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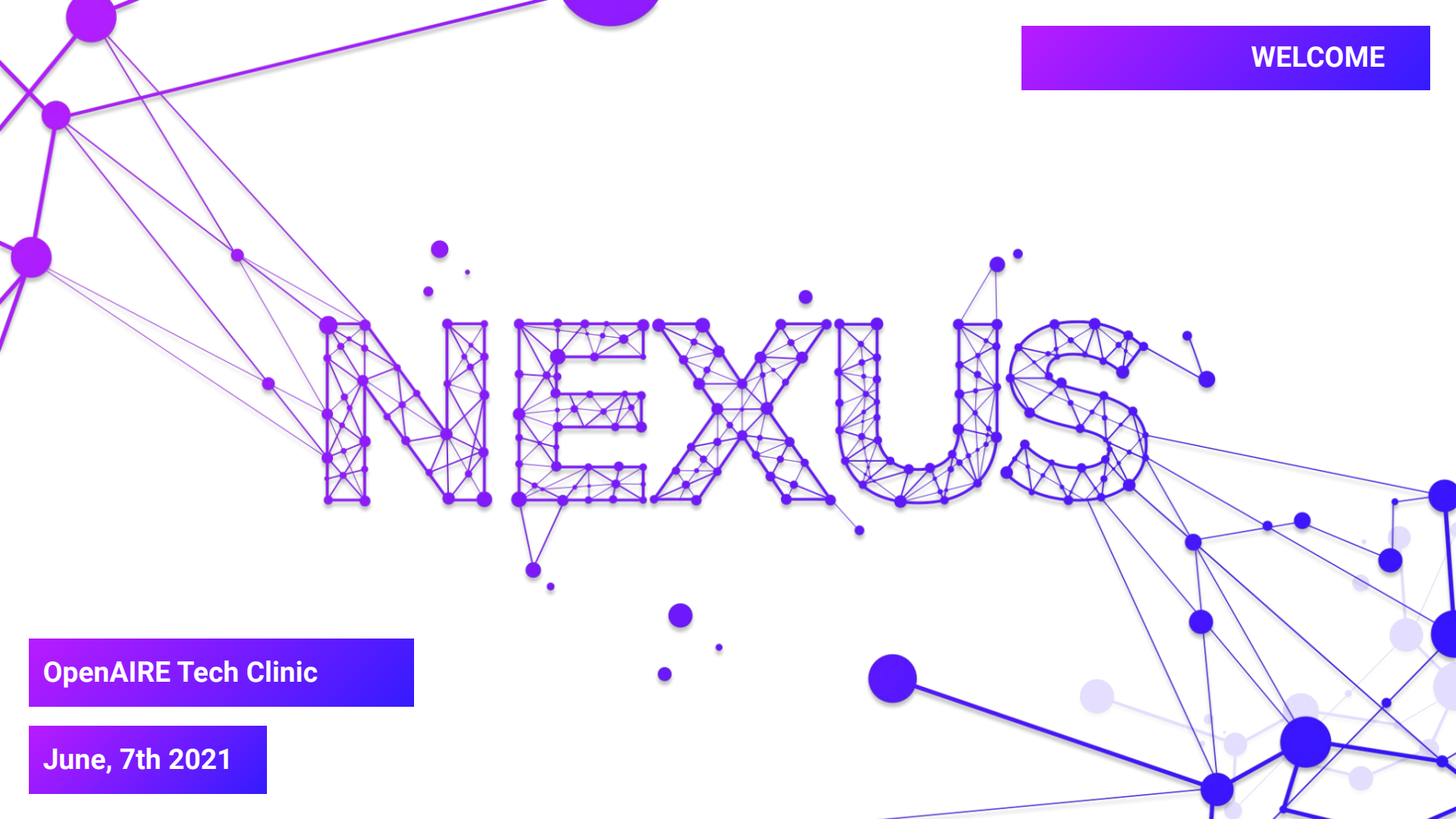

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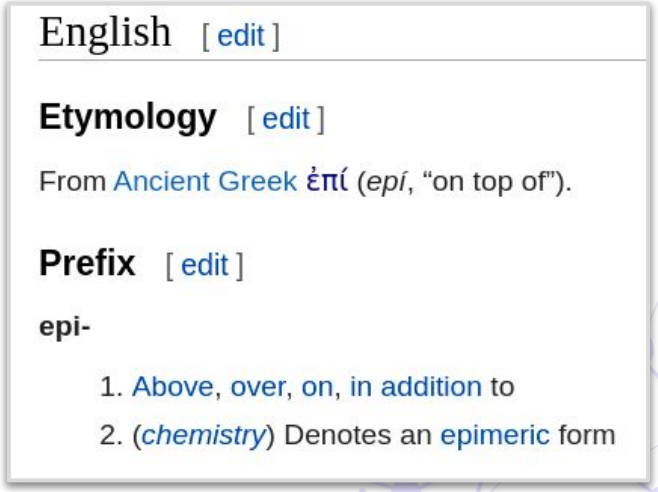

English [edit]

Etymology [edit]

From Ancient Greek ἐπί (*epí*, “on top of”).

