Research Data in Mathematics

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FIZ Karlsruhe / zbMATH

1st Leibniz MMS Days
January 28, 2016

Mathematical Research Data

Types of mathematical research data

- software
  - source code
  - programs
  - libraries

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- numerical data
  - results of numerical simulations
  - parameterized models
  - corpora of test data (benchmarks, gold standards)

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- software
  - source code
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- numerical data
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  - parameterized models
  - corpora of test data (benchmarks, gold standards)
- mathematical objects
  - integer sequences
  - L-functions, modular forms
  - group representations
  - geometrical objects

Need for Semantification

Semantic enrichment of research data

- automated interlinking between different kinds of entities
  - research data
  - authors
  - literature
  - dependencies
  - ...

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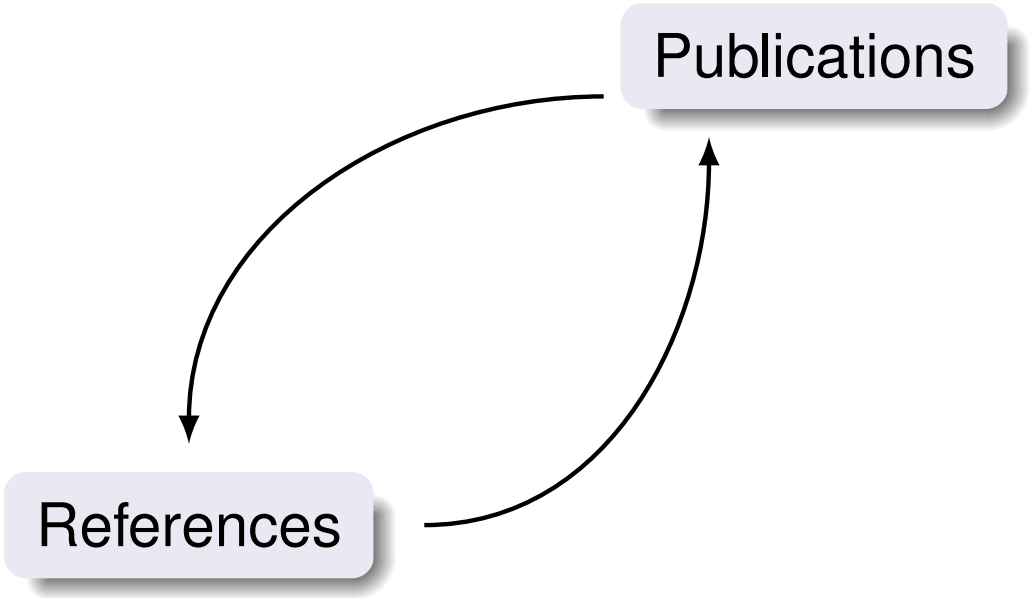
- searching and browsing functionality
  - following links
  - synonym search
  - finding related data

