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Visual mapping of target tracing methods based on CiteSpace bibliometrics

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***Abstract*—Visual target tracking is a hot problem in computer vision research in recent years, and the application fields are gradually increasing, such as unmanned driving, intelligent surveillance, etc. In recent years, with the wide application of deep learning in the field of computer vision, the field of target tracking has also developed rapidly, and many scholars have improved and innovated the target tracking. Common target tracking areas include single target tracking, multi-target tracking, pedestrian re-identification, multi-target multi-camera tracking, pose tracking for many complex scenarios. Eventually the problem will also be attributed to single target tracking or multi-target tracking, which has become the focus of many scholars' research. In view of the rapid development of this field, this paper presents a review of visual target tracking research, including a review and analysis of single-target tracking methods, a review and analysis of multi-target tracking methods, and a summary of the shortcomings of these methods, including the lack of fusion based on target detection methods, the decrease of real-time accuracy, and the problem of target loss in long-term target tracking. . And according to the shortcomings, the following suggestions are made: combining traditional algorithms based on filtering and deep learning algorithms, focusing on the improvement of the ideas of deep learning frontier theories, and improving the long-term target tracking loss.**

INTRODUCTION

Fukunaga et al. introduced the concept of mean drift in 1975 [1], which was initially used to solve the problem of gradient estimation of probability density functions, and then mean drift was used as a target tracking algorithm with remarkable results. The mean drift-based target tracking method uses a statistical histogram to model the image to be detected, which can approximate the probability density function of the corresponding region of the image, and then the optimal kernel function is obtained based on the principle of minimizing the drift vector computation error. As an early target tracking algorithm, the mean drift target tracking method has received widespread attention and concern, and has many advantages such as simple and practical model, efficient algorithm and easy modular implementation, which is an important fundamental algorithm in the field of target tracking algorithm research [2]. Particle filtering algorithms were first proposed in the early 1990s and were initially applied in the field of control. The particle filter is an approximate implementation of Bayesian filtering using Monte Carlo simulation algorithm [3]. The basic idea is that a random set of samples (called particles) is generated based on the state vector distribution function of the dynamic system, and then the data obtained from the measurement equations are used to adjust the positions and weights of the particles, and finally the adjusted particles and weights are used to approximate the A-state value of the system [4]. The particle filter-based target tracking algorithm combines particle filters and color histograms, which are simple to extract, rotationally invariant, and insensitive to deformation and partial occlusion, so it can track the target effectively when the image background to be detected is simple [5]. However, particle filter-based target tracking methods also still have a large number of problems to be solved mainly including: particle degradation and depletion, importance density function, and large computational effort [4]. Therefore, discriminative target tracking methods (correlation filtering methods and deep neural network methods) have been more widely recognized and emphasized in recent years.

ANALYSIS OF RESULTS

Searching the target tracking related literature in Web of Science, since there is a gradual study of related literature after 1953, the statistics of target tracking research literature published from 1953 to 2020 were done (Figure 1), the literature kept low level in 1953-1977, from 1977 onwards, the research had a small growth trend, to 2001 the growth rate accelerated, in 2009 reached the peak of the number of studies in the nearby years, after 2009 the number of studies began to decline, to 2011 again reached a lower number of levels and maintained until 2015, after 2015 the growth rate increased significantly, growth to 2017 reached a small peak, in 2018 the number of studies again occurred to decline, back to a level slightly lower than The number of studies declined again in 2018, returning to a slightly lower level than in 2016, and then began to increase rapidly after 2018, with the number of studies in the literature reaching the peak of the target tracking calendar year in 2019.

