International Journal of Trend in Scientific Research and Development (IJTSRD)
Volume 4 Issue 6, September-October 2020 Available Online: www.ijtsrd.com e-ISSN: 2456 – 6470

Research on Image Recognition and Tracking Based on Knowledge Mapping

Chen Rong

Department of Physics, Nanchang Normal University, Nanchang, China

ABSTRACT

During 2015-2020, 489 articles with the theme of "target", "recognition" and "tracking" were selected as the research objects, which were included in CNKI database. This paper analyzes the amount of papers, research power and research hotspots of "target" "recognition" and "tracking" in China, and obtains two research fields by using cluster analysis of high-frequency keywords, which are recognition field and tracking field, in order to grasp its development trend and provide reference for theoretical research.

KEYWORDS: *knowledge mapping, image, recognition, tracking*

How to cite this paper: Chen Rong "Research on Image Recognition and Tracking Based on Knowledge Mapping" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-4 | Issue-6, October 2020, pp.1533-1536, URL: www.ijtsrd.com/papers/ijtsrd35700.pdf

IJTSRD35700

1. INTRODUCTION

Moving target tracking in dynamic background has been widely used in infrared imaging guidance, infrared imaging reconnaissance and infrared video surveillance. A stable and reliable target locking and tracking method is an important prerequisite for high-level understanding of computer vision. Li Jiang, Zhang Haitao and Liu Rangsu (2017) proposed a fast locking and tracking method for moving targets in dynamic background, which has less computation for target feature extraction, which has high recognition accuracy, which has high accuracy of trajectory prediction, which can quickly and accurately lock and track targets from multiple moving targets[1].Chen Guojun, Chen Wei and Yu Hanqi (2019) proposed a new monocular vision target tracking method for underwater vehicles based on deep learning[2].Yang Jinlong, Cheng Xiaoxue, Miao Jiani et al. (2019) proposed a multi-Bernoulli and multi-target video tracking algorithm based on yolov3 detection[3]. Jia Pengtao and Jia Wei (2019) proposed video multi-target trajectory tracking algorithm, which is suitable for underground coal mines. The algorithm of improved Camshift reduces the randomness of the original Camshift algorithm in the initial candidate target, and improves the accuracy rate of target detection and tracking[4]. Xiu Chunbo, Li Xin, Ba Fushan (2019) proposed a target tracking method based on fuzzy histogram model. The target histogram model was established by fuzzy division of chroma level, which weakened the influence of chroma division threshold on histogram model, reduced the sensitivity of target model to light changes and other interference, improved the adaptability of tracking method, and realized object recognition, location and tracking by using Camshift method[5]. Zhao Qirui, Han Yaobin, Shen Hui, et al. (2019) proposed a video image tracking method of aircraft target in ascending phase based on particle filter method, and established particle filter tracking model of aircraft target to realize recognition and tracking of aircraft target[6].Wang Huiyan, Yang Yutao, Wang Jingqi, Wang Xun, Chen Weigang, Yan Guoli, and Hua Jing (2017) proposed a recognition model aided multi-target tracking algorithm based on deep learning, which can accurately and robustly track multiple targets when the target disappears and reappears and there is serious occlusion in the long-distance tracking process[7]. Shen Tongping, Yang Songtao, Chu Jiewang (2013) analyzed the research hotspots of image retrieval in China, mainly focusing on the algorithm research of image retrieval, image feature research (such as color feature, texture feature, shape feature, etc.), image semantic research, etc[8].The research results of Shen Tongping, Dong Yin, Yu Lei (2019) show that image retrieval algorithm, image feature extraction and image semantic research have become important hot topics, and relevance feedback research, multi feature fusion retrieval, deep learning algorithm and image automatic annotation technology become important research frontiers[9].

This paper uses the knowledge mapping to visually analyze the research hotspots, research institutions and core authors of image target recognition and tracking, aiming to sort out the context and trend of target recognition and tracking research, grasp the current research hotspots, research

power and future development trend, and provide reference for future research in this field.

2. Data sources and research methods

2.1. Data sources

According to the research topic, the sample data is from CNKI database. In the process of data retrieval, in order to ensure the accuracy of data and optimize the retrieval strategy, the literature retrieval formula is: ((SCI source journal=Y or EI source journal=Y or Peking University core journal=Y or CSSCI Journal=Y or CSCD journal =Y) and keyword= target and (key word = recognition or Key words=tracking) (exact matching), the retrieval time span was from "2015-01-01" to "2020-10-08", a total of 489 records were retrieved, and finally 489 literatures were selected as samples.

