第11回月刊JPCOAR「オープンアクセス新任担当者相談会」実務紹介(1)

学術コミュニケーションの基礎知識

2022年　JPCOAR イベント運営作業部会

本講の内容

①学術雑誌とはどのようなものか
②論文とはどのようなものか
③オープンアクセスとはどういうことか

①学術雑誌とはどのようなものか

①学術雑誌とはどのようなものか

“学術雑誌の４機能”

それを生み出したのが私だと世界に認知してほしい

論文の先取権の確立

査読による質の保証

その科学的真価を認めてほしい

世に広まってほしい

知見を世に知らせる

知見を後世に伝える

後世にも伝えたい

ヘンリー・オルデンバーグ氏の書簡（1664～1665）より。同氏は、世界最古の学術雑誌と言われるイギリス王立協会「フィロソフィカル・トランザクション」（1665～）創刊時の事務総長

①学術雑誌とはどのようなものか

一般的な出版物

- 著者・作者は原稿料や印税などを受け取り、収入とする

学術雑誌

むしろ著者がお金（例えば20万円とか）を払うケースもある。

- 著者は対価を得ない
  - 研究論文執筆・公開の目的は金銭でなく、著作が広く行き渡り、科学の発展に寄与すること
  - 収入は所属機関の給与など。学術的名声を得て、ポストを獲得することが間接的に収入に寄与

①学術雑誌とはどのようなものか

THE ROYAL SOCIETY PUBLISHING | All Journals

Brought to you by Kyoto University, Faculty of Integrated Human Studies

Sign in | Search

Home | Content | Information for | About us | Sign up | Submit

PROCEEDINGS OF THE ROYAL SOCIETY A

MATHEMATICAL, PHYSICAL AND ENGINEERING SCIENCES

The Royal Society's physical sciences research journal, publishing high-quality research and review articles from all disciplines in the physical sciences

Current issue

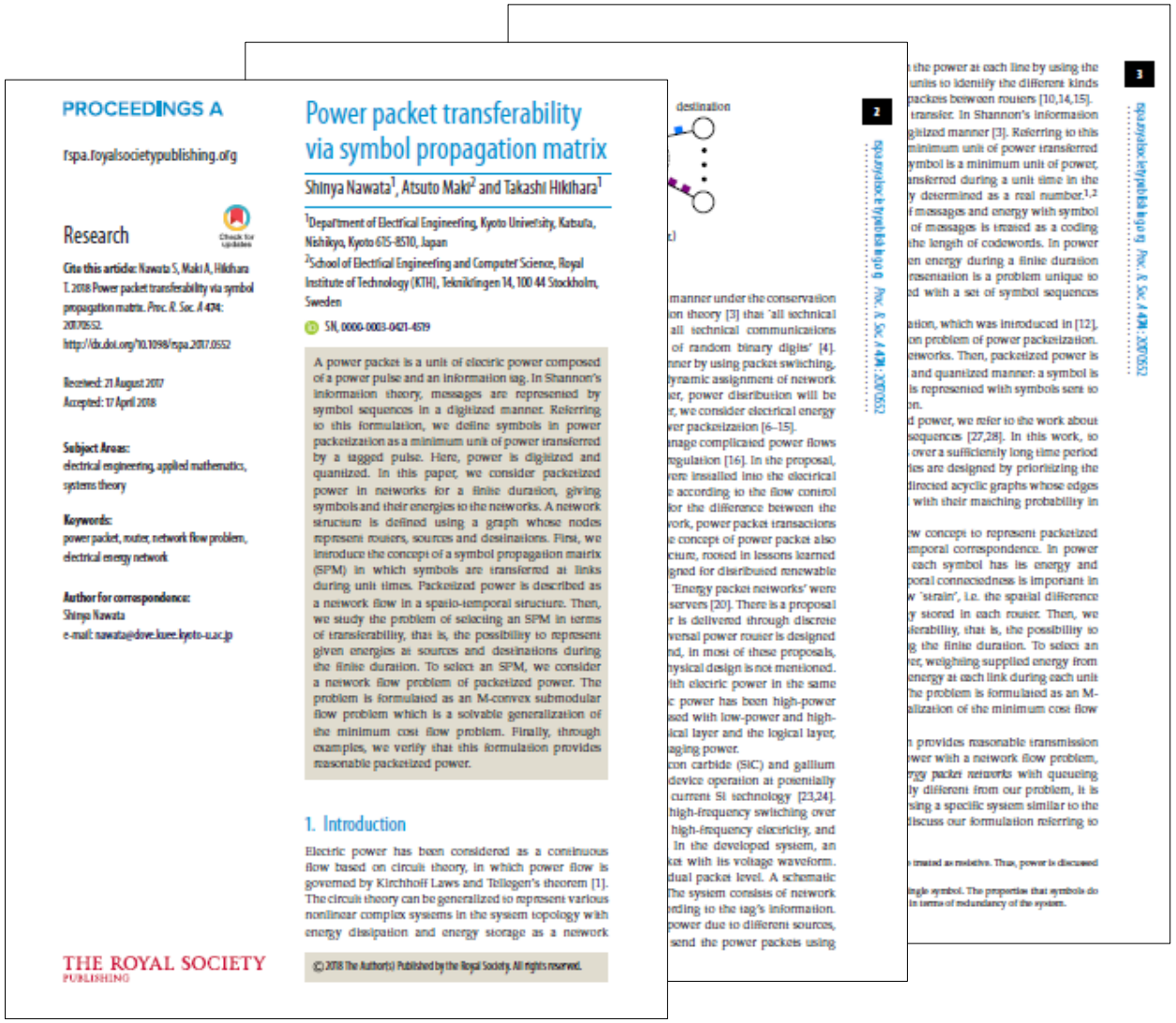
Editor-In-Chief
Professor Michael Lockwood FRS