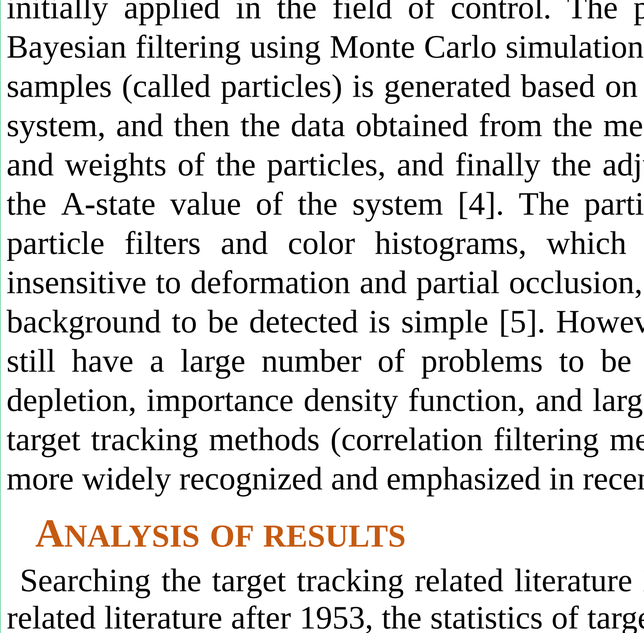

Figure 1. Folding line graph of issuance volume

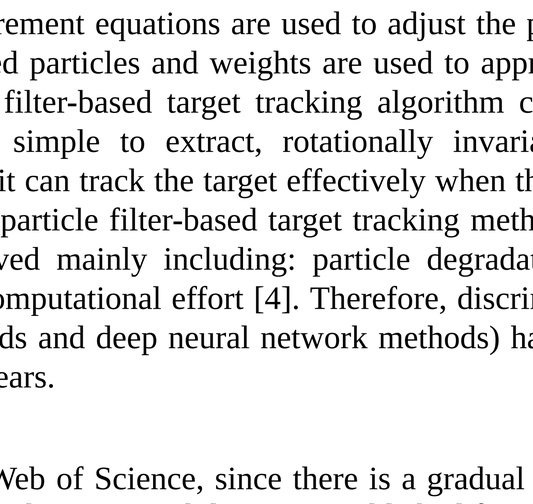

Figure 2. Keyword timeline mapping 2019-2019.

