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Bibliometrical Analysis in Multimedia Jurnal Face Recognition

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ABSTRACT

The objective of this research is to bibliometrically analyze multimedia journals on the subject of "face recognition" with a focus on developments and related research trends over a certain period of time. The research uses bibliometric methodologies to identify and analyze scientific publications related to face recognition in the multimedia world, including trends in research, major contributors, the most frequently quoted journal, and how research topics evolve over time. These findings provide an important understanding of how multimedia face reconnaissance evolves and develops, and provide a solid foundation for further research in this field. Thus, this research can be an important reference for researchers, practitioners, and decision makers in the fields of artificial intelligence, facial recognition, multimedia technology in general.

Keywords: *Bibliometrics, Multimedia, Face Recognition, Situation Analysis, Co-Quotation Analyses, Bibliographic Analysis*

1. INTRODUCTION

Solving the challenge of face identification under complex illumination I s a difficult task. Techniques for extraction that are insensitive to lighting and illumination preprocessing are frequently used to reduce the effect of illumination variation. Nevertheless, the previously suggested methods provide poor results. This study offers a unique illumination processing algorithm, namely REC&SIG-SVD algorithm, to perform high-accuracy recognition under variable illumination. Above all, the facial image's initial high-frequency and low-frequency features are obtained in the logarithm domain using singular value decomposition (SVD). In order to calculate efficient high-frequency features, this study suggests the Sigmoid function, which satisfies the concept of declining marginal utility to normalize singular values, aiming at calculating effective high-frequency features.

A traditional and effective technique for representing faces is the Weber Local Descriptor (WLD). However, one drawback of this method is that it uses contrast information between the center pixel and its eight neighboring pixels, which can also vary depending on the lighting. We present a novel face recognition algorithm, Weber Local Circle Gradient Pattern (WLCGP), which not only takes the relationship between the target pixel and the surrounding pixels into account, but also takes into account the relationship among the surrounding pixels in order to address the aforementioned shortcomings and the issue of sensitivity to illumination.

This research proposes a sequential deep learning-based framework for face identification together with a revolutionary 3D face reconstruction method. It makes advantage of the voxels produced during the voxelization procedure. It creates the 3D reconstruction point utilizing the mid-face plane and the reflection concept. A sequential deep learning framework is created to identify gender, emotion, object, and person from the reconstructed face. Triplet loss training, bidirectional long short-term memory, and variational autoencoders are all used in the created framework. Through the creation of deep features, the sequential deep learning model extracts and improves the rebuilt voxels. Deep features are subjected to the support vector machine in order to get the final prediction.

Variations in illumination and position in diverse environments obviously impact the face images obtained during the image acquisition phase of face recognition. Utilizing the Local Binary Pattern (LBP) operator reduces the efficacy of illumination. In our previous work, we suggested the Improved Pairwise-constrained Multiple Metric Learning method (IPMML) as a classification metric, which tackles the misalignment problem more effectively than PMML. Prior to IPMML, Linear Discriminant Analysis (LDA) is carried out in order to address the high processing complexity of IPMML. As a result, a face recognition technique that addresses misalignment and lighting issues is suggested. It is based on LBP and IPMML. First, LBP is chosen to extract texture features from facial image data. Second, the dimension is decreased by applying LDA.

In computer vision, face recognition is important. It is commonly known that complex stimulus signals, such as misalignment, orientation, position changes, and variations in facial expression, can cause non-rigid deformations in facial images. This research presents an enhanced sparse-representation based face recognition technique that creates dense pixel correspondences between training and testing facial samples in order to solve these variations. To be more precise, we first build a deformable spatial pyramid graph model that regularizes matching consistency at several spatial extents at once, from the whole image through coarse grid cells to each individual pixel.

The COVID-19 pandemic has caused a global health disaster. Image recognition algorithms are a helpful tool in stopping the pandemic's spread; in fact, the World Health Organization (WHO) advises wearing face masks in public to prevent infection. Thus, cutting-edge algorithms and technologies were used to quickly screen a big number of individuals whose faces were hidden under masks. In this paper, we examine the present status of the field as well as potential future developments in masked-face recognition methods and systems. The paper first introduces the basic methodologies and talks about the applications and significance of facial and face mask recognition. Subsequently, we examine the latest facial recognition frameworks and systems that rely on MobilNet, deep learning, machine learning, and convolution neural networks.

