Table 10. Positioning result

Test point / fingerprint	p1 (m)	p2 (m)	p3 (m)	p4 (m)
1	15.08556			
2	5.967408			
3	23.45828			
4	20.68605			
5				
6		18.63661		
7		7.592886		
8		17.81228	18.49962	
9			11.13334	18.23737
10			17.89401	15.8654
11			20.5516	17.47013
12				
13				

5.4 Results analysis

The positioning result of the traditional fingerprint positioning algorithm is displayed in Table 11 and compared with that of the proposed method in Table 12.

Table 11. Result of the traditional fingerprint positioning algorithm

Result / Test point	Pre-tartget	Result
1	Finger print 2	Finger print 2
2	Finger print 7	Finger print 7
3	Finger print 9	Finger print 9
4	Finger print 10	Finger print 10

Table 12. Comparison between the results of the traditional and proposed algorithms

Method	Length of each fingerprint segment	Mount of fingerprint segment	Time mount of matching
Traditional	6	13	6*13*13
This paper	3	3	3*3*13

The results in the above tables demonstrate that the proposed algorithm achieved the same result as the traditional algorithm but saved 88% of matching time. Thus, the proposed algorithm is an efficient and accuracy way of fingerprint positioning.

6. CONCLUSIONS

This paper proposes a fingerprint positioning algorithm with piecewise filtering factor and pedestrian scene features as the optimization parameters. The proposed algorithm was validated through a case study on an office scene, revealing that it could reduce the matching time by 88%. Suffice it to say that the proposed algorithm is an efficient and accuracy way of fingerprint positioning. In future research, the space-scene will be further categorized to yield more accurate positioning constraints, and the proposed method will be applied to more positioning cases.

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REFERENCES

[1] Chen L. (2014). Key technologies research on fingerprinting positioning based on WLAN. Huadong Normal University.

[2] Hang G. (2014). Fingerprint database optimization algorithm based on zigbee indoor positioning system. Computer Engineering, 40(2): 193-198.

[3] Xu Y, Shi Y, Zheng X, Long Y. (2016). An Indoor space partition method and its fingerprint positioning optimization considering pedestrian accessibility. ISPRS Archive, XLI-B4 347-350. https://doi.org/10.5194/isprs-archives-XLI-B4-347-2016

[4] Zhou Y, Cao H, Li JX. (2007). A shortest route-planning algorithm within a restrcited area. Microelectroinics and Computer 24(8): 110-112.

[5] Xie DJ, Kong FZ, Hu HY. (2014). Research on robustness of location fingerprint under terminal heterogeneity. Computer Engineering 40(5): 81-85.

[6] Lin FX, Zhu MH. (2015). Adaptive piecewise curve fitting indoor localization algorithm based on RSSI. Transducer and Microsystem Technologies 34(10): 151-153.

[7] Shi Y, Long Y, Xu Z. (2017) Indoor RSSI trilateral algorithm considering piecewise and space-scene. IEEE International Conference on Smart Cloud 278-282.

[8] Shi Y. (2016). Indoor positioning algorithm considering space-scene. Nanjing Normal University 12.