SURF HMP Echo canceller extension

Document version: 1.1
Date: November 2016

SURF Communication Solutions, Ltd.

7 Hamada St., Yoqneam Industrial Park

YOQNEAM – 20667, Israel

Tel: +972 (0)73 714-0700

Fax: +972 (0)4 959-4055

Web site	www.surfsolutions.com,
Email	info@surfsolutions.com

Table of Contents

1. Introduction

1.1 Abstract

This document describes the SURF HMP Echo canceller extension including APIs, configuration and testing procedures

1.2 General

The Echo canceller functionality is implemented as part of new tool type "voice_tdm_ip" which supports also TDM interface.

2. New API

2.1 voice_tdm_ip tool

Voice TDM IP (voice_tdm_ip) implements full duplex TDM⇔IP functionality. It functions similar to voice_fe_ip, but instead of backend tool, it connects to a driver towards TDM interface. In addition voice_tdm_ip adds 'line-echo cancellation' functionality on the TDM side.

The configuration of the voice_tdm_ip tool is based on same configuration as the voice_fe_ip tool (as specified in the Surf-HMP_API document), with addition of parameter set (listed below)

The events and statuses of the voice_tdm_ip tool are same as the voice_fe_ip tool (as specified in the Surf-HMP_API document)

2.1.1 Tool configuration

NOTEs:

- To work with TDM interface, the "block_size" parameter in the configuration file (config.json) must be set to 10
- The below parameters are the additional set of parameters

Parameters:

- **TDM** – *object,* represents TDM interface configuration, contains the following fields:
  - **timeslot** – *integer,* TDM timeslot number to be used by this tool.
    Valid values: 0 – 2015
    Default value: N/A
  - **coding** – *string,* coding type of the specific TDM timeslot.
    Valid values: "alaw","ulaw"
    Default value: "ulaw"
- **EC** – *object,* represents line-echo canceller configuration, contains the following fields:
  - **enabled** – *boolean,* enables/disables the line-echo cancellation module.
    Valid values: true, false
    Default value: true
  - **algorithm** – *string,* specifies algorithm type to be used in the echo canceller.
    Valid values: "subband","fullband","fastsubband"
    Default value: " subband"
  - **adaptation** – *string,* specifies adaptation type to be used in the echo canceller.
    Valid values: "none","full","lite"
    Default value: "full"
  - **CNG** – *string,* specifies comfort noise generation type to be used in the echo canceller.
    Valid values: "none","general","sbf"
    Default value: "general"

- **NLP** – *string,* specifies NLP type to be used in the echo canceller.
  Valid values: "none","general","sbf","howling_suppress"
  Default value: "general"
- **tone_disabler** – *boolean,* enables/disables the tone disabler feature of the echo cancellation module.
  Valid values: true, false
  Default value: true
- **anti_howling** – *boolean,* enables/disables the anti-howling feature of the echo cancellation module.
  Valid values: true, false
  Default value: false
- **ap** – *integer,* order of the affine projection to be used. 1 and 4 are the recommended values.
  Valid values: 0 – 255
  Default value: 1
- **noise_reduction_level** – *integer,* specifies the noise reduction level. 0 is the lowest level (no noise reduction) and 4 is the highest noise reduction level. 5 is automatic noise reduction.
  Valid values: 0 – 5
  Default value: 0
- **NR_smooth** – *string,* specifies the Noise Reduction smoothing mode.
  Valid values: "none","static","dynamic"
  Default value: "none"
- **dc_flag** – *boolean,* enables/disables Direct Current(DC) offset compensation.
  Valid values: true, false
  Default value: false
- **echo_tail_ms** – *integer,* specifies maximum echo tail supported in milliseconds.
  Valid values: 0 – 200
  Default value: 64
- **delay_ms** – *integer,* if greater than 0, causes Rin input of the echo canceller to be delayed by the specified number of milliseconds. Is used to optimize performance by adding Rin delay and allowing reducing the echo_tail value.
  Valid values: 0 – 100
  Default value: 0

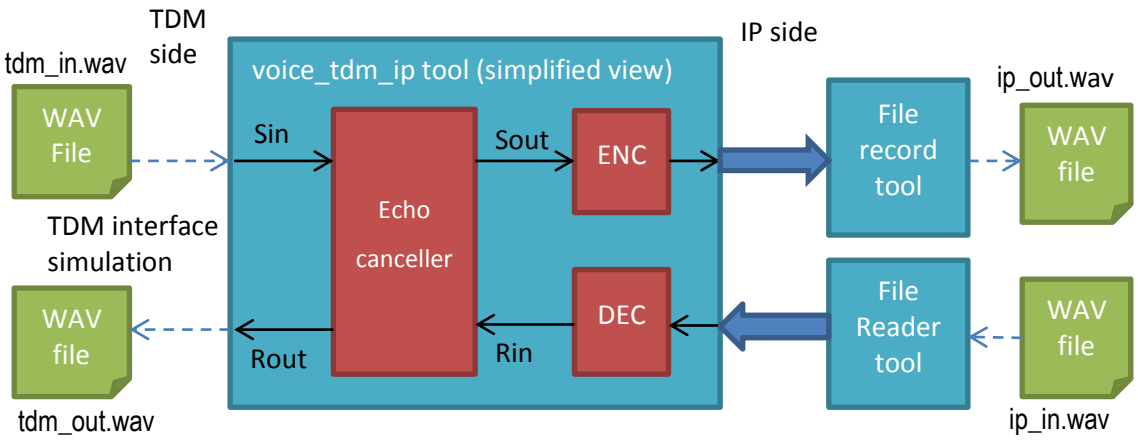
3. Testing procedures

3.1 HMP Configuration

To work with TDM interface, the "block_size" parameter in the configuration file (config.json) must be set to 10

3.2 Tool configuration

To test the Line Echo Canceller module the following setup will be used:



This setup composed of 3 tools:

- File Reader tool that reads the reference file and passes it to the voice_tdm_ip tool in order to simulate IP side input.
- voice_tdm_ip tool that do the actual work and performs echo cancellation (in addition to other tasks of a voice tool like encoding, decoding, EVG, EVD, AGC, etc.)
- File Record tool that receives input from the voice_tdm_ip tool and records it to a file. This tool simulates IP output direction. The file saved by this tool can be used to validate the testing results.

3.2.1 Voice tool configuration

voice_tdm_ip tool is configured to work with TDM interface (simulation), means that it can receive TDM samples from file and it can save output TDM samples to a file.

The synchronization between 2 files (ip_in.wav and tdm_in.wav) is handled internally inside the voice_tdm_ip tool so that the contents of both files enter the echo canceller at the same time (unless read_delay_ms or delay_ms parameters were set no non-zero value).

3.2.2 Input and output files for test scenario

- ip_in.wav file contains input speech from the IP direction (for example "A B C")
- ip_out.wav in case of success echo cancelation will contain clean speech from the TDM direction (in case of using loopback TDM driver it means almost silence)

3.3 Running the test

The script ec_test.py performs this test – it is part of the Surf-HMP package

The files ip_in.wav and tdm_in.wav are also part of the package

Follow the same steps as with other scripts to run this test.

Test duration equals to input files duration. After the file playing finished, the test can be stopped and the result can be validated

Note: before running the test the previous (if exists) ip_out.wav should be deleted, otherwise File Record tool will not overwrite it and return an error on file creation.

3.4 Validating testing results

Open ip_out.wav file and check that the echo was cleaned.