System bandwidth and the existence of generalized shift-invariant frames

We consider the question whether, given a countable family of lattices \( \{\Gamma_j\}_{j \in J} \) in a locally compact abelian group \( G \), there exist functions \( \{g_j\}_{j \in J} \) such that the resulting generalized shift-invariant system \( \{g_j(\cdot - \gamma)\}_{\gamma \in \Gamma_j} \) is a tight frame of \( L^2(G) \). This paper develops a new approach to the study of generalized shift-invariant systems via almost periodic functions, based on a novel unconditional convergence property. From this theory, we derive characterizing relations for tight and dual frame generators, we introduce the system bandwidth as a measure of the total bandwidth a generalized shift-invariant system can carry, and we show that the so-called Calderón sum is uniformly bounded from below for generalized shift-invariant frames. Without the unconditional convergence property, we show, counter intuitively, that even orthonormal bases can have arbitrary small system bandwidth. Our results show that the question of existence of frame generators for a general lattice system is rather subtle and depends on analytical and algebraic properties of the lattice system.
Limits to anatomical accuracy of diffusion tractography using modern approaches

Diffusion MRI fiber tractography is widely used to probe the structural connectivity of the brain, with a range of applications in both clinical and basic neuroscience. Despite widespread use, tractography has well-known pitfalls that limit the anatomical accuracy of this technique. Numerous modern methods have been developed to address these shortcomings through advances in acquisition, modeling, and computation. To test whether these advances improve tractography accuracy, we organized the 3-D Validation of Tractography with Experimental MRI (3D-VoTEM) challenge at the ISBI 2018 conference. We made available three unique independent tractography validation datasets — a physical phantom and two ex vivo brain specimens — resulting in 176 distinct submissions from 9 research groups. By comparing results over a wide range of fiber complexities and algorithmic strategies, this challenge provides a more comprehensive assessment of tractography's inherent limitations than has been reported previously. The central results were consistent across all sub-challenges in that, despite advances in tractography methods, the anatomical accuracy of tractography has not dramatically improved in recent years. Taken together, our results independently confirm findings from decades of tractography validation studies, demonstrate inherent limitations in reconstructing white matter pathways using diffusion MRI data alone, and highlight the need for alternative or combinatorial strategies to accurately map the fiber pathways of the brain.

General information

State: Published
Organisations: Department of Applied Mathematics and Computer Science, Image Analysis & Computer Graphics, Vanderbilt University, German Cancer Research Center (DKFZ), University of Southern California, University of Verona, University of Lausanne, University of North Carolina, Southern Medical University, Universite de Sherbrooke, Cardiff University, Harvard University, Danish Research Centre for Magnetic Resonance, University of Pennsylvania, National Institutes of Health, Swiss Federal Institute of Technology Lausanne
Pages: 1-11
Publication date: 15 Jan 2019
Peer-reviewed: Yes
Web of Science (2019): Indexed yes
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): CiteScore 6.15 SJR 3.679 SNIP 1.806
Web of Science (2017): Impact factor 5.426
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 6.31 SJR 3.967 SNIP 1.759
Web of Science (2016): Impact factor 5.835
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 6.71 SJR 4.583 SNIP 1.852
Web of Science (2015): Impact factor 5.463
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 6.9 SJR 4.323 SNIP 2.03
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 7.06 SJR 4.489 SNIP 2.028
Web of Science (2013): Impact factor 6.132
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): CiteScore 6.86 SJR 4.026 SNIP 1.972
Web of Science (2012): Impact factor 6.252
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): CiteScore 6.31 SJR 3.728 SNIP 1.818
Web of Science (2011): Impact factor 5.895
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 3.654 SNIP 1.869
Web of Science (2010): Impact factor 5.937
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Scopus rating (2009): SJR 3.954 SNIP 1.899
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Scopus rating (2005): SJR 3.78 SNIP 1.921
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 3.481 SNIP 1.803
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 2.003 SNIP 1
Tunable terahertz broadband absorber based on a composite structure of graphene multilayer and silicon strip array

We propose a terahertz broadband absorber composed by silicon strips with continuous graphene on top of a metal mirror. The simulation results show that under the combined effect of the Fabry–Perot resonance and the dipole mode oscillation excited in the silicon strip array interacting with graphene, this structure can achieve an ultra-wide absorption band from 0.73 to 1.95 THz with absorbance of 90%. By changing the size of the silicon strips or the Fermi level of graphene, the working band of the absorber can be tuned.