Frequency: Monthly
ISSN (Online): 1471-2946
ISSN (Print): 1364-5021

Latest articles

②論文とはどのようなものか

Nawata S, Maki A, Hikihara T. (2018)
Power packet transferability via symbol propagation matrix.
Proc. R. Soc. A 474: 20170552. http://dx.doi.org/10.1098/rspa.2017.0552



PROCEEDINGS A

rspa.royalsocietypublishing.org

Research

Cite this article: Nawata S, Maki A, Hikihara T. 2018 Power packet transferability via symbol propagation matrix. *Proc. R. Soc. A* 474: 20170552. http://dx.doi.org/10.1098/rspa.2017.0552

Received: 21 August 2017
Accepted: 17 April 2018

Subject Areas:
electrical engineering, applied mathematics, systems theory

Keywords:
power packet, router, network flow problem, electrical energy network

Author for correspondence:
Shinya Nawata
e-mail: nawata@dove.kuee.kyoto-u.ac.jp

THE ROYAL SOCIETY PUBLISHING

Power packet transferability via symbol propagation matrix

Shinya Nawata[1], Atsuto Maki[2] and Takashi Hikihara[1]

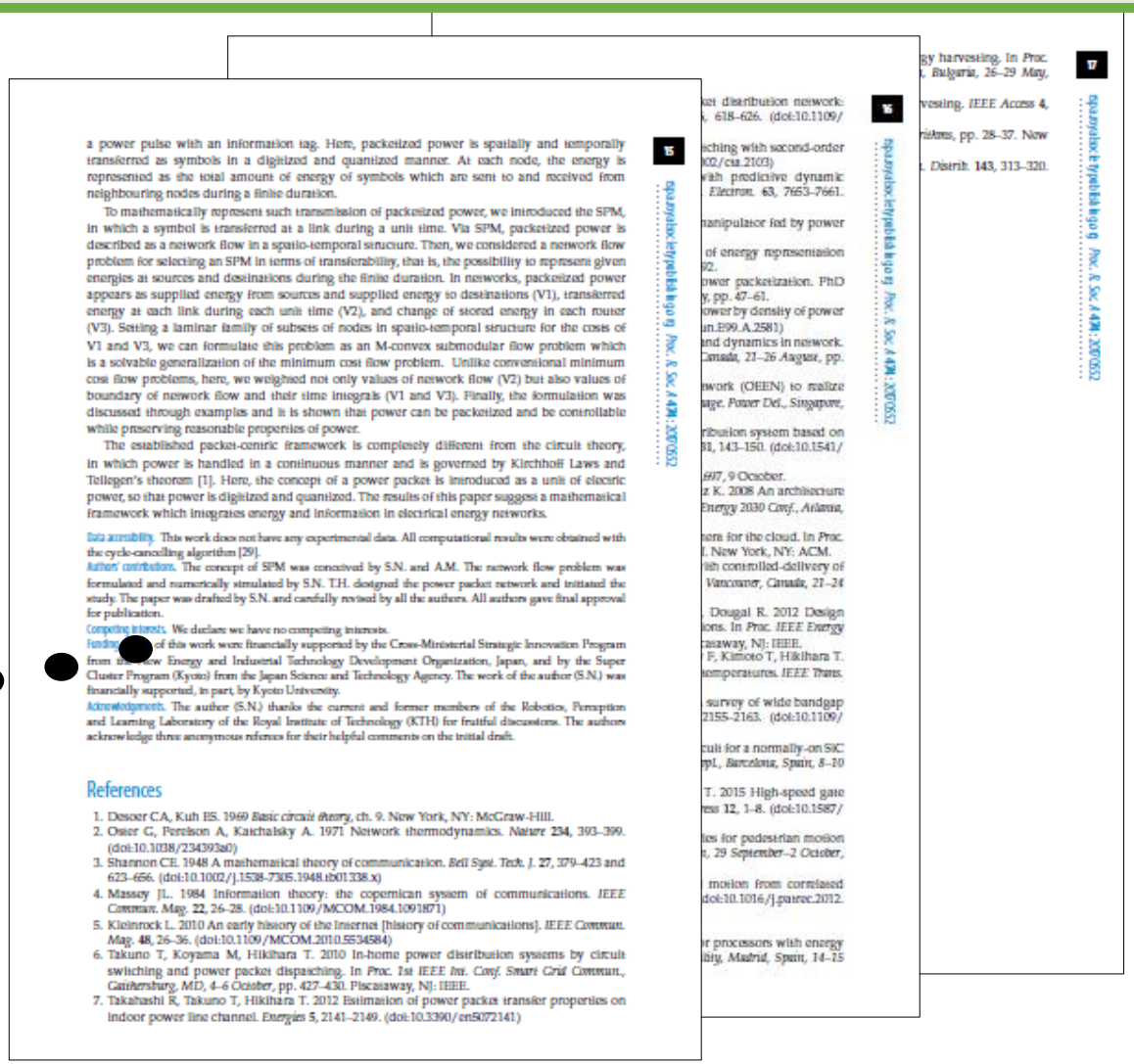
[1]Department of Electrical Engineering, Kyoto University, Katsura, Nishikyo, Kyoto 615-8510, Japan
[2]School of Electrical Engineering and Computer Science, Royal Institute of Technology (KTH), Teknikringen 14, 100 44 Stockholm, Sweden

