

A New Spectrum Sensing Technique with Double Threshold

António Brito^{(1), (2)}, Pedro Sebastião^{(1), (2)},
Fernando J. Velez^{(1), (3)} and Jon Peha⁽⁴⁾

(1) Instituto de Telecomunicações
(2) ISCTE- Instituto Universitário de Lisboa
(3) Universidade da Beira Interior
(4) Carnegie Mellon University

CIÊNCIA
2023

Introduction

This work addresses Waveform-based Detection (WBD) and Adaptive Double Threshold Waveform-based Detection (ADTWBD). The ADTWBD uses double threshold and two factors (noise uncertainty and check parameter), while the existing WBD only uses single threshold.

Methods

Simulations and theoretical curves were produced in MATLAB for WBD and ADTWBD. The probability of miss-detection (P_{md}) was determined as function of P_{fa} with the SNR and N as parameters.

Results

P_{fa} - probability of false alarm; N - number of samples; SNR- signal-to-noise ratio

Although three types of analysis were performed in Figure 1 and 2 simply present examples for the first type of analysis, i.e., P_{md} as function of the P_{fa} with N and SNR as parameters.

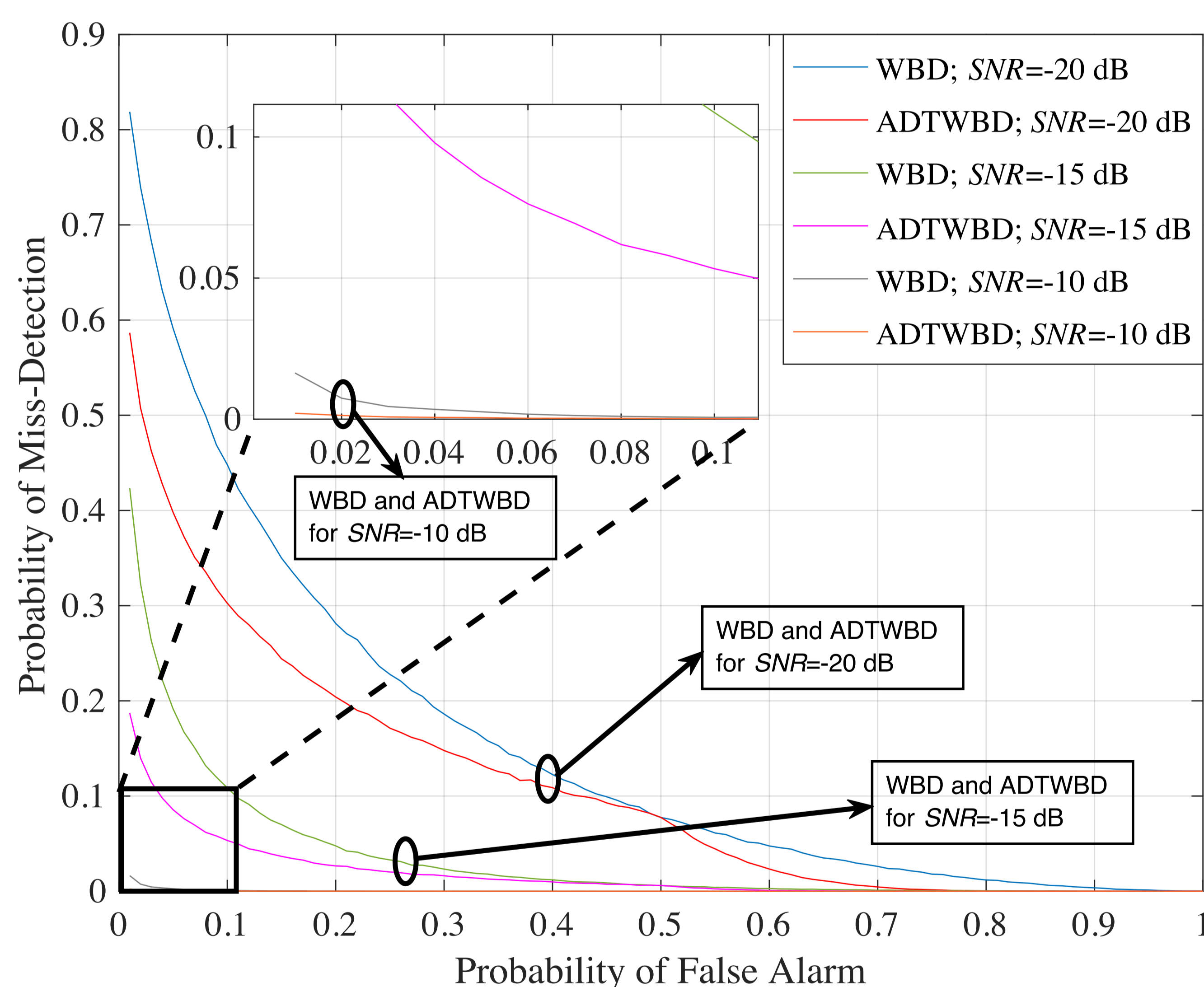


Figure 1: Probability of miss-detection (P_{md}) as a function of the P_{fa} for $N=200$