General information
State: Published
Organisations: Department of Photonics Engineering, Structured Electromagnetic Materials, China Jiliang University
Contributors: Zhai, Z., Zhang, L., Li, X., Xiao, S.
Number of pages: 4
Pages: 199-202
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Journal: Optics Communications
Volume: 431
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Ratings:
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BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): CiteScore 1.86 SJR 0.614 SNIP 0.95
Web of Science (2017): Impact factor 1.887
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 1.65 SJR 0.603 SNIP 0.87
Web of Science (2016): Impact factor 1.588
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 1.62 SJR 0.673 SNIP 0.928
Web of Science (2015): Impact factor 1.48
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 1.62 SJR 0.7 SNIP 1.03
Web of Science (2014): Impact factor 1.449
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 1.78 SJR 0.74 SNIP 1.154
Spatiotemporal patterns of snow depth within the Swiss-Austrian Alps for the past half century (1961 to 2012) and linkages to climate change

Our current knowledge on multi-decadal to centennial changes of snow in different parts of the world is based largely on observations of snow depth and depth of snowfall from national weather and hydrographic services. Studies analysing these snow observations in the European Alps are predominantly based on national data and are therefore limited by their respective borders in the detection of robust, spatiotemporal snow trends. In order to overcome this limitation, data from Austria and Switzerland, which cover a substantial fraction of the Alps when taken together, are merged for this study (196 station-records). Additionally, it is the first time that such an analysis is based on homogenized data. Our homogenization
study shows that, although the detection of breaks in snow depth series works quite well with the existing methods, further research is needed to adequately correct snow depth series at a daily resolution. Roughly, 70% (139 station-records) of the snow depth series could be homogenized and are used for further trend analysis. The findings concern seven climatologically different areas that are identified by a regionalization (using empirical orthogonal functions) using station records from 1961 to 2012. These regions share a high degree of inner similarity and outer separation, and the temporal trends detected are rather different across the Swiss-Austrian domain. Regions in the south show a clear decrease in the snow depth of up to −12 cm/decade on average, while those in the northeast are characterized by almost no change. The declining trend in the southern regions intensifies as altitude increases. Comparisons of these variations in depth changes with concurrent changes in air temperature and precipitation totals reveal a clear dichotomy with respect to elevation. Snow depths in low elevated areas are highly sensitive to air temperature changes, whereas those at high elevations strongly depend on alterations in precipitation totals.

General information
State: Accepted/In press
Organisations: Department of Wind Energy, Meteorology & Remote Sensing, University of Graz, Swiss Federal Institute for Forest, Snow and Landscape Research, Central Institution for Meteorology and Geodynamics
Contributors: Schöner, W., Koch, R., Matulla, C., Marty, C., Tilg, A.
Publication date: 1 Jan 2019
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Journal: International Journal of Climatology
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Ratings:
BFI (2019): BFI-level 1
Web of Science (2019): Indexed yes
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 3.7 SJR 1.797 SNIP 1.516
Web of Science (2017): Impact factor 3.1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.49 SJR 1.916 SNIP 1.535
Web of Science (2016): Impact factor 3.76
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 3.28 SJR 2.015 SNIP 1.434
Web of Science (2015): Impact factor 3.609
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 3.16 SJR 1.959 SNIP 1.583
Web of Science (2014): Impact factor 3.157
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 3.32 SJR 2.094 SNIP 1.702
Web of Science (2013): Impact factor 3.398
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 2.88 SJR 2.038 SNIP 1.515
Web of Science (2012): Impact factor 2.886
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 2.85 SJR 1.842 SNIP 1.559
Web of Science (2011): Impact factor 2.906
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.875 SNIP 1.446
Web of Science (2010): Impact factor 2.479
TIMES-DK: Technology-rich multi-sectoral optimisation model of the Danish energy system