Prefix [edit]

epi-

1. Above, over, on, in addition to
2. (*chemistry*) Denotes an epimeric form

https://en.wiktionary.org/wiki/epi-#Etymology


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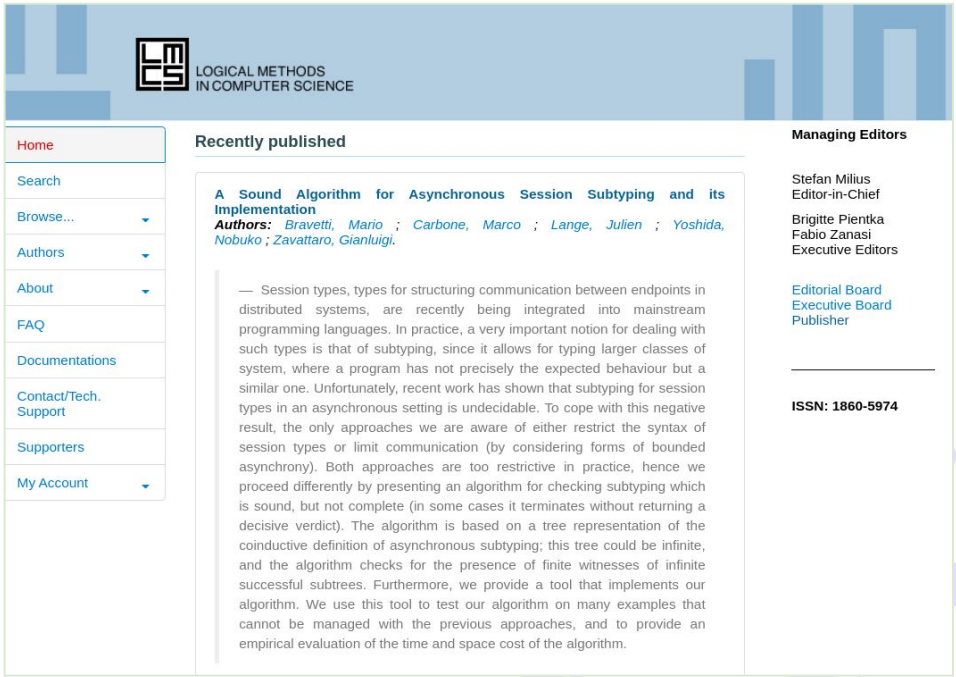

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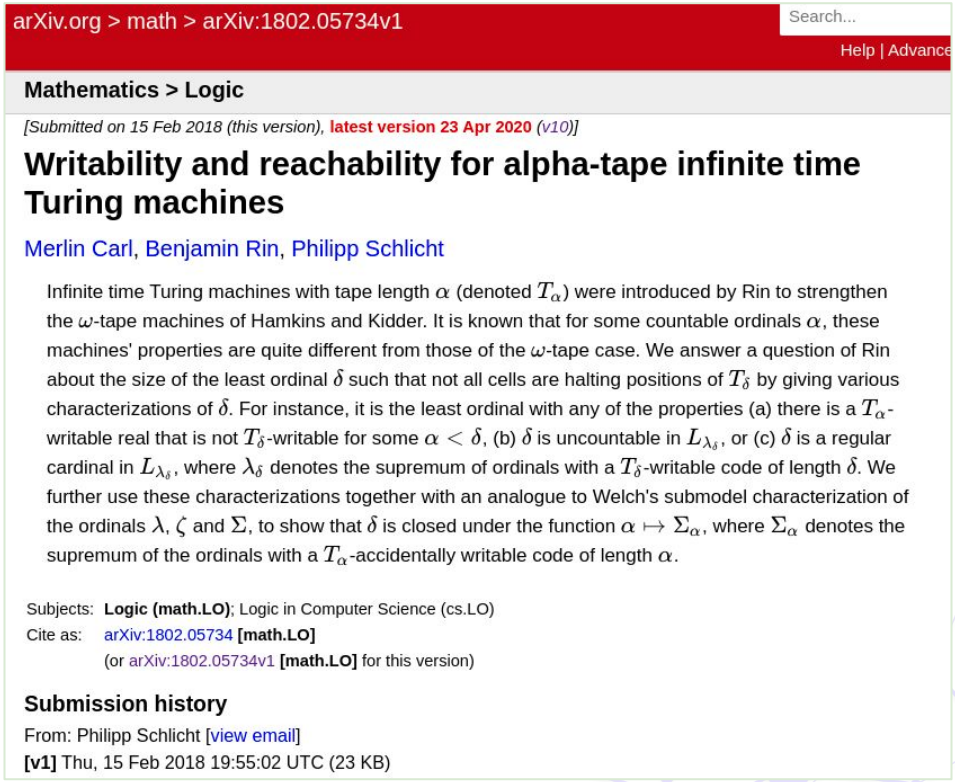