Linking Mathematical Entities

Publications

Linking Mathematical Entities



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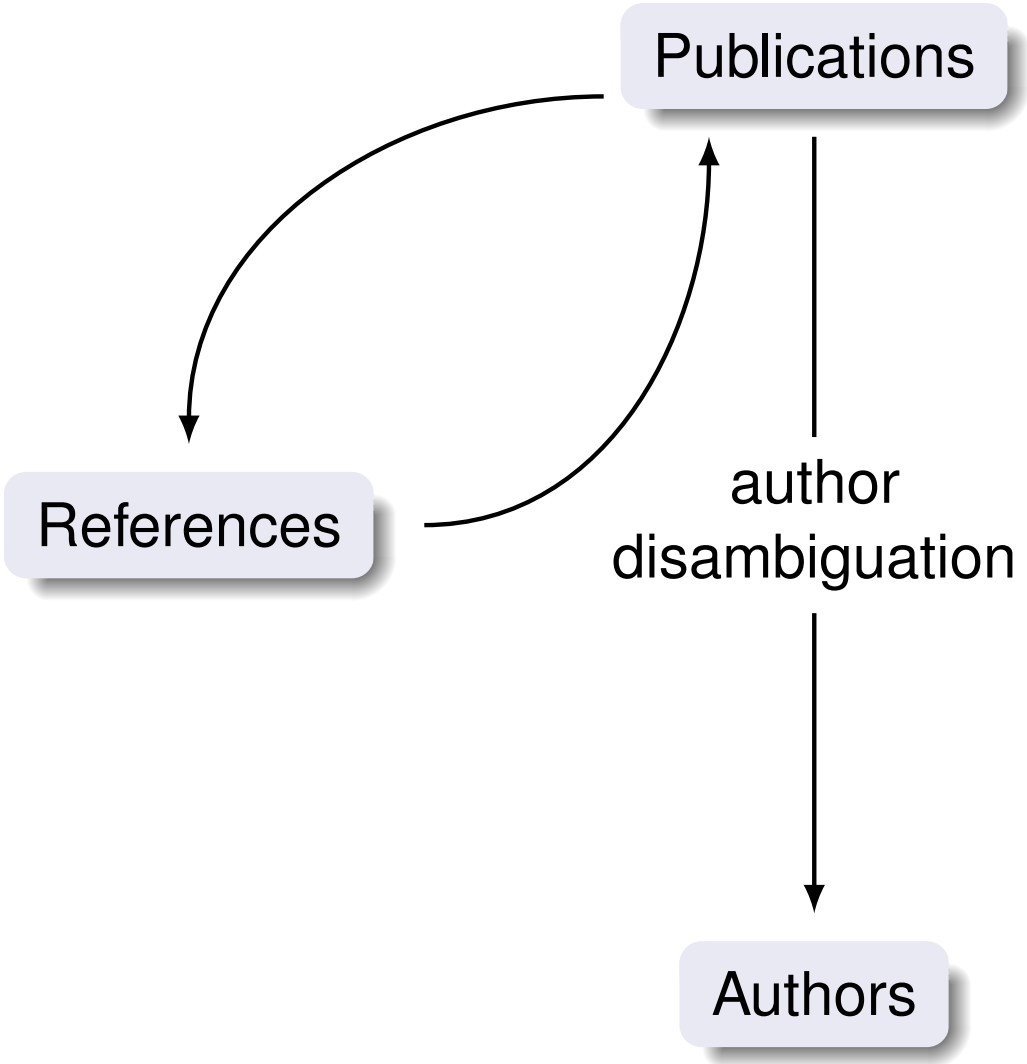