As Denmark progresses towards a carbon neutral future, energy system models are required to address the challenges of the energy transition. This article describes design, input data and current usage of TIMES-DK, the first Danish energy system model that includes the complete national energy system, covering long-term technology investments. The article aims at explaining the modelling approach; highlighting strengths and reflecting upon limitations of the model; illustrating possible applications of TIMES-DK and inspiring new model developments. Some of the key strengths of the model include simultaneous optimisation of operation and investments across the complete energy system over the whole modelling horizon, explicit representation of the most important sectors of the economy, modular structure and the possibility of linking to a computable general equilibrium model for an additional insight on, e.g. public finance or CO₂-leakage. TIMES-DK is being developed in close collaboration between an energy agency, a university and a consulting firm, to improve its robustness, relevance and impact on policy making. It allows for a wide range of applications including exploratory energy scenarios and policy analysis. To meet challenges of the future, further development of the model is needed and consequently the article provides references to ongoing projects addressing current development needs, such as improved representation of transport and flexible handling of the temporal dimension. To support a democratic and transparent process around decisions for the future Danish energy system, TIMES-DK should become available to interested parties.

General information
State: Published
Organisations: Technical University of Denmark, Department of Management Engineering, Systems Analysis, Danish Energy Agency, E4SMADanish Energy Agency, E4SMAR
Contributors: Balyk, O., Andersen, K. S., Dockweiler, S., Gargiulo, M., Karlsson, K., Næraa, R., Petrović, S., Tattini, J., Termansen, L. B., Venturini, G.
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Peer-reviewed: Yes

Publication information
Journal: Energy Strategy Reviews
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ISSN (Print): 2211-467X
Ratings:
BFI (2019): BFI-level 1
Web of Science (2019): Indexed yes
Biomanipulating streams: a supplementary tool in lake restoration

Removal of cyprinid fish is a widely used biomanipulation tool to transform turbid shallow eutrophic lakes in north temperate regions into a clear water state. We here evaluate the removal of cyprinids from streams as a supplement to lake fishing. Since cyprinids often aggregate in high densities in lake inlet/outlet streams during winter migration, removal of fish in this space-confined habitat may be cost-efficient as compared to fish removal in the lake habitat. In two consecutive years, we annually removed up to 35% of the dominant cyprinids from an inlet stream to a lake and argue that this could easily be increased with a more targeted fishing effort. Concurrently, we monitored species- and length-specific variation in migration propensity, to explore how this relates to efficient fish removal. Smaller planktivores generally had a much higher migratory propensity than larger benthivores. Hence, stream fishing specifically targets species and size groups that are less efficiently controlled with traditional lake fishing methods. As a rule of thumb, stream fishing is most efficient when water temperature is 2–6°C. Prior to implementing fish removals from streams, the potential evolutionary consequences of the targeted removal of migratory phenotypes should be considered.

General information
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Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology, Technical University of Denmark, Swiss Federal Institute of Aquatic Science and Technology, University of Bern, Lund University, University of Manchester, Karlstad University
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Journal: Hydrobiologia
Volume: 829
ISSN (Print): 0018-8158
Ratings:
BFI (2019): BFI-level 1
Web of Science (2019): Indexed yes
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 2.15
Possible power of down-regulated offshore wind power plants

This paper proposes a method for real-time estimation of the possible power of an offshore wind power plant when it is down-regulated. The main purpose of the method is to provide an industrially applicable estimate of the possible (or reserve) power. The method also yields a real-time power curve, which can be used for operation monitoring and wind farm control. Currently, there is no verified approach regarding estimation of possible power at wind farm scale. The key challenge in possible power estimation at wind farm level is to correct the reduction in wake losses, which occurs due to the down-regulation. Therefore, firstly, the 1-second wind speeds at the upstream turbines are estimated, since they are not affected by the reduced wake. Then they are introduced into the wake model, adjusted for the same time resolution, to correct the wake losses. To mitigate the uncertainties due to dynamic changes within the large offshore wind farms, the algorithm is updated at every turbine downstream, considering the local axial and lateral turbulence effects. The
PossPOW algorithm uses only 1-Hz turbine data as inputs and provides possible power output. The algorithm is trained and validated in Thanet and Horns Rev-I offshore wind farms under nominal operation, where the turbines are following the optimum power curve. The results indicate that the PossPOW algorithm performs well; in the Horns Rev-I wind farm, the strict power system requirements are met more than 70% of the time over the 24-hour data set on which the algorithm was evaluated.

