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Native Instruments



NATIVE INSTRUMENTS^{NI}



iZOTOPE



Plugin Alliance



BRAINWORX



You can do it!



You can do it!







Ceci n'est pas une pipe.

Topics

- Inspiration from eXtreme Programming
- Build, Measure, Learn
- What is a Prototype?
- What is an MVP?
- Real examples

What we won't cover

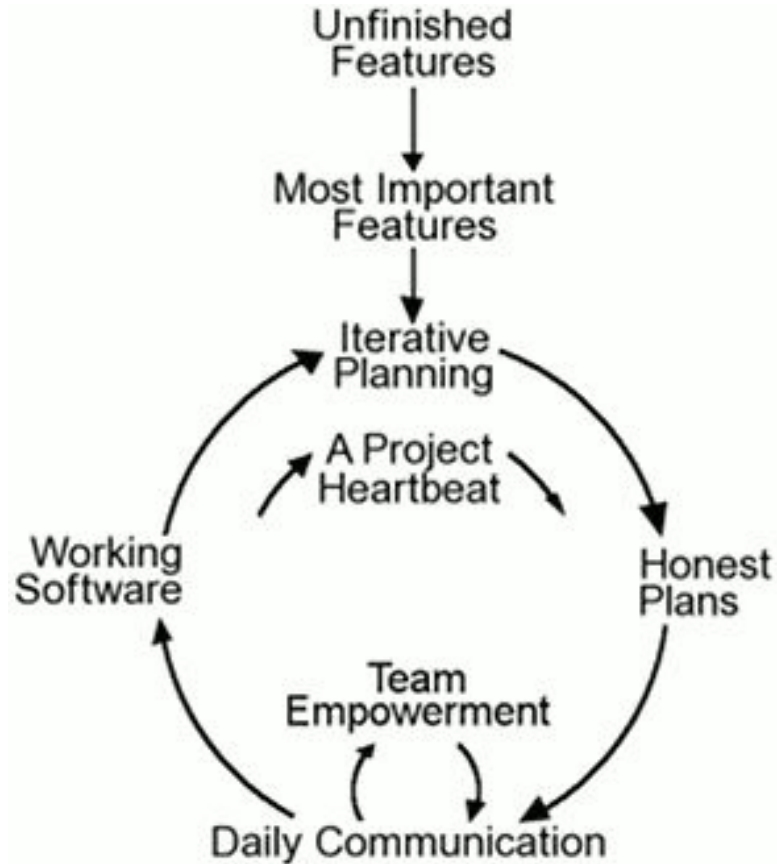
Listening Tests

- WebMushra
- <https://github.com/audiolabs/webMUSHRA>
- Andy Sarroff and Roth Michaels, "Blind Arbitrary Reverb Matching," submitted to the Proceedings of the 23rd International Conference on Digital Audio Effects (DAFx-20).