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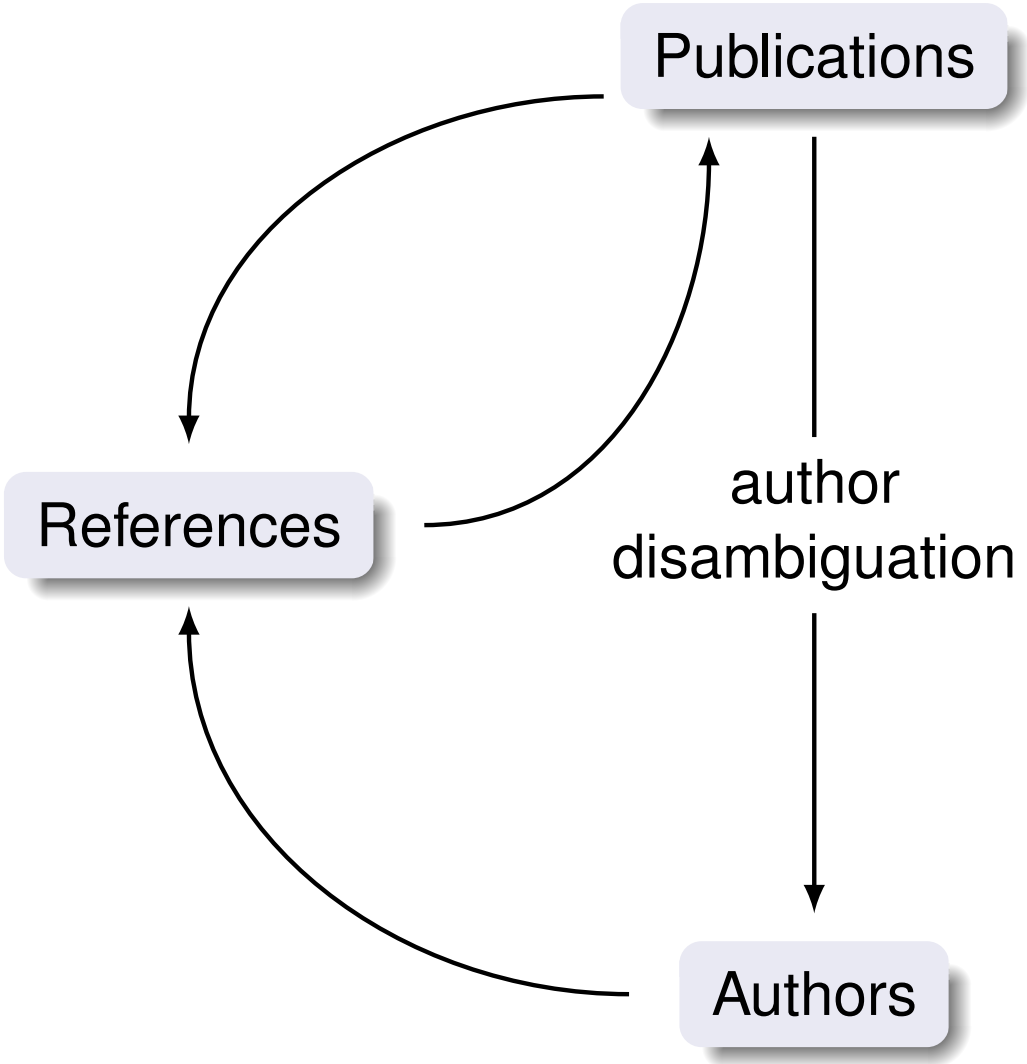

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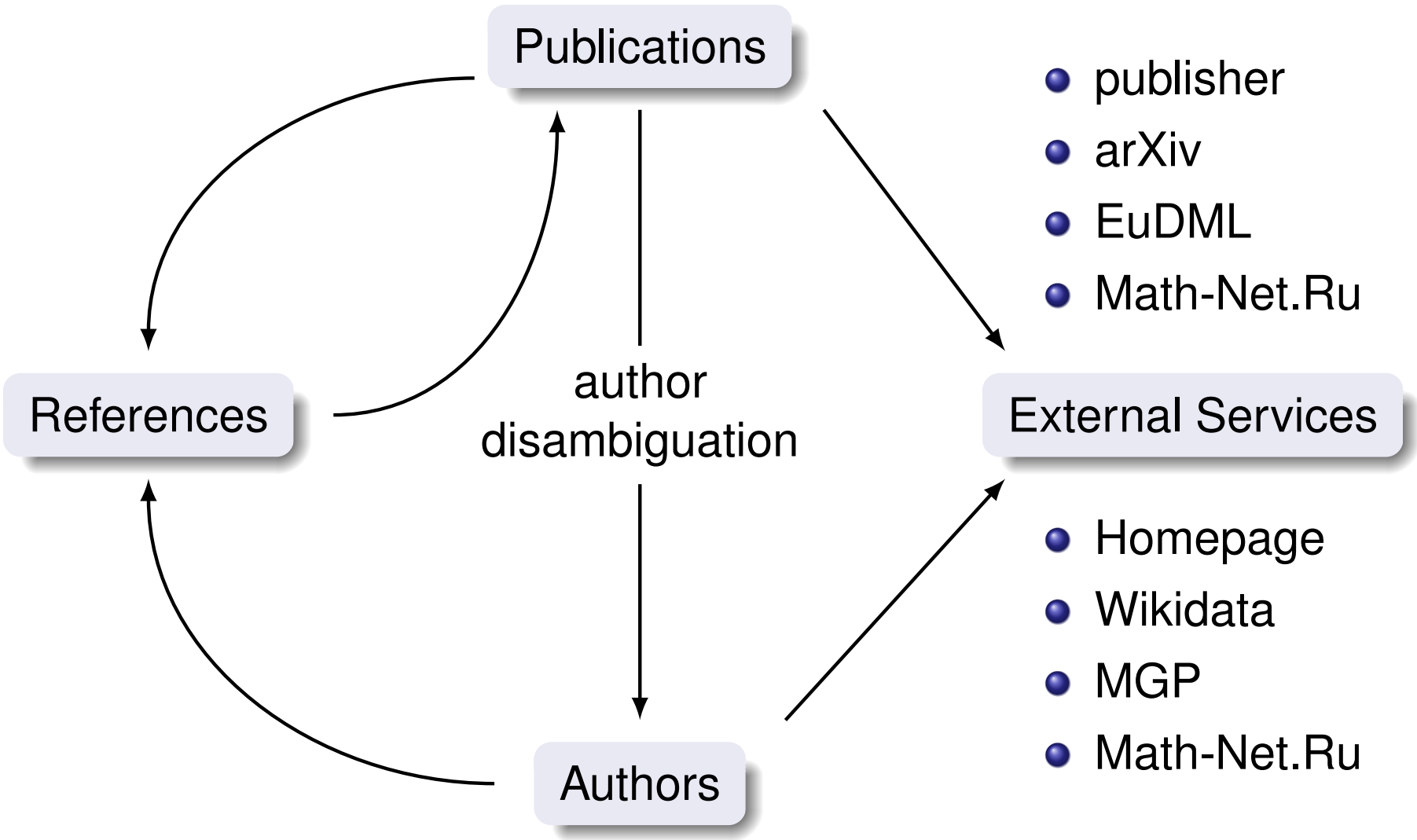