2.2. Research methods and tools

The research tools are BICOMB and SPSS software which identify the document type as ANSI coded text file. Therefore, the file exported from CNKI database is transformed into ANSI coded text file, and then imported into BICOMB for keyword statistics. Then, the keyword statistical results are extracted, and the co-word matrix analysis of key words is carried out. The co-word matrix is analyzed by SPSS.

3. Research results and analysis

3.1. Annual analysis of the number of papers published

We can see from table 1 that the distribution of literature is in different periods from 2015 to 2020. Basically, the research in this field shows a downward trend, and the number of published papers is becoming smaller and smaller, which indicates that the focus of research is no longer in this field.

Table 1 Statistics of literature publication

Time (year)	2015	2016	2017	2018	2019	2020
Literature(N)	104	96	93	71	78	43
Proportion (%)	21.4%	19.8%	19.2%	14.6%	16.1%	8.9%

3.2. Analysis of research power

3.2.1. Analysis of key journals

From 2015 to 2020, 297 journals were involved in the 489 articles on "target", "recognition" and "tracking", and 12 journals published more than 5 papers. The Transactions of the Chinese Society of Agricultural Engineering ranked first with 12 papers, followed by Electronic Technology & Software Engineering and Modern Defence Technology, etc, which is as shown in table 2.

Table 2 main journals of target recognition and tracking research

NO.	Journal name	Quantity (article)	Proportion
1	Transactions of the Chinese Society of Agricultural Engineering	12	14.63%
2	Electronic Technology & Software Engineering	11	13.41%
3	Modern Defence Technology	7	8.54%
4	Laser Journal	6	7.32%
5	Ship electronic engineering	6	7.32%
6	Ship Science and Technology	6	7.32%
7	Fire Control & Command Control	6	7.32%
8	Transducer and Micro system Technologies	6	7.32%
9	Technology Innovation and Application	6	7.32%
10	Metallurgical Industry Automation	6	7.32%
11	Laser & Optoelectronics Progress	5	6.09%
12	Computer Simulation	5	6.09%
total		82	100%

3.2.2. Analysis of main research institutions and authors

From 2015 to 2020, there are 632 affiliations studying target recognition and tracking technology. According to table 3, the frequency of occurrence of the University of Chinese Academy of Sciences is 7 times, ranking the top of the list, followed by Air Force Early Warning Academy, air defense and antimissile College of Air Force Engineering University, and air defense early warning equipment department of air force early warning Academy, and so on.

Table 3 main author's affiliations of target recognition and tracking research

NO.	author's affiliations	frequency	Proportion
1	University of Chinese Academy of Sciences	7	16.26%
2	Air Force Early Warning Academy	4	9.30%
3	Air defense and antimissile College of Air Force Engineering University	4	9.30%
4	Air defense early warning equipment department of air force early warning Academy	4	9.30%
5	Xi'an Branch of China Academy of space technology	3	6.98%
6	Shanghai Astronomical Observatory, Chinese Academy of Sciences	3	6.98%
7	Graduate management team of air force early warning Academy	3	6.98%
8	Key Laboratory of space active optoelectronic technology, Shanghai Institute of Technical Physics, Chinese Academy of Sciences	3	6.98%

9	The 54th Research Institute of China Electronics Technology Group Corporation	3	6.98%
10	Airport Research Institute, CAAC	3	6.98%
11	Institute of Optics and Electronics, Chinese Academy of Sciences	3	6.98%
12	The 724 Research Institute of China Shipbuilding Industry Group Corporation	3	6.98%
total		43	100%

4. Analysis of research hotspots

4.1. Frequency analysis of high frequency keywords

Keyword frequency statistics is one of the main methods to determine the research hotspots, the attention degree of the research topic can be explained by the word frequency of key words. According to the statistics of keyword frequency, the highest frequency is "tracking", which appears 471 times. By using George Price's calculation formula, which is as follows

$$M = 0.749\sqrt{N_{\max}}$$

Where, M is the high frequency threshold, $N_{\max}$ is the number of the highest frequency.The frequency of tracking occurrence is 471, which is the highest frequency, followed by recognition and detection, as shown in table 4. In view of the small sample size of the literature, the frequency 7 is selected and 16 high frequency keywords are obtained.