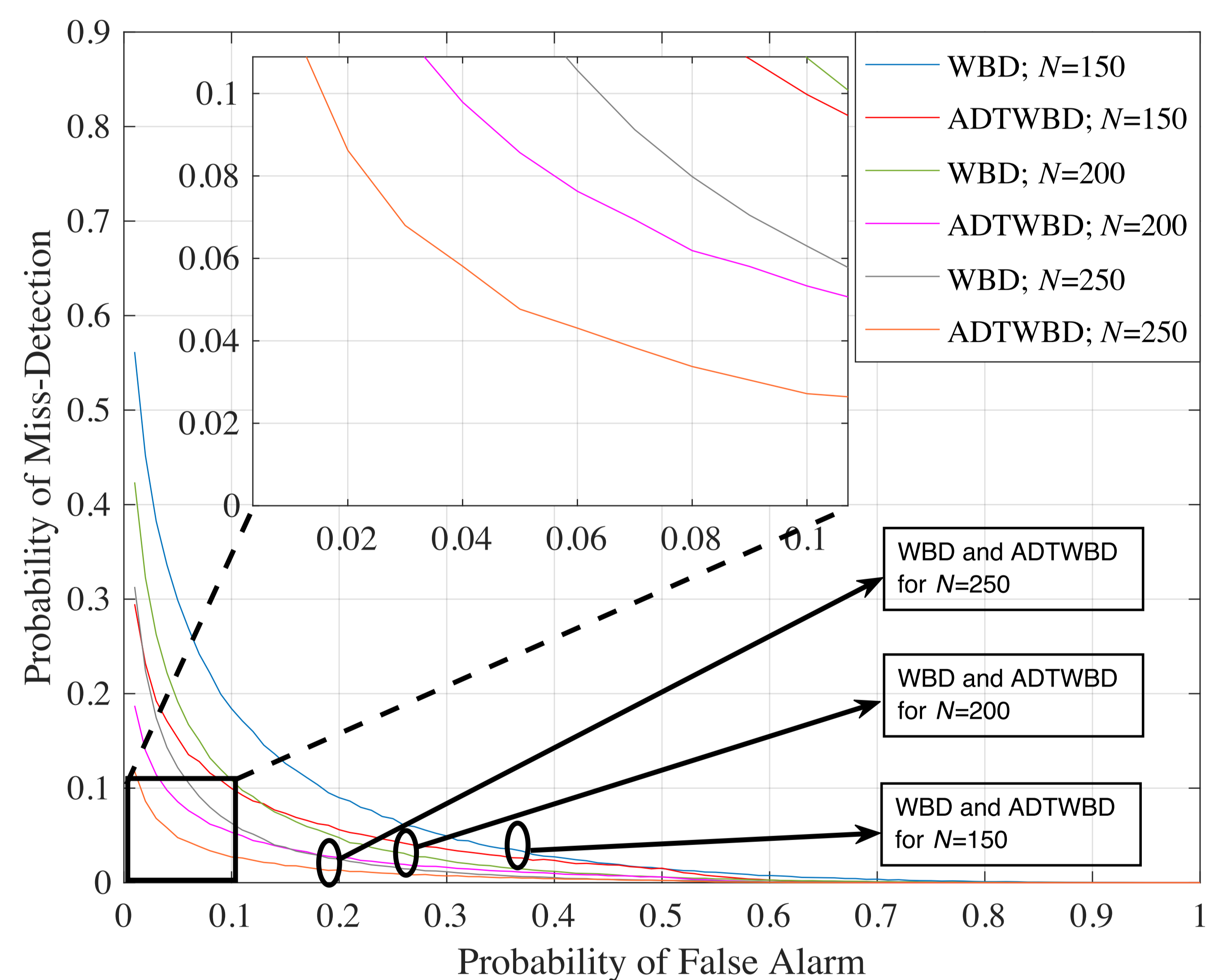


Figure 2: Probability of miss-detection (P_{md}) as a function of the P_{fa} for SNR=-15 dB

Conclusions

The proposed ADTWBD technique outperforms WBD in terms of the ability to detect the presence of a primary user in licensed spectrum; for low P_{fa} , low N and low SNR..

Acknowledgements

This work is co-financed by Fundação para a Ciência e a Tecnologia through the CMU Portugal Program under the fellowship PRT/BD/154257/2022 and CONQUEST UIBD/50008/2020.