This study proposes a way to assist the task force in identifying criminals, missing persons, civilians, and for surveillance purposes utilizing an Unmanned Aerial Vehicle (UAV) based on facial recognition. A facial recognition system is a technological advancement that entails comprehending the process of face detection and recognition. It is typically utilized for user authentication via identity verification services and for computing facial features from an image. This piece describes an unmanned aerial vehicle (UAV) equipped with a camera, connected to Face Recognition software, and utilized to operate a robot via a wireless remote control.

Table 1. Some bibliometric analysis carried out by researchers on the Multimedia topic of Face Recognition

Author & Year	Citation	Source	Research Findings
[1]	13	GOOGLE SCHOLAR	In order to extract accurate high- and low-frequency features from face images, we thoroughly investigate the frequency components of the SVD technique in this study. We then propose a high-frequency feature-based method called henhanced face. Trials conducted using the Yale B and CMU-

			PIE datasets demonstrate that this approach performs better than conventional high-frequency feature-based techniques like LOG-DCT, HFSVD-face, and AHFSVD-face. Additionally, we can robustly process the face image in harsh light conditions by introducing a novel illumination normalization approach to process low-frequency features, resulting in the low-frequency and high-frequency features-based method: REC&SIG-SVD face. Experimental results show that this method is clearly superior than other conventional methods that are similar, like S&L_LTV and H&L_SVD. Furthermore, the results of the experiments demonstrate that the REC&SIG-SVD face and the improved face perform better than the deep learning methods (DLN and SSAE) and state-of-the-art illumination invariant measurements (SQI, Gradient-face, Weber-face). Even though the REC&SIG-SVD face displays a pleased recognition rate, several works remain unexplored and warrant further investigation [37, 42–44]. First and foremost, further research is required to more thoroughly extract the frequency aspects of the face image. Then, to address uneven lighting features in tiny areas, we can incorporate the illumination invariant measurement into the REC&SIG-SVD algorithm. Lastly, we may attempt extending the suggested approach to additional domains like facial expression and gender recognition.
[2]	14	GOOGLE SCHOLAR	This paper introduced the WLCGP approach and used it to study facial recognition. This operator can take use of the gradient relationship that exists between the target pixel and its surroundings as well as within those surroundings. The WLCGP approach can generate the fusion characteristic and extract more effective and discriminative feature information that can aid in future research by computing the overall gradient information and the cycle gradient information of an image. Specifically, WLCGP can successfully prevent information loss by calculating the transformation directly from the gray values rather than using the LBP operator to convert a binary string to a decimal value. And the results of the experiments done on the ORL, AR face database, and Singapore infrared face database show that, when compared to LBP, LGP, WLD, and WLGP methods, the WLCGP operator outperforms them even under the most difficult circumstances of various facial expressions and lighting variations.

[3]	36	GOOGLE SCHOLAR	This research proposes a unique deep sequential learning-based 3D face recognition system. Mirror image is the inspiration for 3D voxel-based face reconstruction (3DVFR). Triplet loss training, bidirectional long short-term memory (BiLSTM), and variable autoencoder (VAE) are the concepts used in the suggested deep learning pipeline. When addressing the sparsity of the voxels acquired following the voxelization procedure for various poses, the fuzzy c-means clustering technique comes in handy. VAE uses a probabilistic model for latent space to effectively reduce the dimensionality of the number of voxels. The BiLSTM technique optimizes the VAE embedding by utilizing the sequential data property of the facial features.
[4]	16	GOOGLE SCHOLAR	This paper proposes a face recognition technique based on LBP and IPMML. Initially, texture characteristics are extracted using the LBP operator. LDA is then applied to reduce the feature dimension. Third, the discriminative distance is calculated using IPMML. Ultimately, facial picture classification is done via NNC. The LBP+LDA approach yields features with low dimension and rich texture information, hence reducing calculation complexity. Furthermore, IPMML is resilient to images that are not aligned correctly. The results of the experiments demonstrate that the suggested method is capable of accurately and consistently identifying faces in both original and misaligned photos.
[5]	13	GOOGLE SCHOLAR	By addressing its sensitivity to the nonlinear correlation of facial images—such as non-rigid visual alterations of position changes, emotions, and misalignments—we improved SRM for robust face recognition in this study. Our approach uses local and global spatial extents to regularize the matching consistency after first performing picture alignment with the DSPGM. After that, a face recognition ISRM and related classification method are suggested. The experimental results demonstrate that, in terms of recognition efficiency and accuracy, our strategy outperforms the competing models on the ORL, AR, and LFWCrop datasets.
[6]	2	GOOGLE SCHOLAR	Despite recent reductions in its impacts, the COVID-19 pandemic continues to plague different parts of the world. The World Health Organization states that wearing face masks and isolating oneself from others are two of the most