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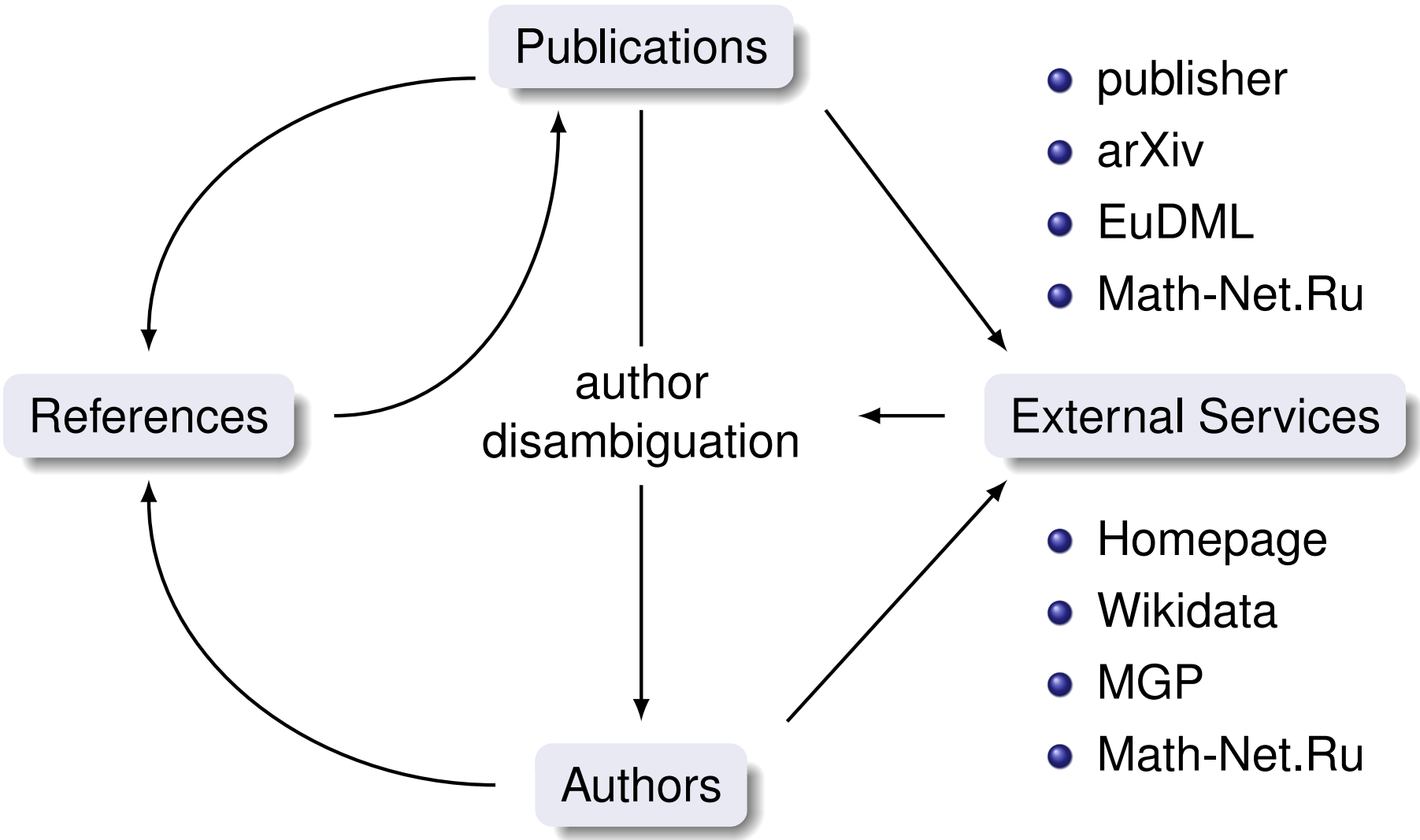