SN, 0000-0003-0421-4579

A power packet is a unit of electric power composed of a power pulse and an information tag. In Shannon's information theory, messages are represented by symbol sequences in a digitized manner. Referring to this formulation, we define symbols in power packetization as a minimum unit of power transferred by a tagged pulse. Here, power is digitized and quantized. In this paper, we consider packetized power in networks for a finite duration, giving symbols and their energies to the networks. A network structure is defined using a graph whose nodes represent routers, sources and destinations. First, we introduce the concept of a symbol propagation matrix (SPM) in which symbols are transferred at links during unit times. Packetized power is described as a network flow in a spatio-temporal structure. Then, we study the problem of selecting an SPM in terms of transferability, that is, the possibility to represent given energies at sources and destinations during the finite duration. To select an SPM, we consider a network flow problem of packetized power. The problem is formulated as an M-convex submodular flow problem which is a solvable generalization of the minimum cost flow problem. Finally, through examples, we verify that this formulation provides reasonable packetized power.

1. Introduction

Electric power has been considered as a continuous flow based on circuit theory, in which power flow is governed by Kirchhoff Laws and Tellegen's theorem [1]. The circuit theory can be generalized to represent various nonlinear complex systems in the system topology with energy dissipation and energy storage as a network



a power pulse with an information tag. Here, packetized power is spatially and temporally transferred as symbols in a digitized and quantized manner. At each node, the energy is represented as the total amount of energy of symbols which are sent to and received from neighbouring nodes during a finite duration.

To mathematically represent such transmission of packetized power, we introduced the SPM, in which a symbol is transferred at a link during a unit time. Via SPM, packetized power is described as a network flow in a spatio-temporal structure. Then, we considered a network flow problem for selecting an SPM in terms of transferability, that is, the possibility to represent given energies at sources and destinations during the finite duration. In networks, packetized power appears as supplied energy from sources and supplied energy to destinations (V1), transferred energy at each link during each unit time (V2), and change of stored energy in each router (V3). Setting a laminar family of subsets of nodes in spatio-temporal structure for the cases of V1 and V3, we can formulate this problem as an M-convex submodular flow problem which is a solvable generalization of the minimum cost flow problem. Unlike conventional minimum cost flow problems, here, we weighted not only values of network flow (V2) but also values of boundary of network flow and their time integrals (V1 and V3). Finally, the formulation was discussed through examples and it is shown that power can be packetized and be controllable while preserving reasonable properties of power.

The established packet-centric framework is completely different from the circuit theory, in which power is handled in a continuous manner and is governed by Kirchhoff Laws and Tellegen's theorem [1]. Here, the concept of a power packet is introduced as a unit of electric power, so that power is digitized and quantized. The results of this paper suggest a mathematical framework which integrates energy and information in electrical energy networks.

Data accessibility. This work does not have any experimental data. All computational results were obtained with the cycle-cancelling algorithm [29].

Authors' contributions. The concept of SPM was conceived by S.N. and A.M. The network flow problem was formulated and numerically simulated by S.N. T.H. designed the power packet network and initiated the study. The paper was drafted by S.N. and carefully revised by all the authors. All authors gave final approval for publication.

Competing interests. We declare we have no competing interests.

Funding. This work was financially supported by the Cross-Ministerial Strategic Innovation Program from the New Energy and Industrial Technology Development Organization, Japan, and by the Super Cluster Program (Kyoto) from the Japan Science and Technology Agency. The work of the author (S.N.) was financially supported, in part, by Kyoto University.

Acknowledgements. The author (S.N.) thanks the current and former members of the Robotics, Perception and Learning Laboratory of the Royal Institute of Technology (KTH) for fruitful discussions. The authors acknowledge three anonymous referees for their helpful comments on the initial draft.