			important ways to stop the pandemic's spread. Numerous worldwide studies have focused on facial recognition recently. The review that is being provided focuses on the most current results about face mask detection and masked-facial recognition systems that have been published in scholarly journals in an effort to combat the COVID-19 pandemic. First, masked-facial recognition and face mask identification using standard machine learning techniques and models are reviewed and addressed. The focus is on methods that combine different ML models to enhance their performance.
[7]	10	GOOGLE SCHOLAR	This research describes an artificial intelligence-enhanced facial recognition system that uses drones. The drone's durability can be enhanced by soldering the connections correctly and adding LiPo batteries to prolong its flying life. It also features an attached camera that is integrated with the Face Recognition software. The accuracy of the suggested system is 98.6%. Although this technology has solely been utilized for security and surveillance, it can be safely applied to a variety of real-world applications, such as retail and law enforcement.

1. How do researchers evaluate facial recognition?
2. What development can we expect in the multimedia world about facial recognition?
3. What are the most frequently published fields of multimedia research on facial recognition?
4. What represents an opportunity for further study of the use of facial recognition technology?

Exploring the complexities of facial perception and understanding in the context of multimedia applications is the goal of the proposed research publication on face cognition in multimedia. This magazine aims to provide light on the complex interactions that exist between visual stimuli, cognitive functions, and technological improvements in order to better understand how people receive and interpret facial cues in a variety of multimedia environments. Furthermore, this publication aims to investigate the possible consequences of combining state-of-the-art technologies, like computer vision and deep learning, to improve the precision and effectiveness of face cognition systems on a variety of multimedia platforms.

2. LITERATURE REVIEW

2.1 Historical Development

The roots of face recognition technology can be traced back to early studies in the 1960s, where rudimentary techniques were developed [8]. Over the decades, advancements in image processing, machine learning, and neural networks have propelled face recognition into a sophisticated and widely applicable technology [9]. The early literature predominantly focused on fundamental algorithms and methodologies, paving the way for the intricate systems and applications seen today [10]. Despite remarkable progress, face recognition systems face several challenges, spurring ongoing research efforts [4]. One of the primary challenges lies in handling variations in lighting, pose, and facial expressions, which can significantly impact recognition accuracy [11]. Additionally, issues related to occlusion, aging, and the need for robustness in unconstrained environments have been persistent themes in the literature. The review of these challenges underscores the dynamic nature of face recognition research and highlights the need for innovative solutions.

2.2 *Multimedia Applications*

Face recognition technology has been widely used in various fields such as security, biometric identification, robotics, video surveillance, health, and commerce. It has been integrated into multimedia applications to enhance user authentication in devices, improve surveillance systems, and develop emotion recognition technologies. The literature reflects the expanding horizons of face recognition beyond traditional boundaries, with researchers exploring its applications in diverse fields. Studies have proposed novel approaches to improve the accuracy rate of face recognition in the presence of variations or occlusion, combining feature extraction techniques with convolutional neural networks (CNNs) [10]. Additionally, deep-learning-based face recognition models have been developed to meet the real-time requirements of practical applications, while ensuring robustness against adversarial attacks [11][12]. These advancements have significantly improved the accuracy, reliability, and robustness of face recognition systems, making them suitable for automation in attendance systems and other multimedia applications [13][8].