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[Submitted on 15 Feb 2018 (this version), latest version 23 Apr 2020 (v10)]

Writability and reachability for alpha-tape infinite time Turing machines

Merlin Carl, Benjamin Rin, Philipp Schlicht

Infinite time Turing machines with tape length α (denoted T_α) were introduced by Rin to strengthen the ω-tape machines of Hamkins and Kidder. It is known that for some countable ordinals α, these machines' properties are quite different from those of the ω-tape case. We answer a question of Rin about the size of the least ordinal δ such that not all cells are halting positions of T_δ by giving various characterizations of δ. For instance, it is the least ordinal with any of the properties (a) there is a T_α-writable real that is not T_δ-writable for some $\alpha < \delta$, (b) δ is uncountable in L_{λ_δ}, or (c) δ is a regular cardinal in L_{λ_δ}, where λ_δ denotes the supremum of ordinals with a T_δ-writable code of length δ. We further use these characterizations together with an analogue to Welch's submodel characterization of the ordinals λ, ζ and Σ, to show that δ is closed under the function $\alpha \mapsto \Sigma_\alpha$, where Σ_α denotes the supremum of the ordinals with a T_α-accidentally writable code of length α.

Subjects: **Logic (math.LO)**; Logic in Computer Science (cs.LO)
Cite as: arXiv:1802.05734 **[math.LO]**
(or arXiv:1802.05734v1 **[math.LO]** for this version)

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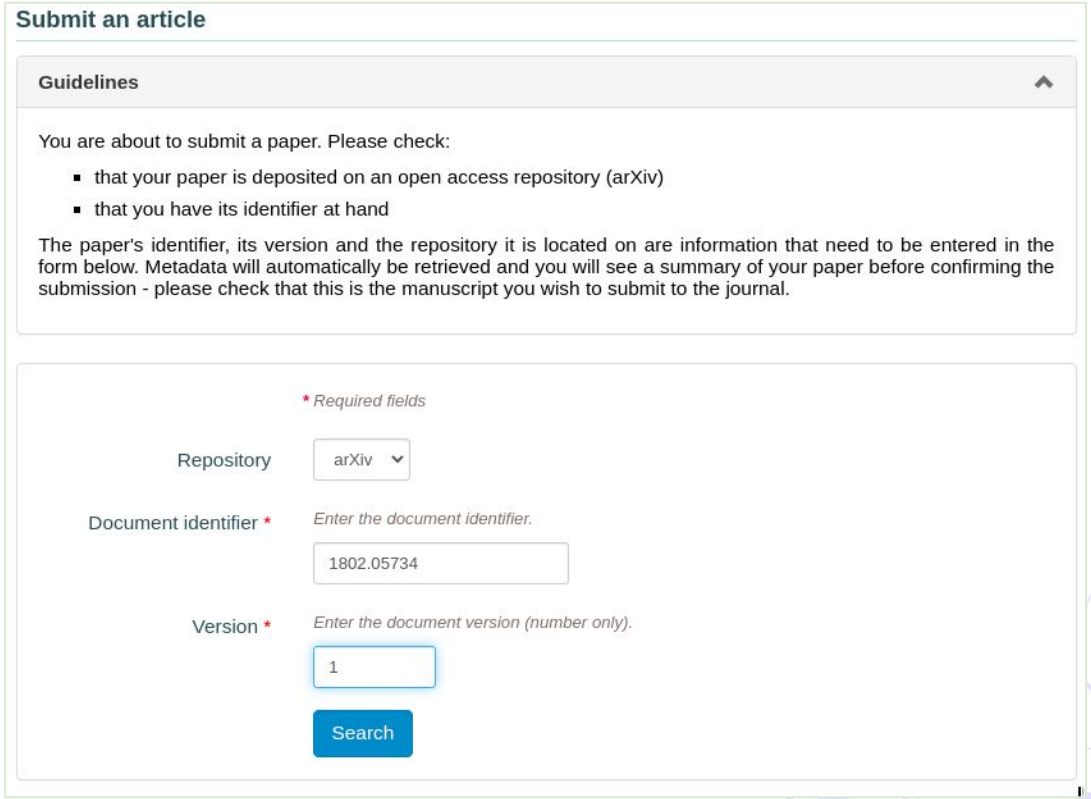