References

1. Desoer CA, Kuh ES. 1969 *Basic circuit theory*, ch. 9. New York, NY: McGraw-Hill.
2. Oseer G, Perelson A, Kaichalsky A. 1971 Network thermodynamics. *Nature* **234**, 393–399. (doi:10.1038/234393a0)
3. Shannon CE. 1948 A mathematical theory of communication. *Bell Syst. Tech. J.* **27**, 379–423 and 623–656. (doi:10.1002/j.1538-7305.1948.tb01338.x)
4. Massey JL. 1984 Information theory: the copernican system of communications. *IEEE Commun. Mag.* **22**, 26–28. (doi:10.1109/MCOM.1984.1091871)
5. Kleinrock L. 2010 An early history of the Internet [history of communications]. *IEEE Commun. Mag.* **48**, 26–36. (doi:10.1109/MCOM.2010.5534584)
6. Takuno T, Koyama M, Hikihara T. 2010 In-home power distribution systems by circuit switching and power packet dispatching. In *Proc. 1st IEEE Int. Conf. Smart Grid Commun., Gaithersburg, MD, 4–6 October*, pp. 427–430. Piscataway, NJ: IEEE.
7. Takahashi R, Takuno T, Hikihara T. 2012 Estimation of power packet transfer properties on indoor power line channel. *Energies* **5**, 2141–2149. (doi:10.3390/en5072141)

（参考）この論文の内容について興味のある方は以下をどうぞ

- 使い方の妙でパワエレ分野の低コスト化に効く技術が続々（日経XTECH）
  - GaN/SiCの実用化が後押し電力パケットで電源をデジタル化
    https://xtech.nikkei.com/atcl/nxt/mag/ne/18/00007/00128/?P=6

②論文とはどのようなものか

PROCEEDINGS A

rspa.royalsocietypublishing.org

Research

Check for updates

Cite this article: Nawata S, Maki A, Hikihara T. 2018 Power packet transferability via symbol propagation matrix. *Proc. R. Soc. A* **474**: 20170552.
http://dx.doi.org/10.1098/rspa.2017.0552

Received: 21 August 2017
Accepted: 17 April 2018

Subject Areas:
electrical engineering, applied mathematics, systems theory

Keywords:
power packet, router, network flow problem, electrical energy network

Author for correspondence:
Shinya Nawata
e-mail: nawata@dove.kuee.kyoto-u.ac.jp

Power packet transferability via symbol propagation matrix

Shinya Nawata[1], Atsuto Maki[2] and Takashi Hikihara[1]

[1]Department of Electrical Engineering, Kyoto University, Katsura, Nishikyo, Kyoto 615-8510, Japan
[2]School of Electrical Engineering and Computer Science, Royal Institute of Technology (KTH), Teknikringen 14, 100 44 Stockholm, Sweden

SN, 0000-0003-0421-4519

A power packet is a unit of electric power composed of a power pulse and an information tag. In Shannon's information theory, messages are represented by symbol sequences in a digitized manner. Referring to this formulation, we define symbols in power packetization as a minimum unit of power transferred by a tagged pulse. Here, power is digitized and quantized. In this paper, we consider packetized power in networks for a finite duration, giving symbols and their energies to the networks. A network structure is defined using a graph whose nodes represent routers, sources and destinations. First, we introduce the concept of a symbol propagation matrix (SPM) in which symbols are transferred at links during unit times. Packetized power is described as a network flow in a spatio-temporal structure. Then, we study the problem of selecting an SPM in terms of transferability, that is, the possibility to represent given energies at sources and destinations during