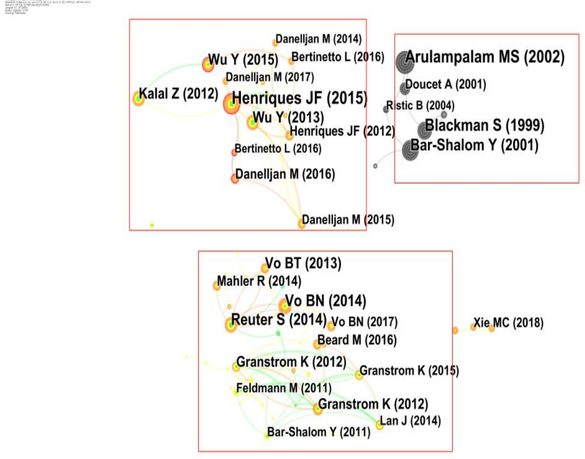

Figure 3. Co-citation distribution mapping

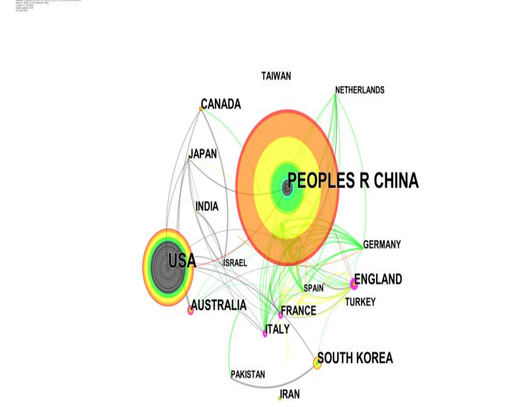

Figure 4. Country co-occurrence mapping

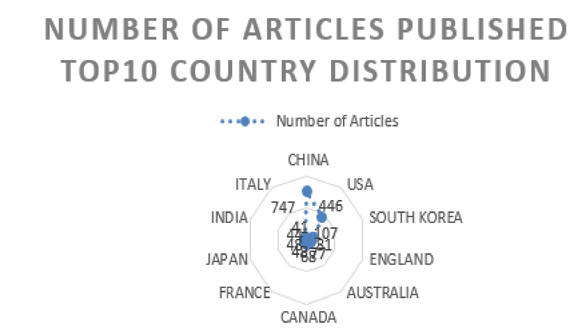

Figure 5. Histogram of country distribution

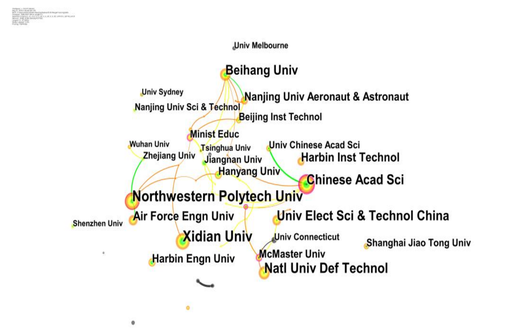

Figure 6. Distribution of institutional issuance

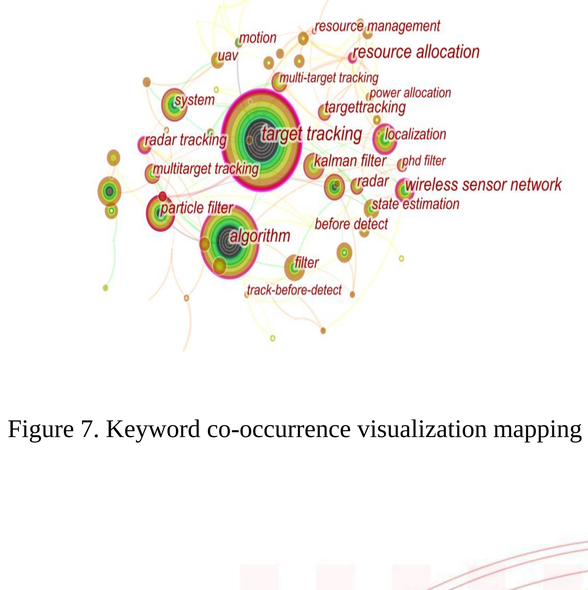

Figure 7. Keyword co-occurrence visualization mapping

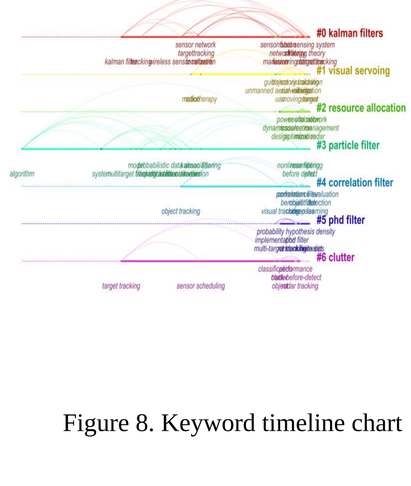

Figure 8. Keyword timeline chart

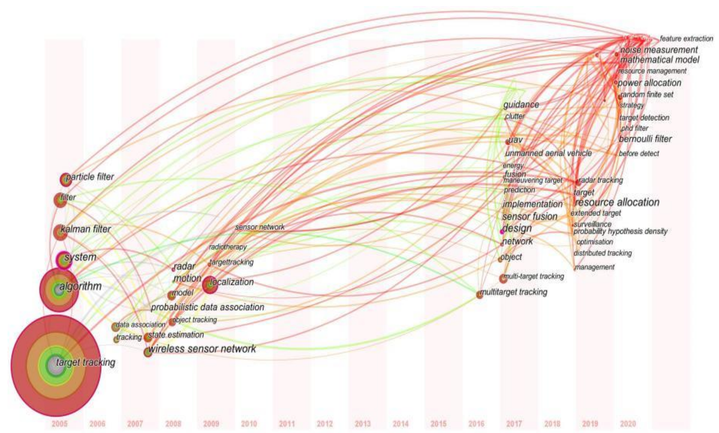

Figure 9. 2005-2020 keyword timeline char

CONCLUSIONS

The fusion of target detection-based methods is still lacking. The twin network-based target tracking framework is a popular and widely studied target tracking model due to its speed and performance advantages. Most of these network models are optimized for the online update process of the SiamFC model, and the integration with traditional filtering and other algorithms is still lacking.

For the poor performance of weak target tracking, the pre-detection tracking method (TBD) can achieve better results. However, TBD has the disadvantages of computational complexity and large implementation cost, so the optimization of TBD and more weak target tracking algorithms will be a direction that cannot be ignored in the future.