2.3 *Benchmark Datasets and Evaluation Metrics*

Benchmark datasets such as Labeled Faces in the Wild (LFW), CelebA, and the MegaFace Challenge have played a crucial role in the development and evaluation of face recognition algorithms [8]. These datasets have shaped the landscape of face recognition research and influenced the direction of algorithmic development. Evaluation metrics like accuracy, precision, and recall are commonly used to assess algorithm performance under varying conditions. In recent years, deep learning techniques, particularly convolutional neural networks (CNNs) and generative adversarial networks (GANs), have emerged as powerful tools for improving recognition accuracy [14]. These technologies have had a significant impact on the field of face recognition and have driven current research trends. As face recognition technology becomes more prevalent, ethical and privacy considerations have become increasingly important [15]. Discussions surrounding surveillance, consent, and the responsible development and deployment of face recognition systems are ongoing. Understanding these ethical dimensions is crucial for guiding the development of guidelines and regulations in this evolving field [15].

3. METHODS

The goal of the journal, devoted to the research analysis of multimedia journals on face recognition is to investigate the applications of facial recognition technology in a variety of domains, including social media, marketing, and security, and to critically assess the technological advancements in this area. Additionally, the journal hopes to add to the ongoing discussion on the moral ramifications and possible social effects of facial recognition technology's widespread use. The approach used in the multimedia journal's methods section, which focuses on face recognition as the main research topic, is a thorough integration of deep learning algorithms, image processing techniques, and data augmentation methodologies. This allows for the development of a strong facial recognition model that can achieve high accuracy with a variety of facial attributes and in a variety of environmental conditions.

3.1 Journal Reputation

At this stage, a well-ranked journal has been selected and is still in the process today. Table 2 shows the results of the journal check.

Table 2. Profile of a journal with a special topic on Multimedia "Face Recognition"

Point of View	**MTA**	**MTA**	**MTA**	**MTA**	**MTA**	**SENSORS**	**CE**
Publisher	Springer Science + Business Media	Springer Science + Business Media	Springer Science + Business Media	Springer Science + Business Media	Springer Science + Business Media	MDPI	Elsevier
First published	2019	2020	2020	2022	2008	2014	2020
Last published	2020	2022	2020	2022	2008	2016	2020
Scopus Indexed	Yes	YES	Yes	YES	Yes	Yes	Yes
Web of Science Indexed	No	No	No	No	No	No	No
Impact factor by SJR	0.72	0.72	0.72	0.72	0.72	0,76	2.8

Table 2 shows that all scope-indexed journals with MTAs are categorized as belonging to Q1, as are SENSORS and CE. Since this instance involves a multimedia diary about facial recognition, analysis is equally crucial.

3.2 Journal Metrics Information

Bagian ini secara eksplisit menggambarkan profil dan metrik dari dua jurnal yang dipilih, yaitu OTIOMS, MS dan IJORE. Tabel 3 menunjukkan beberapa hal penting yang harus diketahui dari tiga jurnal yang dipilih. Informasi metrik ini diperoleh dari informasi metadata menggunakan aplikasi Publish atau Perish (PoP) pada 12 Juni 2023.

Table 3. Metrics Information of Selected Journals

Metrics data	MTA	SENSORS	CE
Publication years	2019-2020	2014-2016	2020
Citation years	4	9	3
Papers	4	20	50
Citations	353	3008	1551
Cites/year	88.25	334.22	517.00
Cites/paper	88.25	150.40	31.02
Authors/paper	2.75	3.55	3.52
h-index	4	19	21

g-index	4	20	38
hI,norm	4	14	13
hI,annual	1.00	1.56	4.33
hA-index	4	10	13

3.3 Reference Management

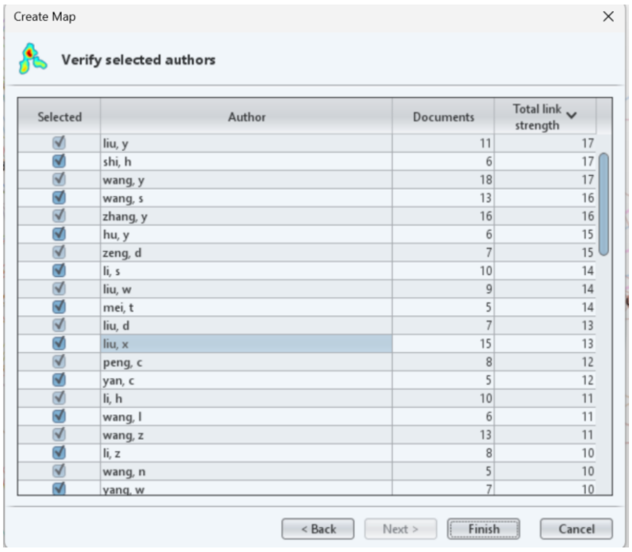
Ultimately, after downloading articles from three different journal websites (Springer Science + Business Media, MDPI, and Elsevier), the following action is to use the Mendeley tool to create references. In order for metadata, which includes author details, keywords, abstracts, and other information to be arranged more clearly and comprehensively, to be full for each article, references are required.