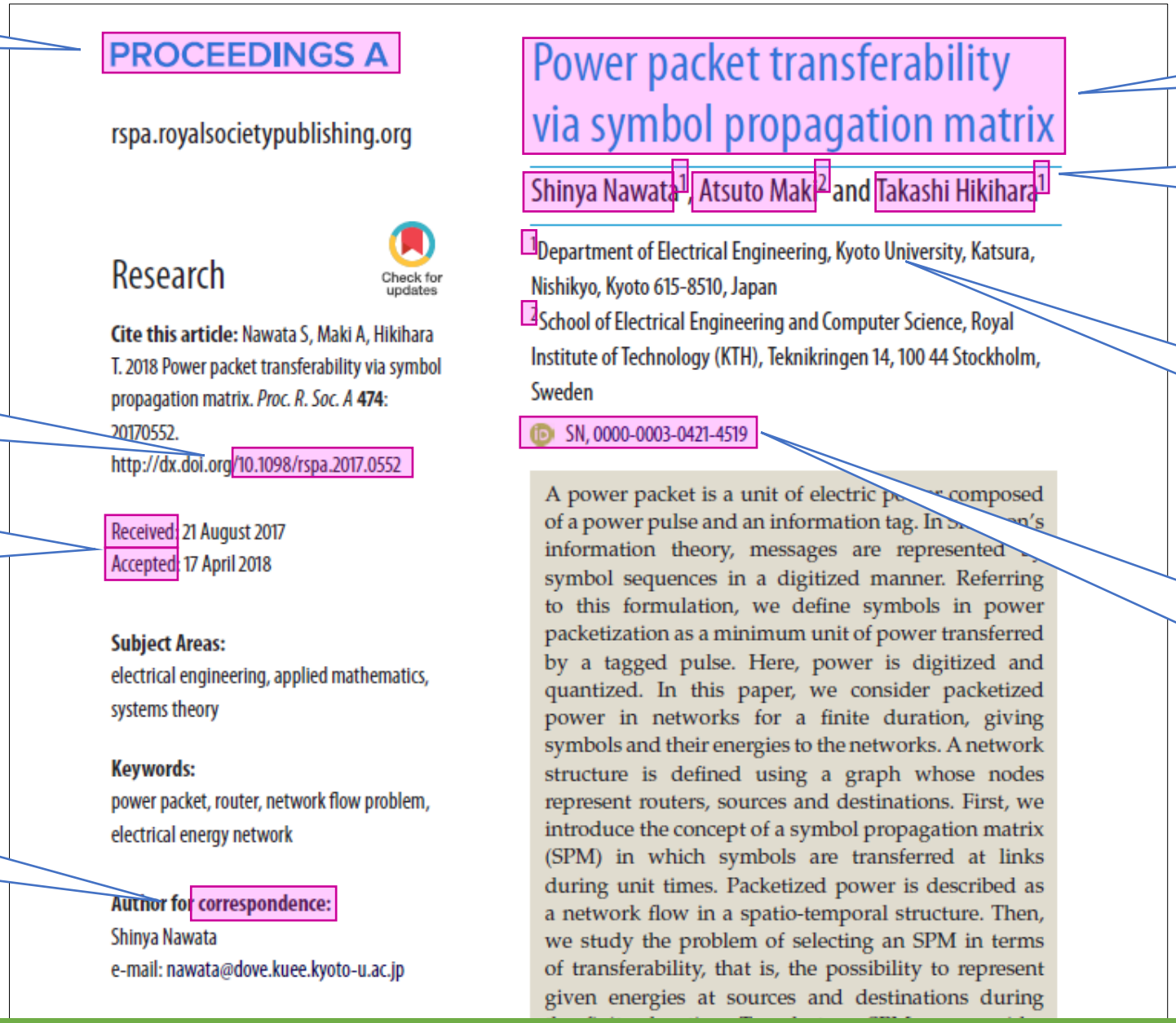
②論文とはどのようなものか

雑誌の名前

この論文を表す記号「DOI」

掲載までの経緯
2017.8.21に投稿され、査読を経て、2018.4.17に受理が決定した

照会等の窓口となる著者



PROCEEDINGS A

rspa.royalsocietypublishing.org

Research

Check for updates

Cite this article: Nawata S, Maki A, Hikihara T. 2018 Power packet transferability via symbol propagation matrix. *Proc. R. Soc. A* **474**: 20170552.
http://dx.doi.org/10.1098/rspa.2017.0552

Received: 21 August 2017
Accepted: 17 April 2018

Subject Areas:
electrical engineering, applied mathematics, systems theory

Keywords:
power packet, router, network flow problem, electrical energy network

Author for correspondence:
Shinya Nawata
e-mail: nawata@dove.kuee.kyoto-u.ac.jp

Power packet transferability via symbol propagation matrix

Shinya Nawata[1], Atsuto Maki[2] and Takashi Hikihara[1]

[1]Department of Electrical Engineering, Kyoto University, Katsura, Nishikyo, Kyoto 615-8510, Japan
[2]School of Electrical Engineering and Computer Science, Royal Institute of Technology (KTH), Teknikringen 14, 100 44 Stockholm, Sweden

SN, 0000-0003-0421-4519

A power packet is a unit of electric p[illegible] composed of a power pulse and an information tag. In S[illegible]n's information theory, messages are represented [illegible] symbol sequences in a digitized manner. Referring to this formulation, we define symbols in power packetization as a minimum unit of power transferred by a tagged pulse. Here, power is digitized and quantized. In this paper, we consider packetized power in networks for a finite duration, giving symbols and their energies to the networks. A network structure is defined using a graph whose nodes represent routers, sources and destinations. First, we introduce the concept of a symbol propagation matrix (SPM) in which symbols are transferred at links during unit times. Packetized power is described as a network flow in a spatio-temporal structure. Then, we study the problem of selecting an SPM in terms of transferability, that is, the possibility to represent given energies at sources and destinations during

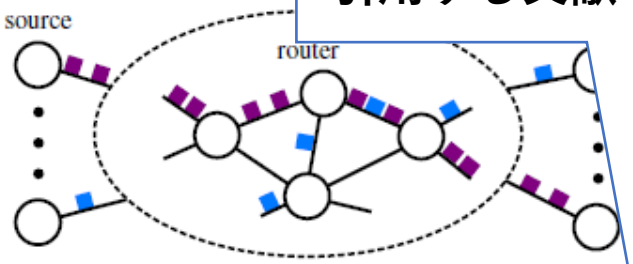
この論文の題名

この論文の著者
自然科学分野では複数名の共著であることが多い

著者の所属
この例では1に所属する著者が2名、2が1名

著者を表す記号「ORCID」
この例は筆頭著者の縄田信哉先生のもの

②論文とはどのようなものか



引用する文献の提示

gure 1. A schematic of power packet dispatching network. (Online version in colour.)