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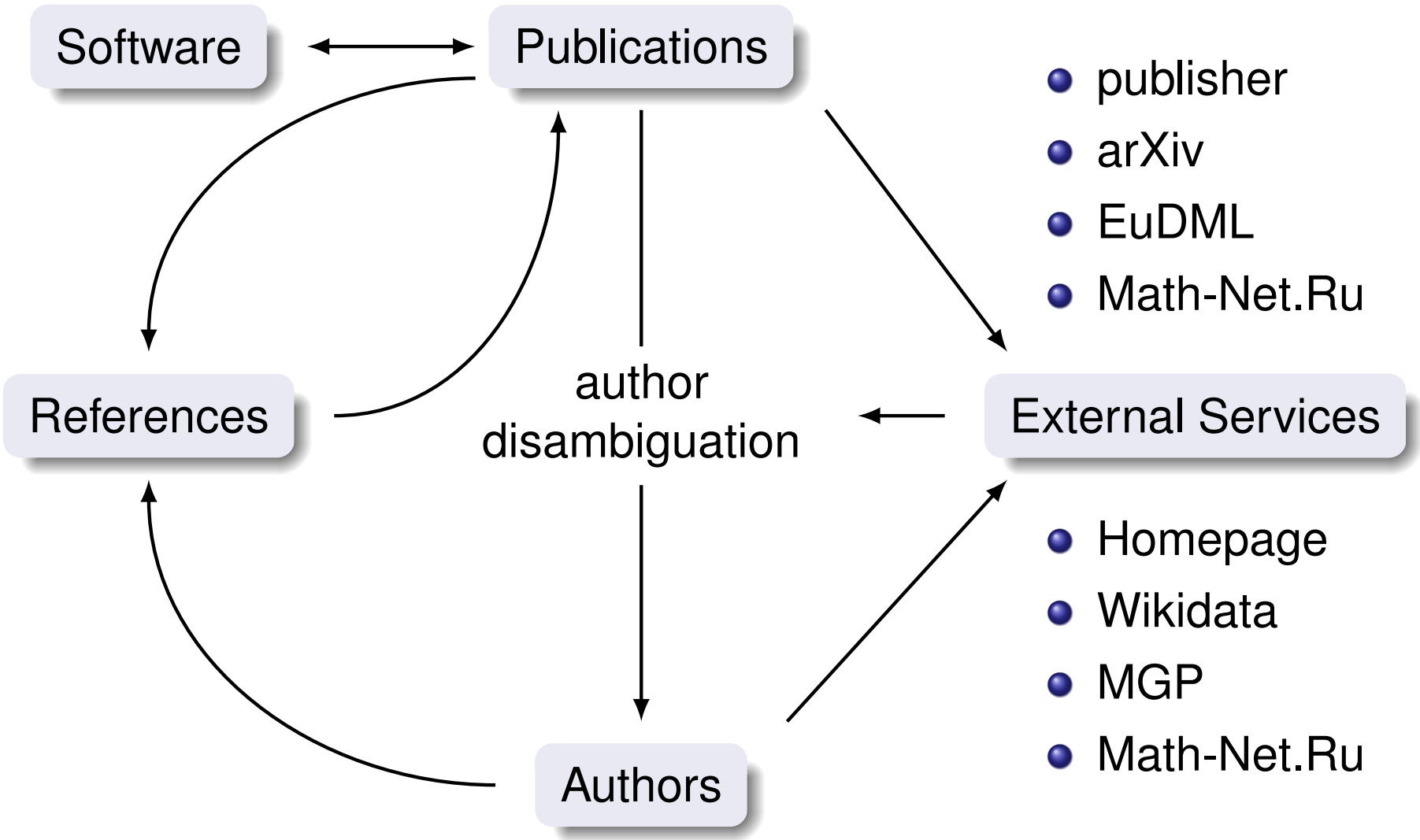