**General information**
State: Accepted/In press
Organisations: Department of Wind Energy, Technical University of Denmark, Integration & Planning, Department of Applied Mathematics and Computer Science, Dynamical Systems
Contributors: Göçmen, T., Giebel, G., Poulsen, N. K., Sørensen, P. E.
Publication date: 1 Jan 2019
Peer-reviewed: Yes

**Publication information**
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Ratings:
BFI (2019): BFI-level 2
Web of Science (2019): Indexed yes
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): CiteScore 3.18 SJR 1.051 SNIP 1.834
Web of Science (2017): Impact factor 2.938
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 3.37 SJR 1.079 SNIP 2.316
Web of Science (2016): Impact factor 2.725
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 3.06 SJR 1.201 SNIP 2.165
Web of Science (2015): Impact factor 2.891
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 3.42 SJR 1.209 SNIP 3.688
Web of Science (2014): Impact factor 3.069
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 2.75 SJR 1.235 SNIP 2.486
Web of Science (2013): Impact factor 2.556
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): CiteScore 2.36 SJR 1.062 SNIP 2.297
Web of Science (2012): Impact factor 1.436
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): CiteScore 2.49 SJR 0.892 SNIP 2.582
Web of Science (2011): Impact factor 1.768
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.364 SNIP 2.026
Web of Science (2010): Impact factor 1.716
Web of Science (2010): Indexed yes
A two-layer game theoretical attack-defense model for a false data injection attack against power systems

With the widespread application of information and communication technology in power systems, cyber security has become critical for ensuring effective measurement, communication, calculation and execution. A successful false data injection attack (FDIA) can bypass traditional systems for identifying bad data and interfere with decision making in control centers, thus causing power system failures. In this paper, the measurements within the phasor measurement units (PMUs) are used as attack and defense objects, and load shedding resulting from line failure is utilized to quantify the attack consequences. To construct the optimal defense against an FDIA, this paper examines the characteristics and construction of FDAs from the perspective of attackers, aiming to reveal the shortcomings of traditional bad data identification. From the perspective of those defending against an FDIA, a two-layer defense model is proposed that includes detection and protection. First, information from multiple sources is utilized to improve the detection of false data. Second, extra PMUs are added as a protection method to strengthen the measurement redundancy. A zero-sum static game algorithm is applied to optimize the deployment of defense resources. The effectiveness of the proposed strategy is tested using IEEE 14-bus, 57-bus and 118-bus systems, and the impact of information asymmetry is also discussed.
Masses and radii for the three super-Earths orbiting GJ 9827, and implications for the composition of small exoplanets

Super-Earths belong to a class of planet not found in the Solar System, but which appear common in the Galaxy. Given that some super-Earths are rocky, while others retain substantial atmospheres, their study can provide clues as to the formation of both rocky planets and gaseous planets, and - in particular - they can help to constrain the role of photoevaporation in sculpting the exoplanet population. GJ 9827 is a system already known to host 3 super-Earths with orbital periods of 1.2, 3.6 and 6.2 days. Here we use new HARPS-N radial velocity measurements, together with previously published radial velocities, to better constrain the properties of the GJ 9827 planets. Our analysis can’t place a strong constraint on the mass of GJ 9827 c, but does indicate that GJ 9827 b is rocky with a composition that is probably similar to that of the Earth, while GJ 9827 d almost certainly retains a volatile envelope. Therefore, GJ 9827 hosts planets on either side of the radius gap that appears to divide super-Earths into pre-dominantly rocky ones that have radii below \( \sim 1.5R_\oplus \), and ones that still retain a substantial atmosphere and/or volatile components, and have radii above \( \sim 2R_\oplus \). That the less heavily irradiated of the 3 planets still retains an atmosphere, may indicate that photoevaporation has played a key role in the evolution of the planets in this system.