ermodynamics [2]. Here, energy flow is handled in a continuous manner under the conservation energy. On the other hand, it is shown in Shannon's information theory [3] that 'all technical ommunications are essentially digital; more precisely, that all technical communications e equivalent to the generation, transmission and reception, of random binary digits' [4]. ommunication networks have been developed in a digitized manner by using packet switching, hich breaks messages into smaller pieces named 'packets', for dynamic assignment of network sources [5]. If we handle electric power in a digitized manner, power distribution will be anged completely different from the conventional. In this paper, we consider electrical energy

Data accessibility. This work does not have any experimental data. All computational results were obtained with the cycle-cancelling algorithm [29].
Authors' contributions. The concept of SPM was conceived by S.N. and A.M. The network flow problem was formulated and numerically simulated by S.N. T.H. designed the power packet network and initiated the study. The paper was drafted by S.N. and carefully revised by all the authors. All authors gave final approval for publication.
Competing interests. We declare we have no competing interests.
Funding. Parts of this work were financially supported by the Cross-Ministerial Strategic Innovation Program from the New Energy and Industrial Technology Development Organization, Japan, and by the Super Cluster Program (Kyoto) from the Japan Science and Technology Agency. The work of the author (S.N.) was financially supported, in part, by Kyoto University.
Acknowledgements. The author (S.N.) thanks the current and former members of the Robotics, Perception and Learning Laboratory of the Royal Institute of Technology (KTH) for fruitful discussions. The authors acknowledge three anonymous referees for their helpful comments on the initial draft.

References

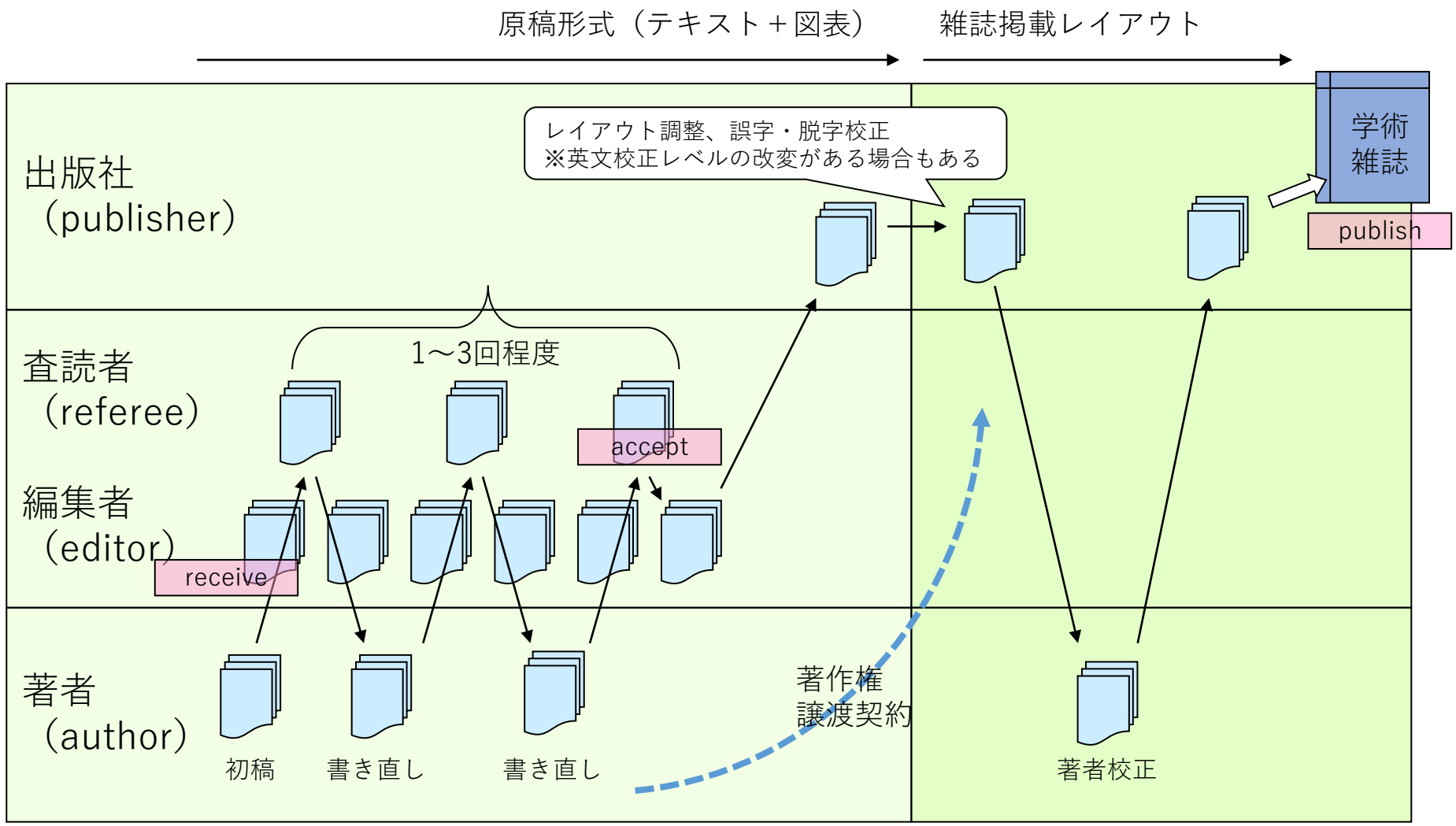
1. Desoer CA, Kuh ES. 1969 *Basic circuit theory*, ch. 9. New York, NY: McGraw-Hill.
2. Oster G, Perelson A, Katchalsky A. 1971 Network thermodynamics. *Nature* **234**, 393–399. (doi:10.1038/234393a0)
3. Shannon CE. 1948 A mathematical theory of communication. *Bell Syst. Tech. J.* **27**, 379–423 and 623–656. (doi:10.1002/j.1538-7305.1948.tb01338.x)
4. Massey JL. 1984 Information theory: the copernican system of ommunications. *IEEE* 26–28. (doi:10.1109/MCOM.1984.1091871)
early history of the Internet [history of commu tions]. *IEEE Commun.* 10.1109/MCOM.2010.5534584)
M, Hikihara T. 2010 In-home power distri n systems by circuit r packet dispatching. In *Proc. 1st IEEE Int. Smart Grid Commun.*, 6 October, pp. 427–430. Piscataway, NJ: IEEE.
T, Hikihara T. 2012 Estimation of power t nsfer properties on annel. *Energies* **5**, 2141–