"Beta" forums

- Feature alpha testing
- Beta testing sound quality and bug reports

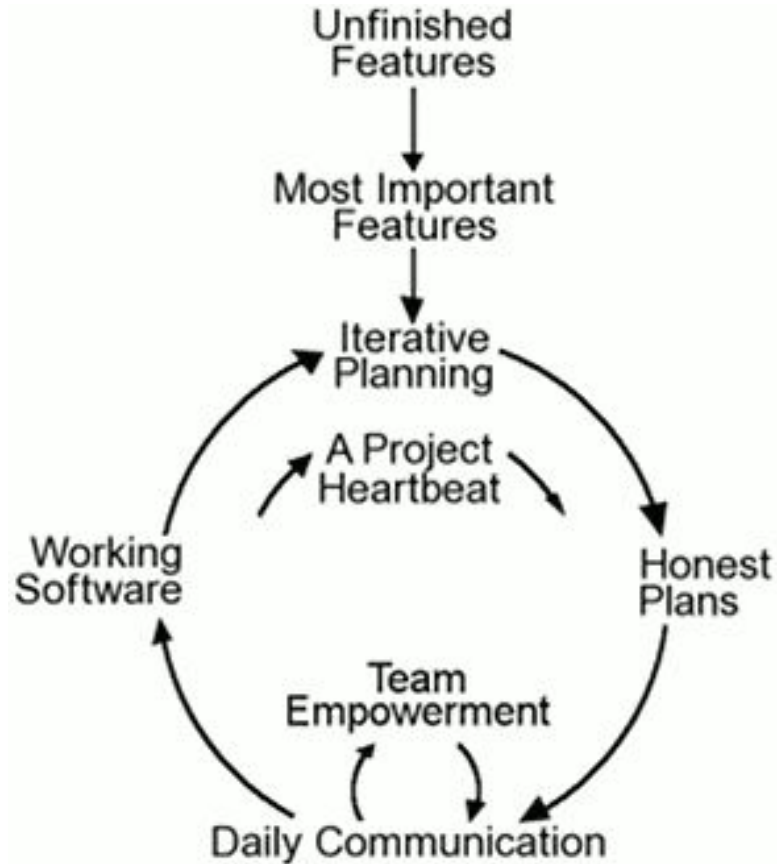
<http://www.extremeprogramming.org/>



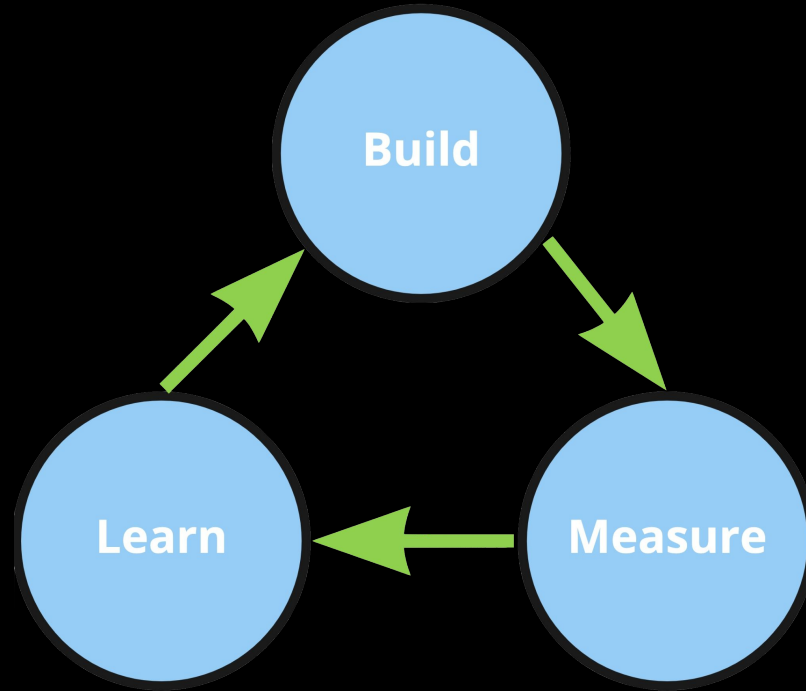
Agile Manifesto

- Individuals and interactions over processes and tools
- **Working software** over comprehensive documentation
- Customer collaboration over contract negotiation
- Responding to change over following a plan

<http://www.extremeprogramming.org/>



Learning while building



Prototyping...

...what are you trying to learn?

Prototype

Idea brought to form

Minimal Viable Product (MVP)

"The smallest version of a "product" that can be delivered with minimal effort to collect the maximum amount of learning about customers or market." - Eric Reese

Minimal Viable Product (MVP)

