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등록 하기 matlabexpo.co.kr
Audio System Toolbox를 이용한 오디오 신호처리 기초

박노윤 대리 (Training Engineer)
MATLAB for Real-Time Audio – key use cases

For research and product development:
- Desktop prototyping
- Custom measurements

For project-based learning:
- Audio for teaching DSP
Prototyping for product development

MATLAB algorithm → Early validation (listening tests) → Advanced prototyping or production

Prototyping for product development

MATLAB

algorithm

Early validation (listening tests)

Advanced prototyping or production
Prototyping for product development

MATLAB algorithm ➔ Early validation (listening tests) ➔ Advanced prototyping or production

Why?

- From *algorithm developers* to *other stakeholders*
- Human in the loop – “How does it sound?”
- Interactive tuning – “What if we changed that?”
Prototyping for product development

MATLAB algorithm → Early validation (listening tests) → Advanced prototyping or production

Existing challenges

- Owned by “algorithm” or “DSP” engineer
- C/C++ hard and time-consuming
- External libraries into MATLAB don’t work well
- Plugin API is challenging to learn
- Code not re-used for production – Wasteful
Audio System Toolbox

Design and test audio processing systems

- Libraries of audio processing algorithms and examples
- Low-latency audio streaming from and to standard audio interfaces (e.g. ASIO, CoreAudio, ALSA)
- Live-tuning of MATLAB and Simulink via UI and MIDI controls
- VST plugin generation to run on Digital Audio Workstations
Time for a bit of MATLAB …

- How does it work?
- How hard is it to achieve?
- …
Agenda

- Prototype with real-time audio streaming and live-tuning in MATLAB
- Run custom algorithm on DAWs with VST plugin generation
Audio System Toolbox
Product ecosystem

- Requires
  - MATLAB
  - Signal Processing Toolbox
  - DSP System Toolbox

- Supports
  - MATLAB
  - Simulink
  - C/C++ Code Generation
Plugin generation and source code generation

MATLAB code

- PC Application
- Custom Plugin
- Custom prototyping infrastructure
- Speedgoat audio real-time target
- Embedded prototype
- ...

C/C++

Audio System Toolbox

VST plugin

MATLAB Coder
Simulink Coder
Simulink Real Time

Design & Validation
Prototyping & code export
Summary – Real-Time Audio in MATLAB

- **Desktop prototyping and listening tests**
  - **Pain:** Traditional prototyping is costly and time-consuming
  - **Solution:** Audio streaming in MATLAB and VST plugin generation

- **Custom real-time measurements**
  - **Pain:** Audio test & measurement equipment can be expensive and inflexible
  - **Solution:** Audio acquisition and unlimited custom analysis

- **Real-time audio for teaching DSP**
  - **Pain:** C/C++ and hardware kits take away time from putting signal processing into practice
  - **Solution:** Real-time audio without C/C++ or embedded kits