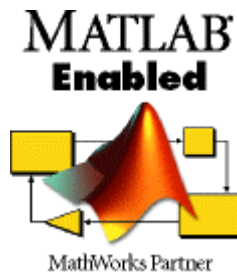


Tutorial
on
WLAN Toolbox for MATLAB
(mWLAN)

for
IEEE Std. 802.11a/b/g



CommAccess Technologies, Inc.
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1. Introduction

This toolbox is developed for the MATLAB users who are tasked to design high-speed wireless local area network (WLAN) physical (PHY) layer systems. This product is an approved third-party WLAN Toolbox for MATLAB. It contains building-block type modules that are necessary to build the IEEE Std. 802.11a, 802.11b, and 802.11g waveform/links. Figure 1 illustrates a typical block diagram for such digital communication link. This toolbox covers most of the boxes in the diagram.

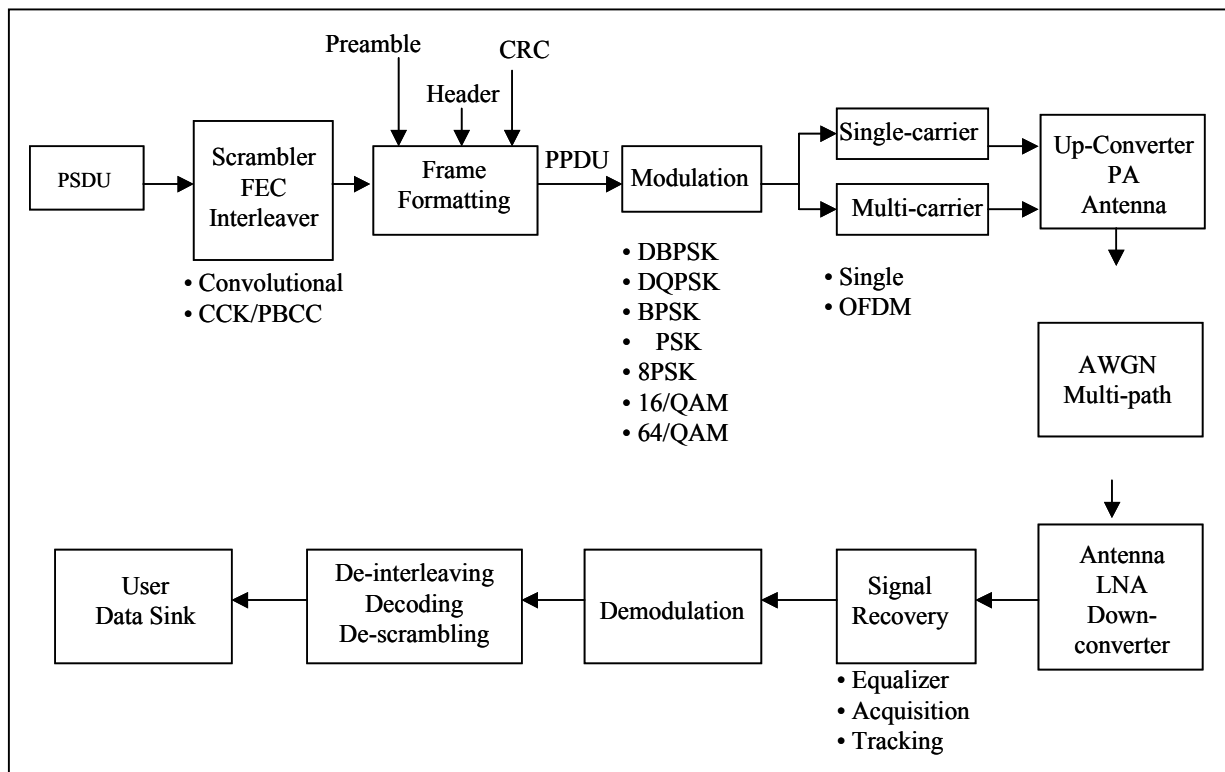


Figure 1. Typical Digital Communication Link for IEEE 802.11a/b/g

As a result, the building-block modules in the toolbox enable the users to prototype customized communication links for their own design purpose. For example, the users can start with the link examples (templates) provided in the toolbox and then access and affect every aspect of the link designs, such as waveform integrity analysis, signal detection, acquisition, and tracking, etc. The user can add noise and multipath interferences (also provided in the toolbox) to the desired waveform and conduct their own noise/multipath mitigation designs.