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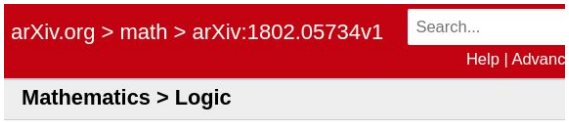

API

Reachability for infinite time Turing machines with long tapes

Merlin Carl, Benjamin Rin, Philipp Schlicht

Infinite time Turing machine models with tape length α, denoted T_α, strengthen the machines of Hamkins and Kidder [HL00] with tape length ω. A new phenomenon is that for some countable ordinals α, some cells cannot be halting positions of T_α given trivial input. The main open question in [Rin14] asks about the size of the least such ordinal δ.
We answer this by providing various characterizations. For instance, δ is the least ordinal with any of the following properties: (a) For some $\xi < \alpha$, there is a T_ξ-writable but not T_α-writable subset of ω. (b) There is a gap in the T_α-writable ordinals. (c) α is uncountable in L_{λ_α}. Here λ_α denotes the supremum of T_α-writable ordinals, i.e. those with a T_α-writable code of length α.
We further use the above characterizations, and an analogue to Welch's submodel characterization of the ordinals λ, ζ and Σ, to show that δ is large in the sense that it is a closure point of the function $\alpha \mapsto \Sigma_\alpha$, where Σ_α denotes the supremum of the T_α-accidentally writable ordinals.

Merlin Carl ; Benjamin Rin ; Philipp Schlicht - **Reachability for infinite time Turing machines with long tapes**

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Authors: Merlin Carl ; Benjamin Rin ; Philipp Schlicht

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Keywords: Mathematics - Logic,Computer Science - Logic in Computer Science

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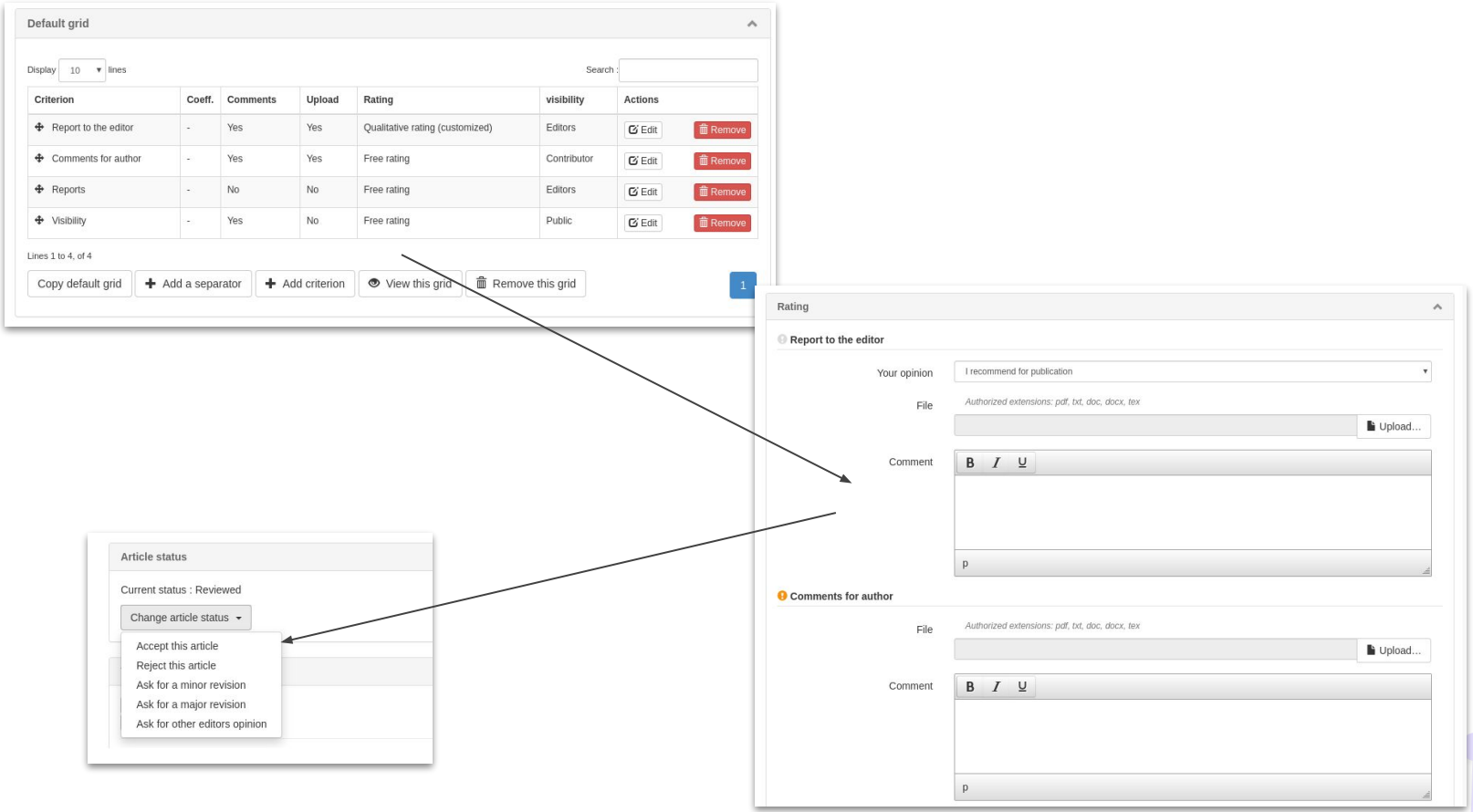