3.4 Bibliometric Analysis

After the confirmation of completeness of all the article metadata, bibliometric analysis is the next stage. VosViewer, an application based on database files, was utilized to analyze bibliometrics in this article.csv file obtained by searching for "Multimedia Face Recognition" on Google Scholar.

4. RESULTS AND DISCUSSION

Using VOSViewer software to determine the type of data, researchers create a map based on bibliographic data to chart the advancement of multimedia research on face recognition. Next, we read data from reference management files that have RIS-compatible file types in the data source. Next, apply complete counting for the counting method, with a maximum of 25 writers per document and a minimum of 5 authors per document. As a result, 67 of the 2201 authors satisfy the requirements.



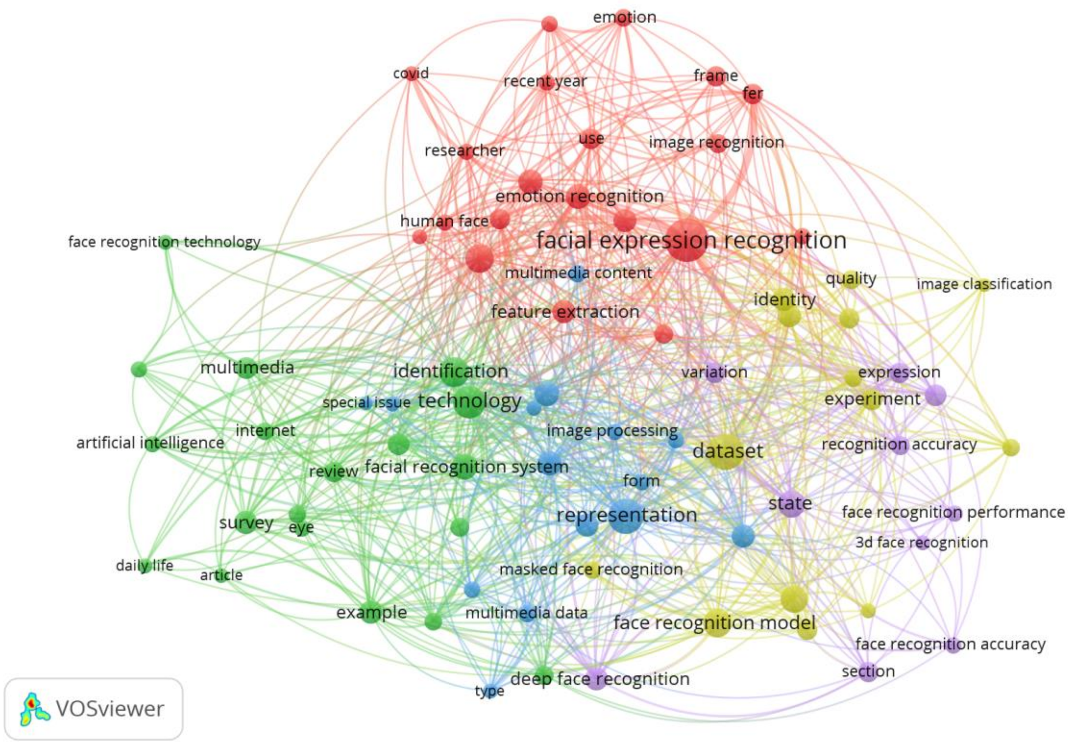


Figure 1. Network Visualization Map of Keywords

Several groupings are shown by the colors blue, yellow, red, green, and purple in Figure 1. A few of the cluster's most frequently occurring words are shown across the entire article. This cluster demonstrates that there are currently five published article classifications. Table 4 has further information.