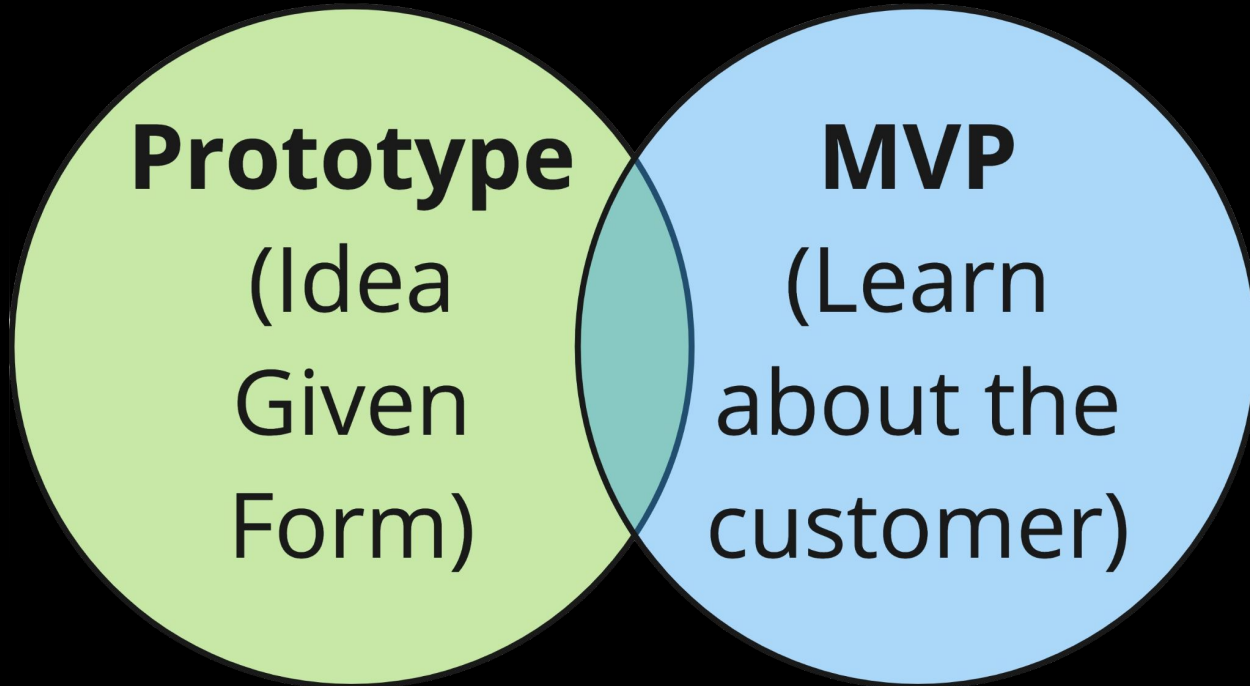
Robinson. (2001). *SyncDev Methodology*.

<https://web.archive.org/web/20160525101214/http://www.syncdev.com:80/minimum-viable-product/>