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Reachability for Turing machines with long tapes

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Subjects: **Logic (math.LO)**; Logic in Computer Science (cs.LO)
Cite as: arXiv:1802.05734 **[math.LO]**
(or arXiv:1802.05734v5 **[math.LO]** for this version)

Submission history

From: Philipp Schlicht [view email]
[v1] Thu, 15 Feb 2018 19:55:02 UTC (23 KB)
[v2] Wed, 21 Feb 2018 07:58:12 UTC (23 KB)
[v3] Mon, 21 Jan 2019 17:35:28 UTC (28 KB)
[v4] Thu, 23 May 2019 11:53:38 UTC (29 KB)
[v5] Thu, 5 Dec 2019 20:00:10 UTC (31 KB)
[v6] Tue, 10 Dec 2019 07:28:22 UTC (31 KB)
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[v8] Wed, 8 Apr 2020 14:35:32 UTC (39 KB)
[v9] Mon, 20 Apr 2020 20:35:58 UTC (41 KB)
[v10] Thu, 23 Apr 2020 09:08:19 UTC (41 KB)

4. Journal Layout

Merlin Carl ; Benjamin Rin ; Philipp Schlicht - Reachability for infinite time Turing machines with long tapes
lmcs:4444 - Logical Methods in Computer Science, April 24, 2020, Volume 16, Issue 2 - https://doi.org/10.23638/LMCS-16(2:2)2020

Reachability for infinite time Turing machines with long tapes

Authors: Merlin Carl ; Benjamin Rin ; Philipp Schlicht

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https://doi.org/10.23638/LMCS-16(2:2)2020
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Logical Methods in Computer Science
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Submitted Apr. 16, 2018
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REACHABILITY FOR INFINITE TIME TURING MACHINES WITH LONG TAPES

MERLIN CARL, BENJAMIN RIN, AND PHILIPP SCHLICHT

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ABSTRACT. Infinite time Turing machine models with tape length α, denoted T_α, strengthen the machines of Hamkins and Kidder with tape length ω. A new phenomenon is that for some countable ordinals α, some cells cannot be halting positions of T_α given trivial input. The main open question in a paper of Rin from 2014 asks about the size of the least such ordinal δ.

We answer this by providing various characterizations. For instance, δ is the least ordinal with any of the following properties:

- For some $\xi < \alpha$, there is a T_ξ-writable but not T_α-writable subset of ω.
- There is a gap in the T_α-writable ordinals.
- α is uncountable in L_{λ_α}.

Here λ_α denotes the supremum of T_α-writable ordinals, i.e. those with a T_α-writable code of length α.

We further use the above characterizations, and an analogue to Welch's submodel characterization of the ordinals λ, ζ and Σ, to show that δ is large in the sense that it is a closure point of the function $\alpha \mapsto \Sigma_\alpha$, where Σ_α denotes the supremum of the T_α-accidentally writable ordinals.

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We would like to thank the anonymous referees for their helpful comments. This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 794020 (IMIC) for the third-listed author.

