FIZ Karlsruhe
Leibniz Institute for Information Infrastructure

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PRESS RELEASE

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FIZ Karlsruhe starts research project to detect veiled plagiarism in mathematical publications

Over the next three years, researchers at FIZ Karlsruhe and Bergische Universität Wuppertal (Germany) will develop methods for detecting veiled plagiarism in scientific publications. For example, publications in mathematics and engineering, natural and technical sciences will be examined for paraphrases, translations or plagiarism of ideas. The German Research Foundation has now approved a pioneering cooperative project.

hence it has been assumed $G_U(\cdot) = -K_U(\cdot)$. The terms $C_U(\Phi, \dot\Phi)$ and $C_{UC}(\Phi, \dot\Phi)$ respectively have elements

$$C_{U,i,j} = \sum_{k=1}^{n} c_{\mathcal{I}_U(i), \mathcal{I}_U(j), k} \dot\phi_k, \quad C_{UC,i,j} = \sum_{k=1}^{n} c_{\mathcal{I}_U(i), \mathcal{I}_C(j), k} \dot\phi_k$$

and likewise $B_U(\Phi)$ and $B_{UC}(\Phi)$ have elements

$$B_{U,i,j} = b_{\mathcal{I}_U(i), \mathcal{I}_U(j)}, \quad B_{UC,i,j} = b_{\mathcal{I}_U(i), \mathcal{I}_C(j)} \quad (16)$$

$F_U(\Phi_U, \dot\Phi_U)$ has elements $F_{U,i}$ which take the form

$$F_{\mathcal{I}_U(i)}(\phi_{\mathcal{I}_U(i)}, \dot\phi_{\mathcal{I}_U(i)}) = F_{s, \mathcal{I}_U(i)}(\phi_{\mathcal{I}_U(i)}) + F_{v, \mathcal{I}_U(i)}(\dot\phi_{\mathcal{I}_U(i)})$$
$$:= F_s(\Phi_U) + F_v(\dot\Phi_U) \quad (17)$$

$$C(\Phi, \dot\Phi)_{\dot\Phi} = C_U(\Phi, \dot\Phi)_{\dot\Phi U} + C_{UC}(\Phi, \dot\Phi)_{\dot\Phi C} \quad (37)$$

with each element $C_U(i, j)$ and $C_{UC}(i, j)$ defined as

$$C_U(i, j) = \sum_{k=1}^{n} c_{N_U(i), N_U(j)} \dot\phi_k, \quad (38)$$

$$C_{UC}(i, j) = \sum_{k=1}^{n} c_{N_U(i), N_C(j)} \dot\phi_k, \quad (39)$$

and likewise $B_U(\Phi)$, $B_{UC}(\Phi)$ have elements

$$B_U(i, j) = b_{N_U(i), N_U(j)}, \quad (40)$$
$$B_{UC}(i, j) = b_{N_U(i), N_C(j)}, \quad (41)$$

and further, $F_U(\Phi, \dot\Phi)$ has element $F_U(i)$ given by

$$F_U(\phi_{N_U(i)}, \dot\phi_{N_U(i)}) := F_s(\Phi_U) + F_v(\dot\Phi_U). \quad (42)$$

Schematic representation: Original (left) and plagiarism (right), with similar text and formula elements highlighted

Karlsruhe, July 23, 2020 – Plagiarism in doctoral theses of high-ranking politicians - almost everyone has heard of this. But far more dramatic is plagiarism in the sciences themselves that, as it were, touches on their code of honor, on good scientific practice. And: Plagiarism violates intellectual property rights, especially copyright. It is theft ideas and thoughts. Detecting scientific plagiarism has become increasingly important everywhere, for institutions in education and research as well as for funding institutions and publishers. At present, service providers in the field of plagiarism detection are mainly focusing on the identification of hardly veiled forms of plagiarism. These are typical for students and, at best, doctoral students. The more demanding research and development

effort to create tools and services that enable the identification of veiled forms of plagiarism in scientific publications, however, is still undertaken to a lesser extent.

Against this background, mathematicians at FIZ Karlsruhe and Bergische Universität Wuppertal were successful with their project to develop methods for the detection of veiled scientific plagiarism, such as paraphrases, translations or plagiarism of ideas, as they occur especially in the so-called MINT disciplines (mathematics, engineering, natural and technical sciences). In order to achieve this goal, FIZ Karlsruhe researches how potentially suspicious similarities between documents can be detected by analyzing mathematical expressions, as text- and language-independent features. This new, consistently mathematics-based approach to plagiarism detection is combined with text- and citation-based approaches from previous research activities. Such analyses of various similarity characteristics are particularly well suited to identify the broad spectrum of scientific forms of plagiarism.

This is supposed to enable the scientific community and providers of plagiarism detection services to make even thoroughly veiled scientific plagiarism more transparent. FIZ Karlsruhe and Bergische Universität Wuppertal feel committed to transparency also in another way: They will realize their research contributions in the free open source plagiarism detection system HyPlag (www.hyplag.org) and make their code and research data publicly accessible. In addition, the joint research contributions will be continuously evaluated together with the editors of the renowned information service zbMATH.

Project leader Dr. Moritz Schubotz of FIZ Karlsruhe explains: "In the last 10 years, more than 400 suspected cases of plagiarism have already been investigated within the scope of quality assurance of zbMATH. Most of the cases were discovered by editors and reviewers, who knew the original results and therefore became suspicious. The new research project and, above all, formula-based analyses should make automatic early detection possible. This cannot be achieved by the existing text-based software. Human expertise will thus be considerably expanded".

zbMATH is the central platform for this purpose. The information service provides detailed records of mathematical publications dating back to 1868 and offers access to more than 3.7 million bibliographic references from the world's scientific literature. Summarized and evaluated by an international network of more than 7,000 scientists, the scientific quality of the articles becomes transparent to the public.

The information service zbMATH, which has so far been subject to charges, is to be converted into an open access platform and will be freely accessible to the mathematical community worldwide from 2021 on. The better detection of plagiarism will thus gain more importance.

More information is available on the zbMATH product website at www.zbmath.org and on our website www.fiz-karlsruhe.de

This press information can be downloaded at:
https://www.fiz-karlsruhe.de/de/aktuelles/pressemeldung

FIZ Karlsruhe – Leibniz Institute for Information Infrastructure is a not-for-profit limited liability company. As one of the largest non-academic information infrastructure institutions in Germany, we have the public mission to provide researchers and scientists with scientific in-formation and to develop the appropriate products and services. To this end, we edit and index large data volumes from manifold sources, develop and operate innovative information services and e-research solutions, and carry out research projects of our own. FIZ Karlsruhe is a member of the Leibniz Association which comprises more than 95 institutions involved in research activities and/or the development of scientific infrastructure. During the start-up phase of the NFDI, FIZ Karlsruhe, together with the Karlsruhe Institute of Technology (KIT), is the supporting institution of the NFDI Directorate for an interim period.

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