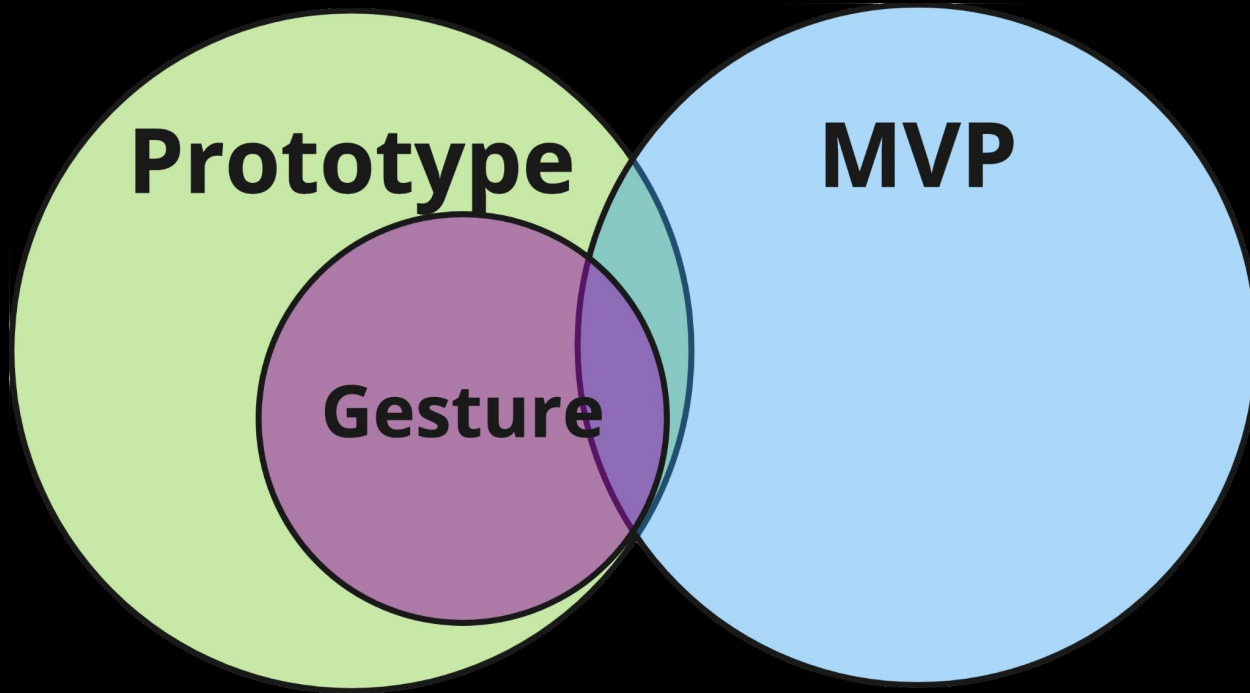
Reis. (2011). *The Lean Startup*.

ISBN: 0307887898

Learning while building



Learning while building



Prototyping...

...examples outside of software.

Prototyping in Formula 1



"3D Printer Ultimaker" by Gastev is licensed under CC BY 2.0. To view a copy of this license, visit <https://creativecommons.org/licenses/by/2.0/?ref=opensearch>.



"formula 1 (titl shift)" by oseillo is licensed under CC BY 2.0. To view a copy of this license, visit <https://creativecommons.org/licenses/by/2.0/?ref=opensearch>.

Prototyping in Pinball



"A first live prototype (whitewood) of the AC/DC pinball" by Marcin Wichary is licensed under CC BY 2.0. To view a copy of this license, visit <https://creativecommons.org/licenses/by/2.0/?ref=opensearch>.



"Spooky Pinball is a thriving business giving a throwback game a 21st-century makeover". Milwaukee Journal Sentinel. March 13, 2023.

Prototyping hardware instruments



What is an MVP?

...should I build the Re-Bird plug-in?

Minimum Viable Product



Minimum Viable Product

The screenshot displays the Ozone Advanced software interface. At the top left, the 'Ozone ADVANCED' logo is visible. The main window features a 'Master Rebalance' module with a music note icon and a '+' sign. Below this is a large image of two pink flamingos. To the right of the image is a spectrum analyzer with two frequency sliders. The bottom section contains a 'Focus' control with a 'Gain' slider set to -70.0 dB, and three focus options: 'Vocals', 'Bass', and 'Drums'. On the far right, there are several control buttons: 'Bypass', 'Gain Match', 'Reference', 'Codec', and 'Dither'. The top right corner includes a 'Presets' menu and various utility icons.