Table 4 statistics of high frequency keywords

NO.	keywords	frequency	NO.	keywords	frequency
1	tracking	471	9	multi-target	10
2	recognition	23	10	target	10
3	detection	23	11	radar	9
4	capture	15	12	audit	8
5	solar energy	13	13	optical communication	7
6	location	13	14	image processing	7
7	particle filtering	12	15	evaluation	7
8	control	11	16	Kalman filtering	7

4.2. Similarity matrix and analysis of high frequency keywords

The keywords are extracted, the co-occurrence matrix is obtained when the frequency threshold is greater than 6 and less than 472.Imported into SPSS software, the similarity matrix is analyzed. The Pearson correlation of 16 high-frequency keywords related to target recognition and tracking is obtained. According to the rule of similarity matrix, the closer the distance between keywords, the stronger the similarity, and the closer the value to 1.It can be seen from table 5 that the order of key words distance tracking from near to far is detection, capture, solar energy, location, particle filtering, control, multi-target, audit, evaluation, Kalman filtering, image processing, radar, recognition, target, optical communication.

Table 5 similarity matrix and Pearson correlation (N =16)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1.tracking	1															
2.recognition	.576*	1														
3.detection	.697**	.470	1													
4.capture	.688**	.314	.402	1												
5.solar energy	.686**	.319	.405	.425	1											
6.location	.685**	.315	.401	.421	.425	1										
7.particle filtering	.683**	.315	.401	.421	.424	.424	1									
8.control	.683**	.319	.405	.425	.429	.425	.424	1								
9.multi-target	.678**	.404	.558*	.407	.411	.406	.406	.411	1							
10.target	.316	.695**	.256	.126	.133	.125	.125	.133	.157	1						
11.radar	.605*	.400	.610*	.340	.345	.339	.339	.345	.367	.410	1					
12.audit	.678**	.319	.405	.425	.429	.425	.424	.429	.411	.133	.345	1				
13.optical communication	.313	.090	.266	.310	.159	.153	.153	.159	.158	-.025	.122	.159	1			
14.image processing	.670**	.408	.484	.392	.397	.521*	.524*	.397	.397	.146	.336	.397	.132	1		
15.evaluation	.676**	.319	.405	.425	.429	.425	.424	.429	.411	.133	.345	.429	.159	.397	1	
16.Kalman filtering	.676**	.319	.405	.425	.429	.425	.424	.429	.411	.133	.345	.429	.159	.397	.429	1

*.It is significant at 0.05 levels (bilateral), **. At 0.01 level (bilateral).

4.3. Cluster analysis of high frequency keywords

In order to further study the hot areas of target recognition and tracking, through the cluster analysis of 16 high-frequency keywords by SPSS software, two hot research fields of image tracking are obtained. One is tracking, the other is detection, capture, solar energy, location, particle filtering, control, multi-target, audit, evaluation, Kalman filtering, image processing, radar, recognition, target and optical communication, as shown in Fig.1.