5. Publication: one Version Of Record

LOGICAL METHODS IN COMPUTER SCIENCE

Reachability for infinite time Turing machines with long tapes

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Merlin Carl, Benjamin Rin, Philipp Schlicht

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Subjects:	**Logic (math.LO)**; Logic in Computer Science (cs.LO)
Journal reference:	Logical Methods in Computer Science, Volume 16, Issue 2 (April 24, 2020) lmcs:6429
DOI:	10.23638/LMCS-16(2:2)2020
Cite as:	arXiv:1802.05734 **[math.LO]** (or arXiv:1802.05734v10 **[math.LO]** for this version)

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Carl, Merlin and Rin, Benjamin and Schlicht, Philipp - **Reachability for infinite time Turing machines with long tapes**

lmcs:4444 - Logical Methods in Computer Science, April 24, 2020, Volume 16, Issue 2 - https://doi.org/10.23638/LMCS-16(2:2)2020

Reachability for infinite time Turing machines with long tapes

Authors: Carl, Merlin and Rin, Benjamin and Schlicht, Philipp

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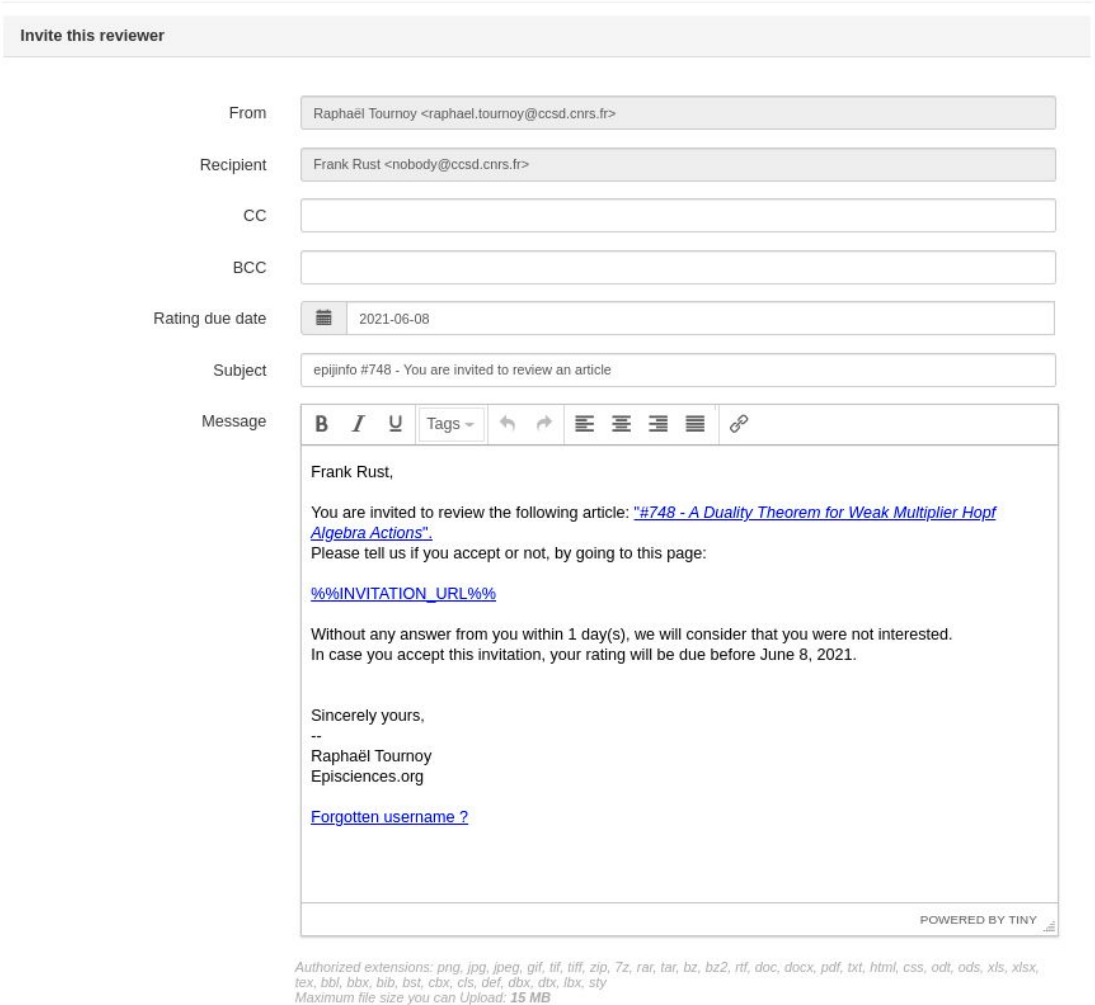