Table 4. Clusters and Keywords Therein

Cluster	**Total items**	**Most frequent keywords (occurrences)**	**Keywords**
1	20	Face expression recognition (79), facial expression (35), emotion recognition (25), mask (25)	Attention, covid, emotion, eomotion recognition, facil emotion recognition, facial expression, facial expression recognition, facial feature, feature extraction, fer, frame, hand, heterogeneous face recognition, human face, iamge recognition, mask, recent year, recognition rate, researcher, use
2	19	Technology (44), identification (37), facial recognition system (28)	Addition, article, artificial intelligence, daily life, example, eye, face recognition technology, facial recognition system, facial recognition technology, identification, machine, machine learning, multimedia, multimedia application, multimedia technology, review, survey, technology

3	15	Representation (53), research (26), computer vision (26), face recognition aalgorithm (24)	Computer vision, context, face recognition algorithm, form, image processing, multimedia content, multimedia data, object, pattern recognition, representation, research, security, special issue, type, varietty
4	14	Dataset (57), face recognition model (34), face recognition method	Dataset, experiment, face recognition method, face recognition model, face recognition task, facil image, identity, image classification, implementation, input, local binary pattern, masked face recognition, order, quality
5	10	State (31), deep face recognition (23), expression recognition (21)	3d face recognition, deep face recognition, expression, expression recognition, face recognition accuracy, face recognition performance, recognition accuracy, section, state, variation

In order to determine the current trends in multimedia research about face recognition, we can examine the replies obtained directly from the cluster. A visualization of article density is shown in Figure 2. The term "facial expression recognition" is most commonly used in Cluster 1.

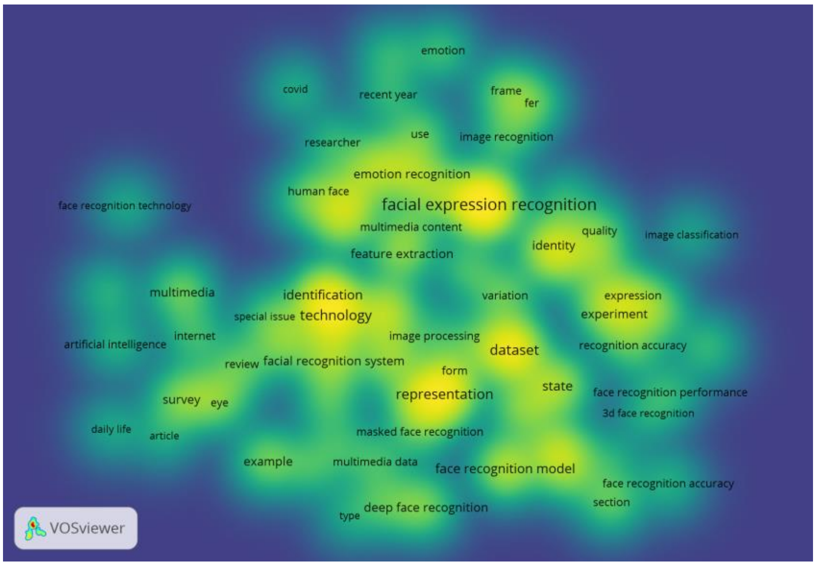


Figure 2. Density Visualization Map of Keywords

One of these mapping result clusters, cluster 1, is present at least in the keyword. The subject of multimedia "face recognition" is covered by this cluster. Additionally, some words, like "hand," "heterogeneous face recognition," and so on, are uncommonly found in keywords inside any cluster. In other words, there are still research gaps that will very certainly lead to future trends—trends that are, of course, tailored to the circumstances of the globe both now and in the future.

CONCLUSION

A number of works with themes pertaining to multimedia "face recognition" are reviewed in the current study. The information in this article was gathered from Chemichal Engineering (CE), Multimédia Tools Application (MTA), and SENSORS. Based on our research, we came to the conclusion that a few of the aforementioned publications have a greater influence on the field of multimedia today, particularly face recognition, since "face recognition" might be an article topic in multimedia.

There are at least two issues with the current study. First of all, even though the study makes use of formal tools (PoP software, VOSviewer, and Mendeley), subjective judgment by the author still exists and can result in error identification. The study is primarily based only on journals that are indexes scopus, though many other journals are qualified as in Thomson Reuters. Subsequent research endeavors ought to employ intricate sample sizes that encompass several sources, nevertheless not included in Scopus' index.

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