2. Features

The representative features supported in the toolbox include:

- PLCP generation (PPDU frame formatting, PLCL preamble, PLCP header, etc.) for 802.11a/b/g
- DBPSK/DQPSK/QPSK/8PSK + CCK_5.5/11 + PBCC_5.5/11/22/33 (802.11b/g)
- OFDM + BPSK/QPSK/16QAM/64QAM (802.11a/g)
- FEC (including puncturing and TCM) and Viterbi decoding
- Multipath generation (the selection of IEEE model or 3-ray user-defined model)
- ALL bit functions such as scrambling, interleaving, CRC check, etc.
- Examples for generating the waveform with the “clock” change during a frame

3. Module List

Modules	Remarks
General	
BitGen	Generate a bit stream with the selected bit pattern. The patterns for selection include random, pseudo random, fixed pattern, etc
SRRC	Squared root raise cosine pulse shaping
AddMTpath	Add multi-path rays to the signal
LMS	Least mean square (LMS) equalizer
RLS	Recursive least square (RLS) equalizer
VitrB_ini	Initialization
Vitrb	Viterbi decoding using the generator polynomials g1=133, g2=171 (11a) g1=133, g2=175 (11b)
Eye_d2	Utility drawing eye diagrams
CArel	Utility re-sampling waveforms
IEEE Std. 802.11a	
Scrambler_11a	Scramble a frame of 11a data
FEC_11a_encode	FEC including convolutional encoding and puncturing
IntLv_11a	Interleaving a frame of for 11a data
Mod_11a	Modulation function for 11a waveform, such as phasor (i.e., complex symbol) assignment
Form_11a_OFDMsymbol	IFFT and pilot tone insertion
Preamble_11a_S	Output the short preamble for 11a
Preamble_11a_L	Output the long preamble for 11a
PLCP_11a	Create PLCP I/Q sequence for 11a
Demod_11a	Demodulate each subcarrier and generate the signal quality for Viterbi decoding
Demod_post_11a	A routine to handle all post demodulation procedures, such as deinterleaving, decoding, and descrampling, etc.

DeintLv_11a	Re-align the coded signal positions (i.e., de-interleave) for decoding
Qz_11a	Quantize the received signal and assign the signal quality metric
Descrambler_11a	Reverse the bit position from the scrambler
Example_11a	Example for the basic link setup
IEEE Std. 802.11b	
CRCen_11b	CRC generation
Scrambler_11b	Scrambler for 11b configuration
PLCP_11b	Create PLCP I/Q sequence for 11b
Mod_11b	DBPSK/DQPSK/CCK5.5/CCK11
CCK_mod	CCK5.5/CCK11 modulation
CCK_demod	CCK5.5/CCK11 demodulation (non-coherent)
CCK_demod_c1	CCK5.5/CCK11 demodulation (coherent)
PBCCmod	PBCC modulations for all rates (5.5, 11, 22, 33 Mbps)
PBCCdemod	PBCC demodulations for all rates (5.5, 11, 22, 33 Mbps)
Demod_11b	DBPSK/DQPSK/CCK5.5_11/PBCC5.5_11_22_33
Descrambler_11b	Reverse the scrambled data sequence
CRCck_11b	Check CRC
Example_11b	Example for the basic link setup
IEEE Std. 802.11g	
Mod_11bg	Modulation module calling all necessary functions in the toolbox for 11a,11b, and 11g
PLCP_11g	Create PLCP I/Q sequence for 11g
Demod_11bg	Demodulation module calling all necessary functions in the toolbox for 11a,11b, and 11g
VitrB22_ini	Initialization
VitrB22	Viterbi module for both 22 and 33 Mbps modes
Wave11g33	Module generating the waveform for 33 Mbps mode. Note that the clock rate changes within a frame.
Example_11g	Example for the basic link setup

4. Contact Us

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