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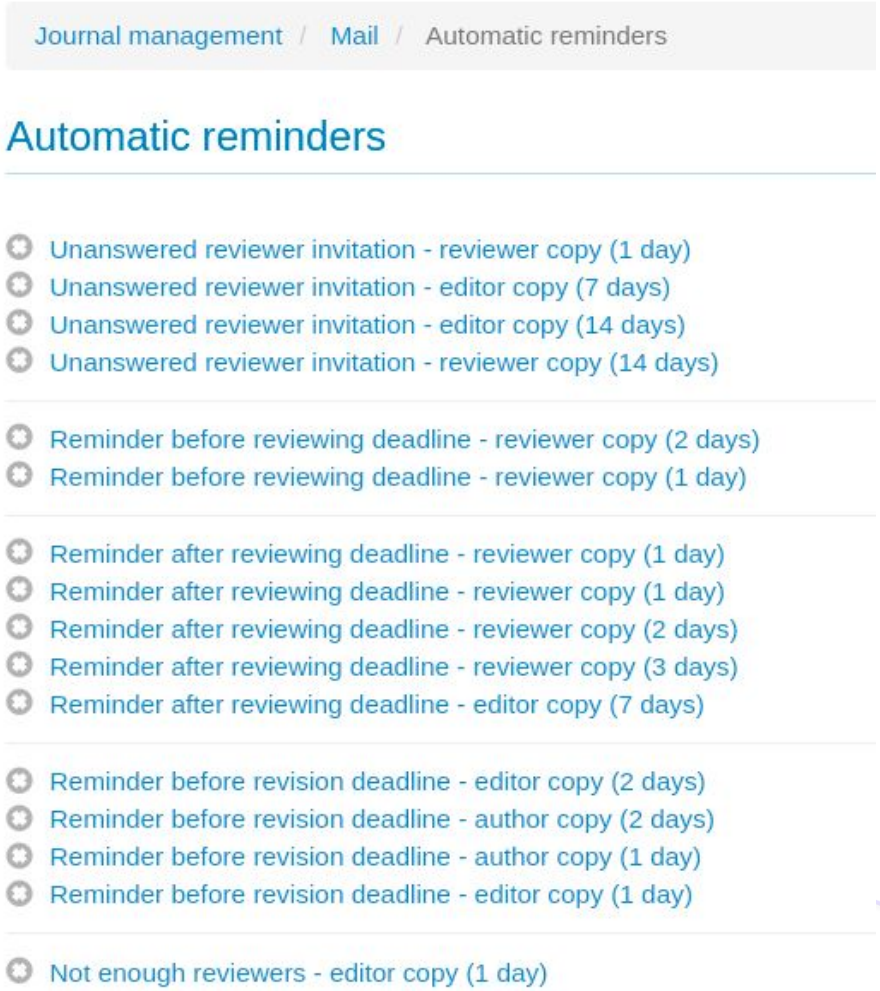

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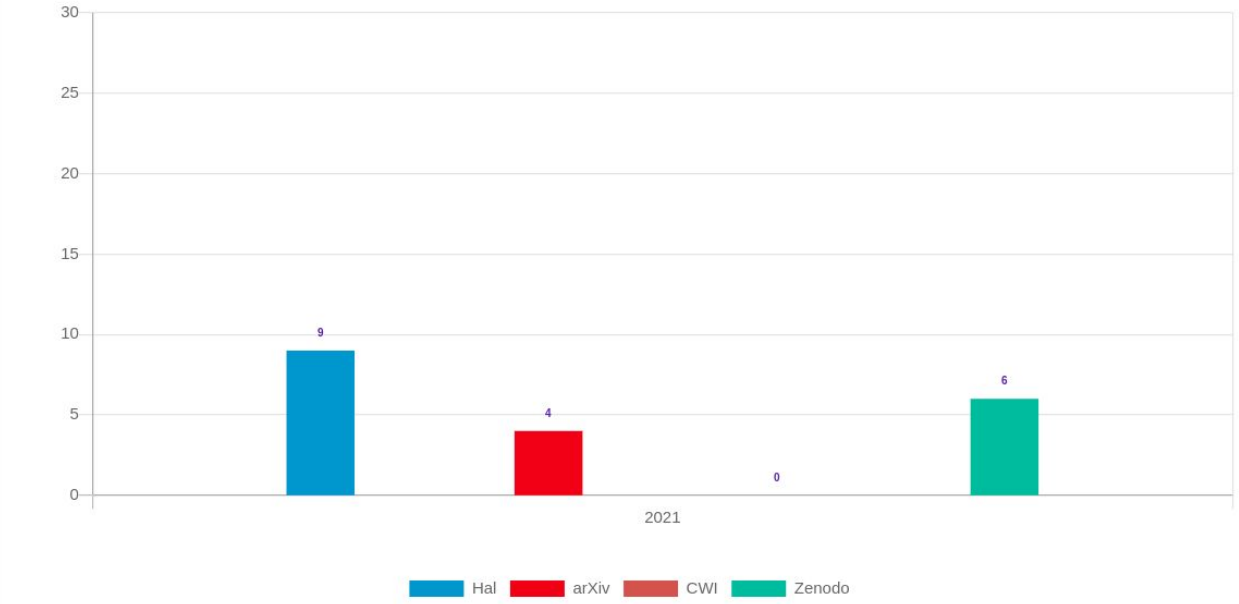

