element attached to them, GIS can be a very useful tool to display and apply spatial analysis to data, which reside in large databases, in order to obtain a strong visual appreciation of the patterns of locations and spatial activities.

Geospatial activities continue to be a major concern in contemporary society, causing headaches for the individual. Most universities are faced with displacement of students as a result of incorrect address location of places around the university. In many of the world's industrialized countries campus maps of universities are created as a software which is very accessible, portable and accurate because it also show the point location of student and the shortest routes to area of interest.

B. Map design and development

Visualization of map attracts much of user‘s attention. Cartographic visualization is concerned with the representation of geospatial data and the spatial understanding of users [4].

A good map should be simple with objective and precise geospatial information. Besides, it should be well presented in such a way that can attract reader‘s attention to the significant information [5]. In order to meet the requirements of a good map, cartographers must keep certain goals of design in mind when planning a map. These goals include: orderliness, clarity, contrast, balance, unity and harmony [6].

[7] proposed his visual hierarchy for map design. In his theory, he stated that map elements and objects are organized in a logical manner by their relative utility depending on the communicative objective of the map. His visual hierarchy is not only focused on the useful for the traditional map but also for the web and mobile map. As a cartographer, it is important to know how to make certain map elements stand out. There is no doubt that designing each map element is the best way to highlight it in the visual hierarchy. Some common techniques include manipulating color value, hue, and intensity to establish contrast and styling objects to make them look different.

Color plays a major role in cartography. The importance of color exceeds the understanding of many mapmakers. A good color scheme should be attractive and match the nature of the data [8].

C. Geographic Information System

GIS as one of the main supporters of education of the 21st century. A large number of options have been tested in order to find the perfect solution, by now it had become clear that GIS offers the best solution for these problems, and it can be used in educational applications too. Let’s look into these methods with the help of a few examples, starting with the past, and at the same time, pointing ahead at the hypothetical, or rather to the probable options of the future.

III. METHODOLOGY

This includes the various stages involved in generating the desired product; a review of the research method and instrument used. It also involves the procedure of the digital mapping and encompasses all the activities carried out from planning to the actual data acquisition and refinement.

A. Study Approach

In carrying out this project, a digital approach to the study was embarked upon, making use of the internet, ArcGIS software, Google Earth pro, Handheld GPS, satellite imagery of study area and ArcGIS 10.2 were used. A survey of the study area, such as Federal university of Technology Minna

Bosso campus site was carried out. This was necessary so as to get acquainted with the study area with regards to what will be required for this study, materials and data used and enable them be compared in relation to what was gotten digitally. The methodology flowchart is shown in figure 2.

B. *Data Required for the Study*

Hardware

Spatial Attributes were collected using the following**:**

- Handheld Germin GPS
- Pavilion M6 Hp Laptop

Software

The following software were utilized to perform data entry, storage, retrieval, manipulation and documentation.

- ArcGIS 10.2
- Google Earth Pro 7.3.1
- Google API
- Android SDK
- Microsoft office Excel 2007
- Microsoft office Word 2007

C. *Presentation of Data Acquisition*

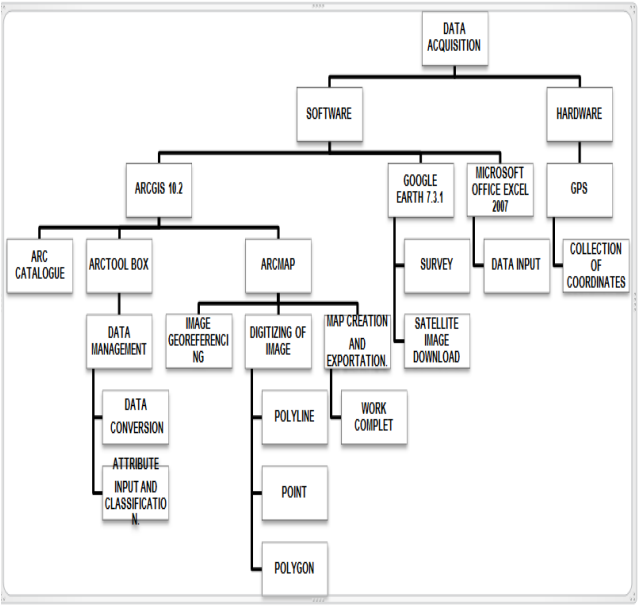

Figure 2. The Methodology Flow chart

D. *Methods of Data Collection*

Digital maps largely depend upon a vast amount of data collected over time. Most of the information that comprises digital maps is the culmination of satellite imagery as well as street level information.