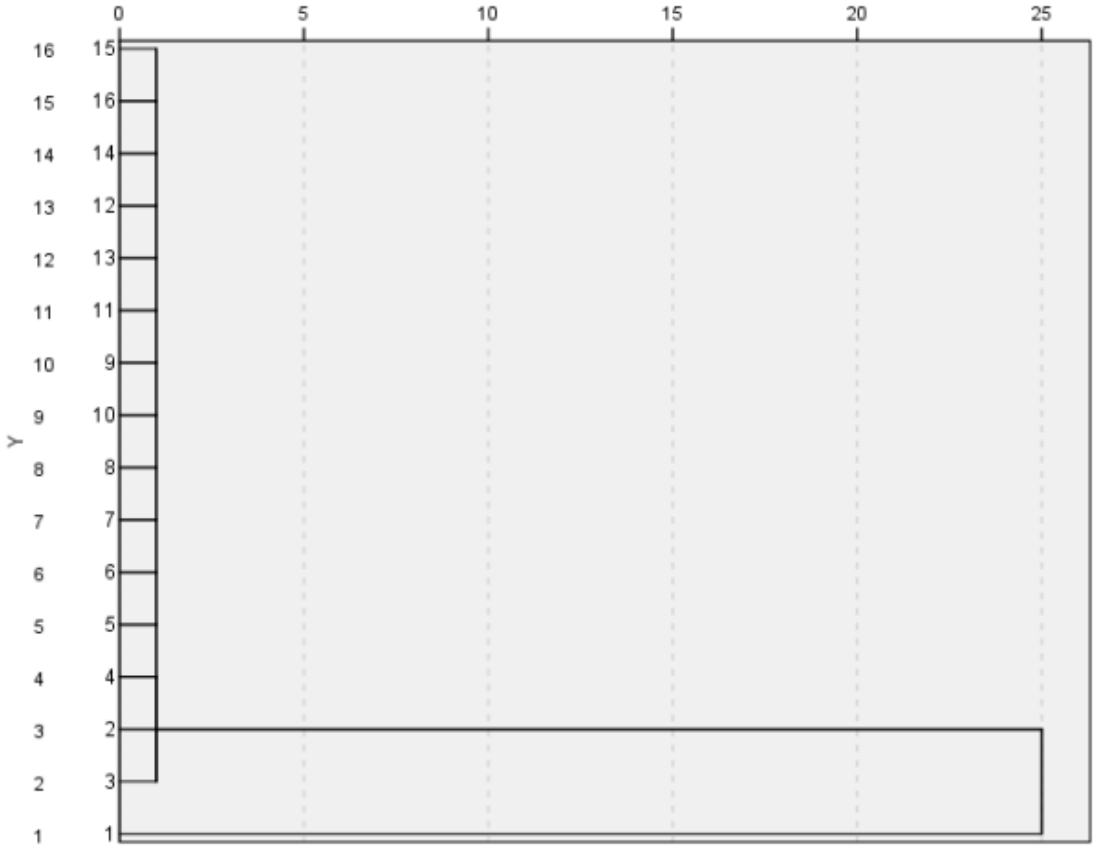

Fig. 1 the clustering tree of high frequency keywords

5. Conclusion

From 2015 to 2020, there are 489 research papers in the field of "recognition" and "tracking". The papers published in the Journal of agricultural engineering occupy the top of the list. Among the research institutions, the University of Chinese Academy of Sciences ranks first. The Pearson correlation analysis of high-frequency keyword similarity matrix and cluster analysis of high-frequency key words are carried out to grasp its development trend and provide reference for theoretical research.

Acknowledgements

The project was funded by Jiangxi Provincial Department of education (Grant No. GJJ191124). Project supported by Training program for college students in Jiangxi Province (Grant No. S202014437004, S202014437012) and by the research on teaching reform of Nanchang Normal University (Grant No.JGKT-19-12), and also by the research on science and technology of Nanchang Normal University (Grant No.18KJYB05).

Reference

[1] Li Jiang, Zhang Haitao, Liu Rangsu. Moving target lock tracking method in dynamic background. Computer Engineering and Applications, 2017, 53 (4) :214-222.

[2] Chen Guojun, Chen Wei, Yu Hanqi. Research on monocular vision target tracking method for underwater robot based on deep learning [J]. Machine Tool & Hydraulics, 2019, 47(23): 79-82.

[3] Yang Jinlong, Cheng Xiaoxue, Miao Jiani et al. Detection Optimized Multi-Bernoulli Algorithm for Visual Multi-Target Tracking[J].Journal of Frontiers of Computer Science and Technology, 2020, 14(10): 1762-1775.

[4] Jia Pengtao, Jia Wei. Recherche algorithm on coal mine multi-target trajectory tracking. Computer Engineering and Applications, 2018, 54(2):222-227.

[5] Xiu Chunbo, LI Xin, BA Fushan. Target tracking based on the fuzzy histogram model [J]. CAAI transactions on intelligent systems, 2019, 14(5): 939-946.

[6] Zhao Qi rui, Han Yaobin, Shen Hui, et al.Video Image Tracking of Ascending Segment Aircraft Targets[J].Journal of Nanjing University of Aeronautics Astronautics, 2019, 51(S):68-72.

[7] Wang Huiyan, Yang Yutao, Wang Jingqi, Wang Xun, Chen Weigang, Yan Guoli, and Hua Jing. Deep-learning-aided multi-pedestrian tracking algorithm [J]. Journal of Image and Graphics, 2017, 22(3):0349-0357.

[8] Shen Tongping, Yang Songtao, Chu Jiewang.Research of Hotspot of Image Retrieval Theory in China——Based on Co-words Analysis [J].Journal of Modern information, 2013, 33(11):100-107.

[9] Shen Tongping, Dong Yin, Yu Lei.Visual Analysis of Image Retrieval Research Progress in China Based on Mapping Knowledge Domain[J].Journal of Tonghua Normal University (NATURAL SCIENCE) , 2019, 40(287):134-141.