General information
State: Accepted/In press
Organisations: Astrophysics and Atmospheric Physics, National Space Institute, University of California at Berkeley, University of Edinburgh, National Institute for Astrophysics, University of Cambridge, University of Texas at Austin, Harvard-Smithsonian Center for Astrophysics, Harvard University, University of St Andrews, Queen's University Belfast, Université de Genève, Fundación Galileo Galilei, Università di Padova, European Southern Observatory, NASA Goddard Space Flight Center
Publication date: 2019
Peer-reviewed: Yes

Publication information
Journal: Monthly Notices of the Royal Astronomical Society
ISSN (Print): 0035-8711
Ratings:
BFI (2019): BFI-level 2
Web of Science (2019): Indexed yes
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): CiteScore 3.54 SJR 2.346 SNIP 0.904
Web of Science (2017): Impact factor 5.194
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 4.09 SJR 2.388 SNIP 1.134
Web of Science (2016): Impact factor 4.961
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 4 SJR 2.701 SNIP 1.165
Web of Science (2015): Impact factor 4.952
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 4.79 SJR 3.23 SNIP 1.322
Web of Science (2014): Impact factor 5.107
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 5.1 SJR 3.155 SNIP 1.23
Web of Science (2013): Impact factor 5.226
This paper presents an analysis of requirements to Software Defined Network (SDN) Controllers (SDNC), from the point of view of the Telco’s Next Generation Platform as a Service (NGPaaS) functional and architectural needs. Numerous requirements have been identified, which can be grouped in 4 categories: domain-based, modularity-based, related to the SDN and Network Function Virtualization (NFV) integration and finally policy-based. These requirements are later mapped into the ONOS SDN controller, with the scope of identifying possible gaps and points of improvement.
Coherent combining of high brightness tapered amplifiers for efficient non-linear conversion

We report on a coherent beam combination of three high-brightness tapered amplifiers, which are seeded by a single-frequency laser at λ = 976 nm in a simple architecture with efficiently cooled emitters. The maximal combined power of 12.9 W is achieved at a combining efficiency of > 65%, which is limited by the amplifiers’ intrinsic beam quality. The coherent combination cleans up the spatial profile, as the central lobe’s power content increases by up to 86%. This high-brightness infrared beam is converted into the visible by second harmonic generation. This results in a high non-linear conversion efficiency of 4.5%/W and a maximum power over 2 W at 488 nm, which is limited by thermal effects in the periodically poled lithium niobate (PPLN).
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Source: FindIt
Source-ID: 2443013160
Research output: Research - peer-review; Journal article – Annual report year: 2019
We report on a simple chemical etching method that enables nonlinear tapering of Polymer Optical Fiber (POF) tips to manufacture Compound Parabolic Concentrator (CPC) fiber tips. We show that, counter-intuitively, nonlinear tapering can be achieved by first etching the core and not the cladding. The etching mechanism is modelled and etched tips are characterized both geometrically and optically in a fluorescence glucose sensor chemistry. A Zemax model of the CPC tipped sensor predicts an optimal improvement in light capturing efficiency of a factor of 3.96 compared to the conventional sensor with a plane-cut fiber tip. A batch of eight CPC fiber tips has been manufactured by the chemical etching method. The batch average showed an increase of a factor of 3.16, which is only 20% less than the predicted value. The method is reproducible and can be up-scaled for mass production.

General information
State: Published
Organisations: Department of Health Technology, Diode Lasers and LED Systems, Department of Photonics Engineering, Fiber Sensors & Supercontinuum
Contributors: Hassan, H. U., Bang, O., Janting, J.
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Publication date: 2019
Peer-reviewed: Yes

Publication information
Journal: Sensors
Volume: 19
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Article number: 285
ISSN (Print): 1424-8220
Ratings:
BFI (2019): BFI-level 2
Web of Science (2019): Indexed yes
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): CiteScore 3.23 SJR 0.584 SNIP 1.55
Web of Science (2017): Impact factor 2.475
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.78 SJR 0.623 SNIP 1.614
Web of Science (2016): Impact factor 2.677
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 2.21 SJR 0.647 SNIP 1.643
Web of Science (2015): Impact factor 2.033
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 2.4 SJR 0.707 SNIP 1.796
Web of Science (2014): Impact factor 2.245
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 2.72 SJR 0.636 SNIP 1.758
Web of Science (2013): Impact factor 2.048
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): CiteScore 2.53 SJR 0.671 SNIP 1.709
Web of Science (2012): Impact factor 1.953
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
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To protect assets and resources from being hacked, intrusion detection systems are widely implemented in organizations around the world. However, false alarms are one challenging issue for such systems, which would significantly degrade the effectiveness of detection and greatly increase the burden of analysis. To solve this problem, building an intelligent false alarm filter using machine learning classifiers is considered as one promising solution, where an appropriate algorithm can be selected in an adaptive way in order to maintain the filtration accuracy. By means of cloud computing, the task of adaptive algorithm selection can be offloaded to the cloud, whereas it could cause communication delay and increase additional burden. In this work, motivated by the advent of edge computing, we propose a framework to improve the intelligent false alarm reduction for DIDS based on edge computing devices. Our framework can provide energy efficiency as the data can be processed at the edge for shorter response time. The evaluation results demonstrate that our framework can help reduce the workload for the central server and the delay as compared to the similar studies.