The spatial data used include data on roads, buildings, streets, areas from the existing digital map collected, the Google Earth image used is indicated in figure 3. Also, the use of GPS to acquire the coordinate of some points of interest (POI). The attribute data (toponyms) of the spatial features were collected. Other important components of data collection include:

- Primary Data sources
- Secondary Data sources
- Reconnaissance survey
- Preliminary data acquisition and field operations
- Actual Field operations/GPS Survey.
- Data entry and storage
- Geo-referencing
- Digitization
- Database Development

Figure 3. Satellite Image of FUT Minna Bosso Campus

E. *Map design.:* Creating Android App FUT Minna Bosso Campus Map.

A decision was made to produce a map of FUT MINNA Bosso Campus, showing the buildings, sport facility, Faculties, laboratories, Residential (staff quarters), Hostels Foot paths, road network) at various scale. Each layer was converted to KML/.KMZ format for easy programming and transformation in Android studio. The methodology flow is indicated in figure 2 while the map of FUT Minna Bosso campus is indicated in figure 4 as digitized directly from the Google earth image in figure 3 and converted for further analysis in ArcGIS. The Android Studio IDE (Integrated Development Environment) comprised of a vast array of panels, tools, and functions to help users become as productive as possible at developing Android applications. I'll cover the most common panels, windows, and toolbars with which user interacts with. [9]

F. *Creating New Project*

When user opens up Android Studio and create your first new project in the IDE, user will notice that Android Studio introduces a new paradigm in regards to folder. Almost all files are located in the directory. The new file structure is in place in order to support the new Gradle build system. [10]

Using Android SDK (Software Development Kit) Configuration, smart Bosso campus map is inputted as the name of the application, company name was left as default, selection of the form in which the application is created with lower android API which will make the application run faster. The application interface was created, which include the navigation menu, Font, theme, colour etc. also the operational function which include the software creation and map

integration. Each of the map layers exported in kmz format was imported into the program to have a distinct functionality, it was overlaid with Google map. Google API 21 was downloaded, editing activities was carried out, see figure 5.

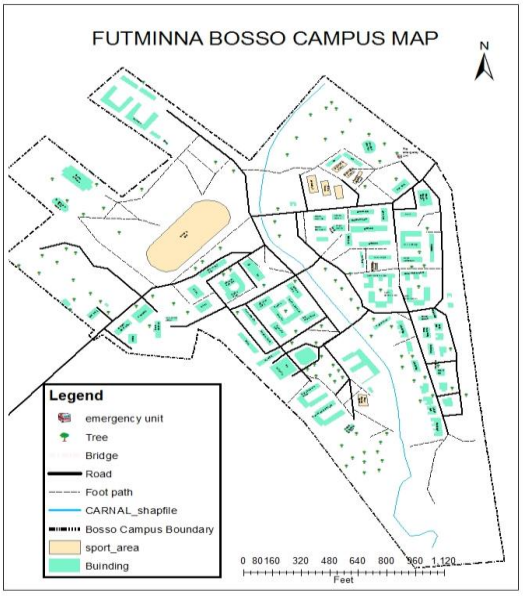

Figure 4. FUT Minna Bosso Campus Map

G. *Steps in Generating an Android Package Kit (APK)*

Generating an APK in Android Studio is a snap. The steps includes:

- Select/Generate Signed APK from the Build menu. This will display the Generate Signed APK Wizard.
- Select your module and click next.
- Either supply the path to your keystore that you're currently using for your Android application, or create a new key store.
- Click Next.
- At this point you can define the destination for your APK. You can also specify whether you'd like to run ProGuard, and where the ProGuard configuration file is located.
- Click Finish and your APK will be generated in the destination folder

H. *Features of FUT MINNA Smart Bosso Campus Map*

- It will give users a friendly interface and overall view of the campus and also tell the position of the user.
- FUT MINNA Bosso campus Map will provide a smart option for a key search for any specific remote around the campus.
- It will also provide directions to a chosen destination.
- It will provide information about targeted search item

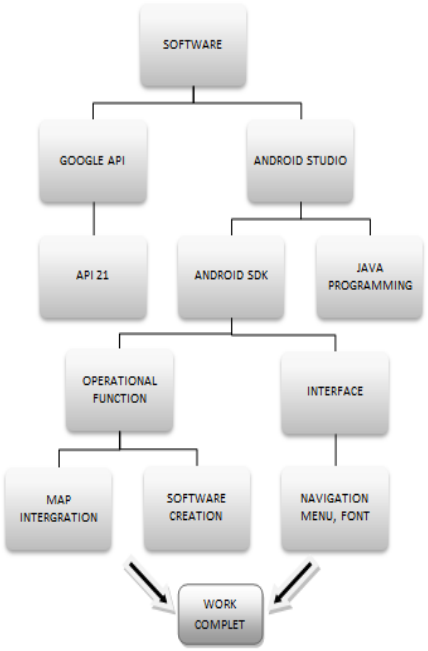

Figure 5. Smart map methodology flow

IV. RESULT/DISCUSSION

The use of ArcGIS and Google maps for developers in Android studio provides an opportunity for establishing a hybrid android application that aids the process of developing mobile map. Designed ArcMap can be integrated into mobile maps. Figure 6 on the last page of this paper gives an outlook of smart map of FUT Minna Bossso campus map showing different interfaces of the map application including a splash screen, main activity. When running the app, the splash screen comes up and it links to the main activity automatically in few seconds. The smart map launches and displays FUT Minna Bosso campus in 2D Format. It shows the buildings, roads, bridges, car parks and Bosso campus boundary in a colourful way. Users can find path ways or route to destination by adding markers from point of location to the point of destination. The smart map finds the possible and easiest route to such destination. A search bar is also added to give user access to search for places easily without much stress, few point marker are displayed to show few point of interest. At the top left corner of the screen is the menu bar. The menu gives other activities apart from map navigation, once clicked it opens up with categories which gives user access to select other activities that they are most interested in according to such categories. The menu has five categories which include search, Bosso campus map, e-portal, e- result portal and a gallery which displays the great structures and other activities of the Federal University of Technology, Minna, Bosso campus.

The interfaces of the interactivities illustrating the menu interface on Bosso campus smart map was displayed on Figure 5. It allows the users to navigate between different categories. Clicking on any of categories gives users access to its activity.