引用された文献

- 科学の発展＝先人の業績を踏まえ、新たな知見を積み足す
  - 参考とした先行研究に対しては引用という形で礼を尽くす
  - 多く引用された研究論文は、後続研究に大きな影響を与えたものと評価される

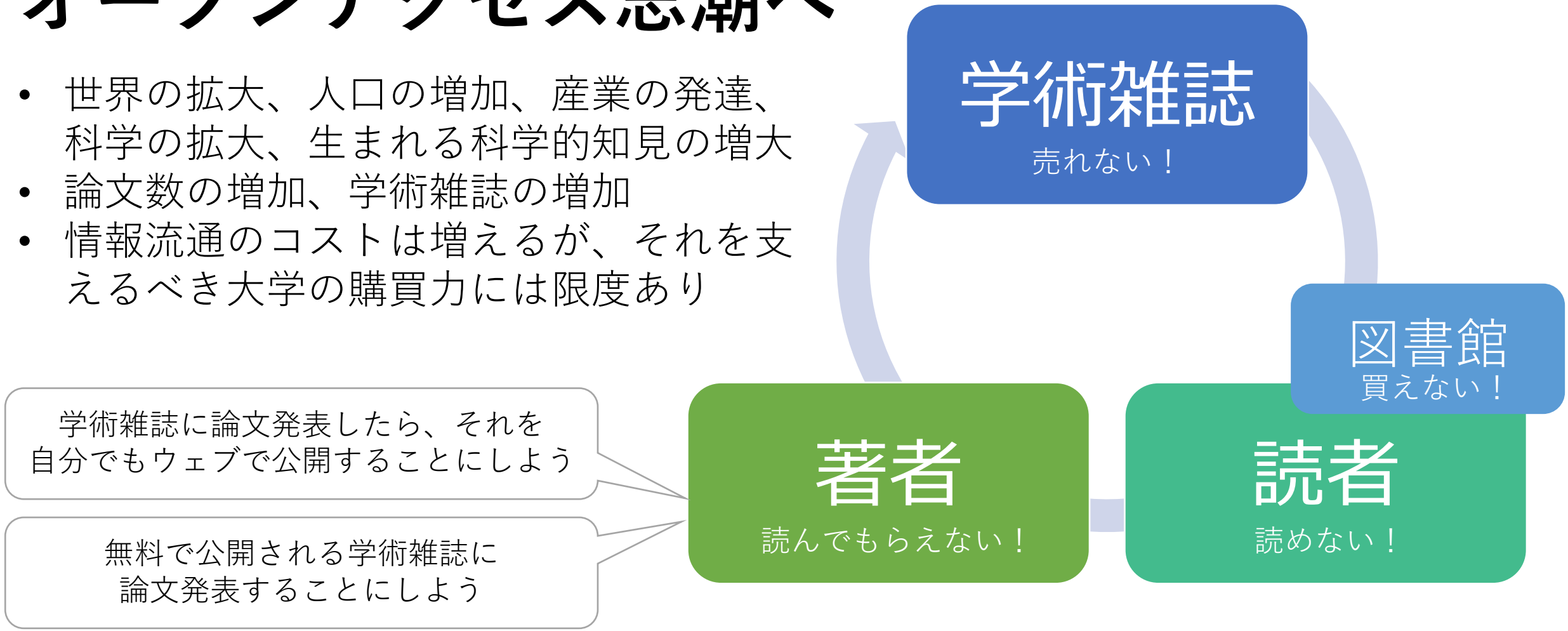
（参考）掲載した論文が多く引用されると、その雑誌自体の評価が上がる
（それを数値化したものとして「インパクトファクター」がある）

論文が学術雑誌に掲載されるまで



学術情報の流通不全から オープンアクセス思潮へ

- 世界の拡大、人口の増加、産業の発達、科学の拡大、生まれる科学的知見の増大
- 論文数の増加、学術雑誌の増加
- 情報流通のコストは増えるが、それを支えるべき大学の購買力には限度あり

