On the improvement of positioning accuracy in WiFi-based wireless network using correntropy-based kernel learning algorithms

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Currently, we have witnessed the rapid development of data-driven machine learning methods, which have achieved very effective results in communication systems. Kernel learning is a typical nonlinear learning method in the machine learning community. This article proposes two novel correntropy-based kernel learning algorithms to improve the accuracy of indoor positioning in WiFi-based wireless networks. In general, correntropy as a measure of local similarity defined in kernel space can be used for robust signal processing to address large outliers. Then, through the combination of the maximum mixture correntropy criterion (MMCC) and online vector quantization (VQ), we develop a learning algorithm, named quantized kernel MMCC (QKMMCC) method, which works with the advantage of correntropy while effectively suppressing the growth of memory structure and reducing the computation in this algorithm using VQ. Furthermore, to fully use redundant information and to further improve the learning accuracy, an intensified QKMMCC, called QKMMCC_BG, is also proposed on the basis of the bilateral gradient (BG) technique. Simulation results show that, compared with some similar approaches, our algorithms can achieve better computational performance. In addition, our proposed algorithms are also applied to indoor positioning of WiFi-based wireless networks. The experimental results show that our kernel learning algorithms can effectively improve the positioning accuracy. The average positioning errors of our two algorithms in the experiment are 0.86 m and 0.76 m, respectively. The effectiveness of our algorithms is further verified.