Formula Search

zbMATH
the first resource for mathematics

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i {\partial \over \partial t} ?u + ?H ?u = 0 | Examples

Help

$$i\frac{\partial}{\partial t}u + Hu = 0$$

The formula search is now integrated into the structured zbMATH search, which allows for free combination with other query types. Furthermore, formula queries (as, e.g., given in the Examples) can be refined via the filter functions.

The zbMATH formula search uses the MathWebSearch system, which is a content-based search engine for MathML formulae based on substitution tree indexing. The first prototype is a result of a joint research project of FIZ Karlsruhe with the Jacobs University Bremen, funded by the Leibniz Association, which aims at developing concepts and methods for a semantic analysis and retrieval of mathematical formulae in the zbMATH corpus.

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Structured Search

an:02124437 | Fields | Operators

Help

Burq, N.; Gérard, P.; Tzvetkov, N.

Strichartz inequalities and the nonlinear Schrödinger equation on compact manifolds. (English)

Zbl 1067.58027

Am. J. Math. 126, No. 3, 569-605 (2004).

Let M be a closed d-dimensional Riemannian manifold. Let Δ be the Laplace-Beltrami operator on M. Fix numbers $p \geqslant 2$, $q < \infty$ such that

$$\frac{2}{p} + \frac{d}{q} = \frac{d}{2}.$$

The authors show that for any finite time interval I the solution to the Schrödinger equation

$$i\frac{\partial}{\partial t}v + \Delta v = 0, \quad v(0,x) = v_0(x),$$

satisfies the Strichartz estimate

$$\|v\|_{L^p(I,L^q(M))} \leqslant C(I)\|v_0\|_{H^{1/p}(M)}.$$

From this they deduce unique solvability of certain nonlinear Schrödinger equations. In the very special case that all geodesics of M are closed with a common period the estimate is improved to

$$\|v\|_{L^4(I\times M)} \leqslant C(I)\|v_0\|_{H^s(M)},$$

$s > s_0(d)$, $d \geqslant 2$.

Reviewer: Christian Bär (Potsdam)

MSC:

58J60 Relations of PDE with special manifold structures
53C22 Geodesics
35Q55 NLS-like (nonlinear Schrödinger) equations

Cited in **3** Reviews
Cited in **45** Documents

Keywords:
Schrödinger operator; Schrödinger equation; Strichartz estimates; loss of derivatives

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