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This paper proposes a dynamic tariff-subsidy (DTS) method for congestion management in distribution networks with high penetration of photovoltaics (PV), heat pumps (HPs) and electric vehicles (EVs) with vehicle-to-grid (V2G) function. The DTS method is an extension of the dynamic tariff method proposed in the previous study. With the DTS, the regulation prices can be positive (tariff) or negative (subsidy). The study shows that the negative regulation price is necessary and very effective to solve congestion due to feed-in power flows, such as PVs and EVs in the V2G mode. In the study, dual decomposition of a convex quadratic model is proposed in addition to a conventional method for the DTS calculation. The case studies on the Roy Billinton Test System (RBTS) demonstrate the efficacy of the DTS method for congestion management in distribution networks.
Optimal Infrastructure Planning of EVs Fast Charging Stations based on Prediction of Users' Behaviour

Electric Vehicles (EVs) appear to offer a promising solution to support sustainable transportation and reduction of CO2 emissions in the metropolitan areas. To satisfy the EV load demand of the new EV models with larger battery capacities, public DC Fast-Charging Stations (DCFCSs) are essential to recharge EVs rapidly. A stochastic planning method of the DCFCSs is presented considering users' behaviour and the probabilistic driving patterns in order to predict EVs charging demand. According to the stochastic method, a coordinated charging demand and battery energy storage (BES) charging demand are proposed with the objective of minimising EVs peak load and the charging infrastructure costs. The proposed planning method shows the ability to avoid additional grid reinforcement costs caused by the EVs demand during the peak hours. In the coordinated charging demand, the EVs peak load is managed by using DCFCSs controllability modes. Instead, in the BES charging demand, an optimal BES is proposed as an alternative solution to reduce DCFCSs operational costs as well as EVs peak demand. Finally, an economic analysis is carried out to evaluate the technical and economic issues of DCFCSs, the BES life-cycle costs as well as the financial performance of BES costs versus grid reinforcement costs.

Do unit commitment constraints affect generation expansion planning? A scalable stochastic model

Due to increasing penetration of stochastic renewable energy sources in electric power systems, the need for flexible resources especially from fast-start conventional generation units (e.g., combined cycle gas turbine plants) is growing. The fast-start conventional units are being operated more frequently in order to respond to the variability and uncertainty of stochastic generation. This raises two important technical questions: as it is common in the literature, is it still an appropriate simplification to ignore the operational unit commitment (UC) constraints of conventional units within the generation expansion planning optimization? And if not, which UC constraint impacts most the expansion planning outcomes? To answer these questions, this paper aims at measuring the planning inefficiency (i.e., the underestimation of need for new generation capacity) caused by ignoring each UC constraint. To this purpose, we develop a centralized network-constrained generation expansion planning model incorporating UC constraints. In particular, we model start-up and shut-down costs, minimum production level and hourly ramping limits of conventional units. Wind power production is considered as the only source of uncertainty, and is modeled through a set of scenarios. A two-stage stochastic programming tool is used, whose first stage determines the long-term expansion and short-term UC decisions over different hours of representative days, while the second stage models the real-time operation for accommodating imbalances arising from wind deviation under different scenarios. Since this problem is potentially hard to solve especially with a large number of representative days and scenarios, a multi-cut Benders' decomposition algorithm is implemented. The well-functioning of the proposed model and the impact of each UC constraint on planning outcomes are evaluated using an extensive numerical study. In our case studies, the exclusion of ramping constraints from planning optimization causes large error and is the most distorting simplification.
Distribution System Services Provided by Electric Vehicles: Recent Status, Challenges, and Future Prospects