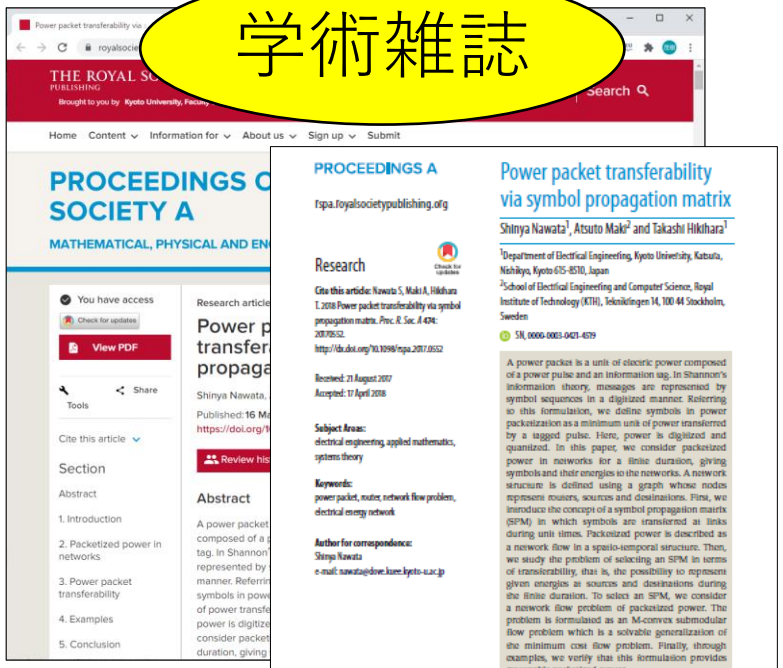


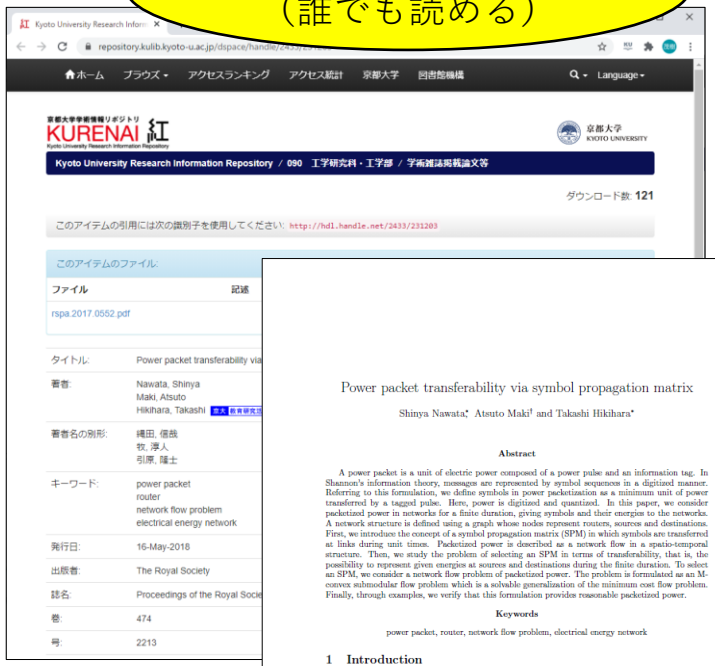
③オープンアクセスとはどういうことか

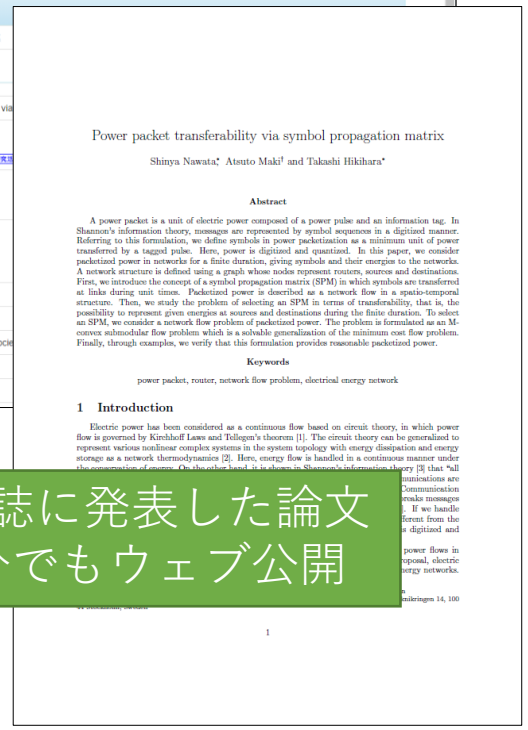
プレプリントサーバ
（誰でも読める）

学術雑誌

機関リポジトリ
（誰でも読める）







学術雑誌に発表する論文
を自分でもウェブで公開

これが正式版。しかし有料の
ため読めない人もいる

学術雑誌に発表した論文
を自分でもウェブ公開

Nawata S, Maki A, Hikihara T. (2018)
Power packet transferability via symbol propagation matrix.

これで本講は終わりです。