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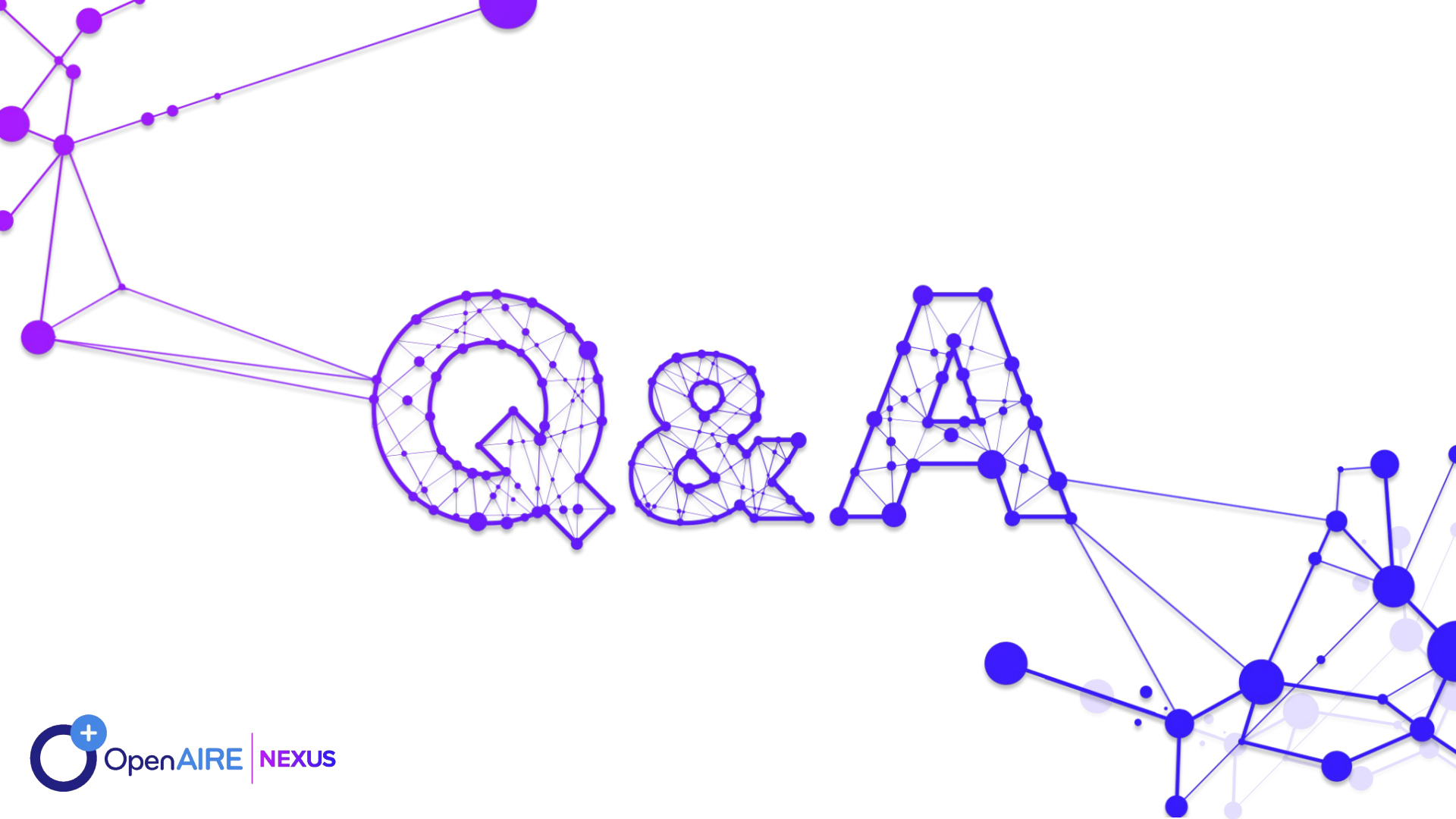

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