Trend-setting countries have promoted or even employed an increased number of electric vehicles (EVs) and other distributed energy resources (DERs) in their power systems. This development has triggered new and increasing challenges in the distribution system planning and operation, whereby the distribution systems must adapt to the increased share of DERs. However, EVs may also offer new opportunities and can be used to support the grid by providing several local and global power- and energy-based services. This paper presents a review and classification of the services potentially available from EVs for distribution systems, referred to as EV distribution system services (EV-DSS). A detailed description of recent services and approaches is given, and an assessment of the maturity of EV-DSS is provided. Moreover, challenges and prospects for future research are identified, considering key topics, such as the design of the market framework, economic assessment, battery degradation, and the impacts of the transmission system operator service provision by EVs on distribution networks. Thus, this paper offers a tool for stakeholders concerning services available from EVs and provides a broad literature framework that can be used as a base for further investigations. It is aligned with the current requirements to move toward the realistic implementations of EV-DSS.
Impact of Large-Scale EV Integration and Fast Chargers in a Norwegian LV Grid

Norway has implemented economic incentives over several years to encourage a transition from conventional vehicles to electric vehicles (EVs), and now has the largest share of EVs per capita in the world. This study explores the effects of increasing EV penetration levels in a Norwegian distribution grid, by using real power measurements obtained from household smart meters in load flow analyses, using the MATPOWER load flow package in MATLAB. The implications of installing a fast charger in the grid has been assessed, and an optimal location for it is proposed, aiming at minimizing both grid losses and voltage deviations. Moreover, the potential for reactive power injection to reduce the voltage deviations caused by it has been investigated. Results show that the EV hosting capacity of the grid is good for a majority of the end-users, but that the weakest power cable would be overloaded at a 20% EV penetration level. The network tolerated an EV penetration of 50% with regards to the voltage levels at all end-users. Injecting reactive power at the location of an installed fast charger proved to significantly reduce the largest voltage deviations otherwise imposed by the charger.

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A Protein-Based, Water-Insoluble, and Bendable Polymer with Ionic Conductivity: A Roadmap for Flexible and Green Electronics

Proteins present an ecofriendly alternative to many of the synthetic components currently used in electronics. They can therefore in combination with flexibility and electroactivity uncover a range of new opportunities in the field of flexible and green electronics. In this study, silk-based ionic conductors are turned into stable thin films by embedding them with 2D nanoclay platelets. More specifically, this material is utilized to develop a flexible and ecofriendly motion-sensitive touchscreen device. The display-like sensor can readily transmit light, is easy to recycle and can monitor the motion of almost any part of the human body. It also displays a significantly lower sheet resistance during bending and stretching regimes than the values typically reported for conventional metallic-based conductors, and remains fully operational after
mechanical endurance testing. Moreover, it can operate at high frequencies in the kilohertz (kHz) range under both normal
and bending modes. Notably, our new technology is available through a simple one-step manufacturing technique and can
therefore easily be extended to large-scale fabrication of electronic devices.

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Numerical modeling of water-soluble solvents for enhancing oil recovery in heterogeneous chalk reservoirs
Dimethyl Ether Waterflooding (DEW) is a promising water-soluble solvent-based EOR technique. Here, we study DEW
mechanisms by developing a mathematical model taking into account the swelling and viscosity reduction of oil. Our
analyses show that the swelling and viscosity reduction of oil cannot explain the observed increased recovery of DEW in
the published core flooding data. Therefore, we define the residual oil saturation as a linear function of DME concentration
in the oil phase to fit the model to the experimental data.

After model validation against a 1D core flooding experiment, we utilize the model to study the effect of permeability
heterogeneity and the injected DME slug size on the recovery of oil from a water-flooded chalk reservoir. We observe a
sharp increase in the ultimate recovery when the DME slug size increases from 0.2 to 1.8 pore volume with a DME
concentration of 10wt%. Since DME is an expensive agent, the optimal slug size requires an integrated economic
evaluation. We calculate the increased Net Present Value (NPV) of DEW flooding in the heterogeneous chalk reservoirs
compared to the conventional water flooding for two scenarios of well completions. By comparing the water breakthrough
and DME induced recovery, we conclude that the most economical scenario for the DEW flooding is observed in the
reservoirs with the lowest heterogeneity.

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