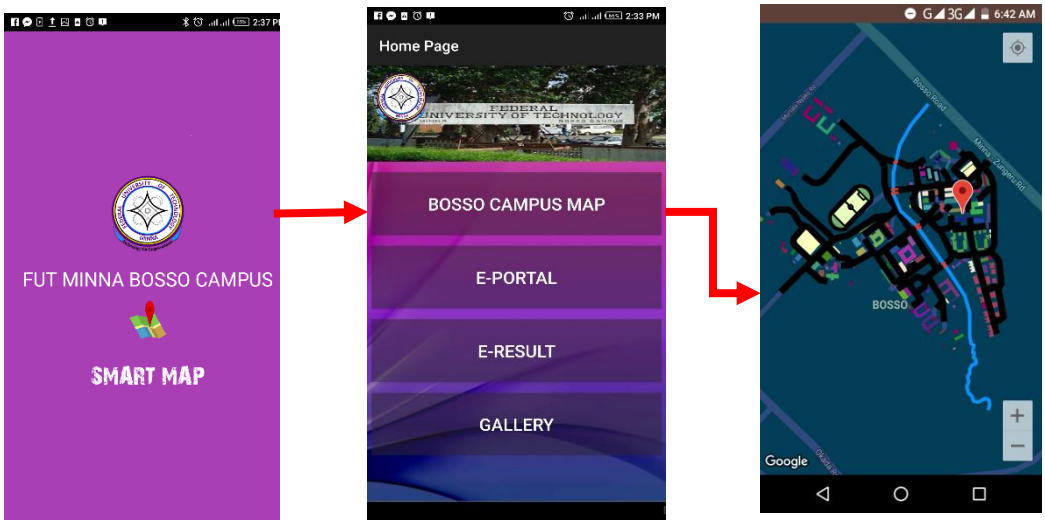

Figure 6. The mobile App Flow

The age of paper map is phasing out already giving rise to the age of smart mobile map inform of the smart campus map developed here. This can be substantiated by the views of [9]where these authours acknowledged to the fact that the age of personal computer (PC) is coming to a close with the emerging age of mobile computers (MC), a situation where smart phones or tablets function in a way that resembles the laptops. This is very true because we have seen a revolution whereby laptop overcame the former desktop, in like manner, the smartphone revolution will soon overcome the laptop and in that, the smart maps on the smart phones will definitely overcome the paper maps to a greater extent.

V. CONCLUSION AND RECOMMENDATION

A. *Conclusion*

The smart Bosso map demonstrates a way of creating an interactive mobile for showing maps based on open source platform. The study of modern trend of mobile mapping is grasped by recent studies. As for implementation part, there are two aspects-design of using ArcMap and developing this mobile map app. Google map is useful for online mapping tool that makes design for mobile mapping, whereas Arcmap is also a key tool in both offline and online mapping activities. The background map was designed by setting various related properties and customization of Google API for the map activity. The individual layers, colours, and labels were done using ArcMap. All the manipulation can be shown in a user friendly interface.

B. *Recommendation*

The following recommendations should be considered:

Smart digital mapping of F.U.T. Minna Gidan Kwano campus should be carried out.

For both campuses (Bosso and Gidan Kwano) this mobile application should be made available to staff, students and visitors for easy access to various places on campus.

- One of the value of digital map that made it different from paper map can be found in its ability for easy upgrade and update besides access, therefore F.U.T. Minna smart maps should be updated from time to time.
- Such maps like this should also be extended and implemented for use in other places other than campuses.

ACKNOWLEDGMENT

I want to thank God for giving us the opportunity to initiate this smart campus map. Thanks to the team of authors who are always ready for input as need arise. Our sincere appreciation also goes to the Department of Geography, Federal University of Technology, Minna for the shape files and other valuable items they made available that have in one way or the other contributed to the success of this work.

REFERENCES

[1] D. Uluocha, " Digital mapping of University of Lagos Akoka.," Lagos.

[2] N. O. Uluocha, Elements of Geographic Information Systems, Lagos: Sam Iroanusi Publications, 2007.

[3] Abraham, "Abraham," 21 January 2017. [Online]. Available: https://www.FUT Minna.edu.ng/index.php/FUT Minna/history. [Accessed 13 April 2018].

[4] C. C. Adam Gerber, Learn Android Studio, 2013.

[5] D. Felker, "Developing with Android Studio," pp. 71-88.

[6] D. Khamphao, "Smart campus map:Sokpaluang campus," national university of Laos..

[7] K. O., Basic concept of Geographic information system, 1998.

[8] Jiang, B, "Cartography," Cartographic visualization: analytical and communication tools, pp. 25(2), 1-11, 1996.

[9] Zealand, S. N., Design principles for maps using New Zealand's statistical data, Statistics New Zealand Tatauranga Aotearoa Wellington, 2014.

[10] Tyner, J. A., "Principles of map design," Guilford Press, 2010.

[11] B. D. Dent, Cartography-thematic map design, William C Brown Pub., 1999.

[12] Harrower, M., & Brewer, C. A., "ColorBrewer. org: an online tool for selecting colour," The Cartographic Journal., 2013.