Ozone ADVANCED

Ozone

Master Rebalance

I/O

Peak -0.5 -0.5 -6.5 -8.9

RMS -8.5 -8.3 -20.2-19.9

0 -3 -6 -10 -15 -20 -30 -40 -50 -Inf

0.0 0.0 0.0 0.0

Bypass Gain Match

Reference

Codec Dither

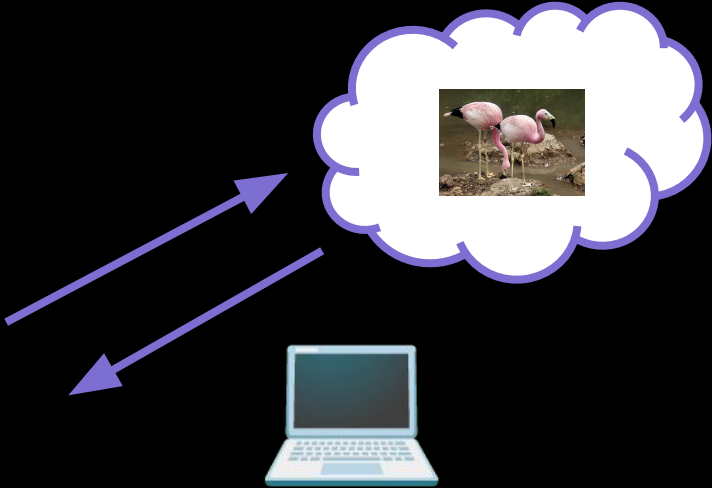
Focus Gain

Vocals Bass Drums -70.0 dB

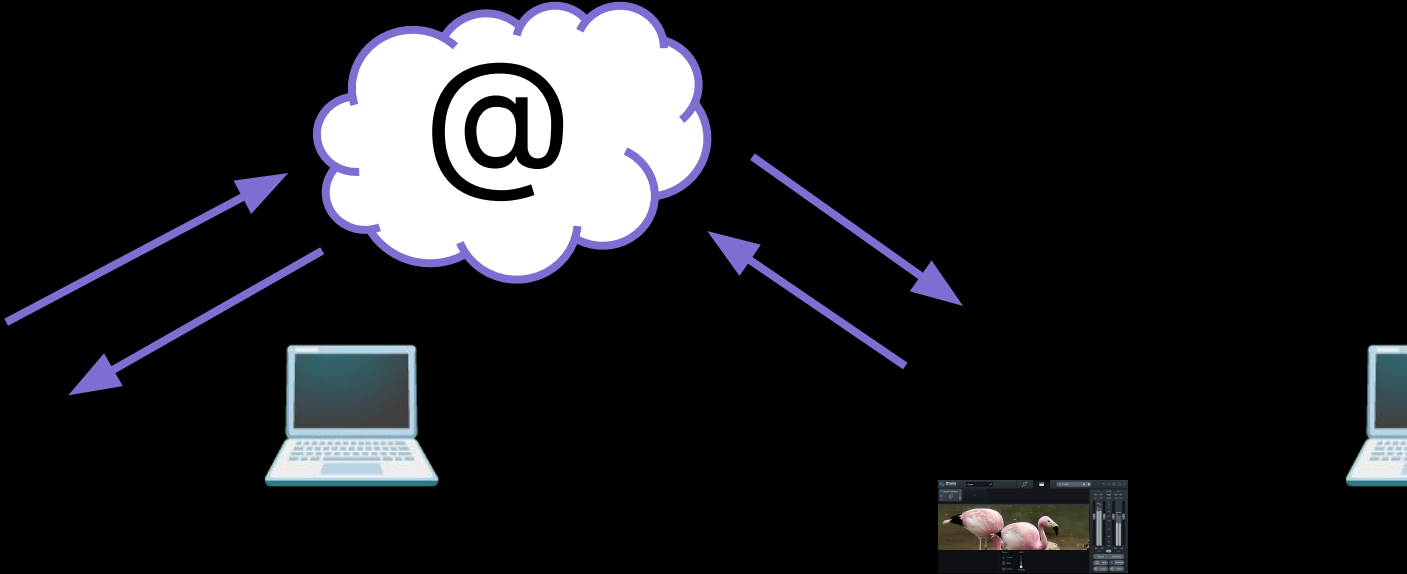
Landing page MVP



Concierge MVP



Concierge MVP



Real MVP example...

...the soundfile MVP.

Soundfile MVP

The image shows the Neoverb reverb plugin interface. At the top, the name "Neoverb" is displayed next to a logo. Below it, there are tabs for "Decay Dry Voca...", "Reverb Assistant", and "Presets". The main interface is divided into several sections:

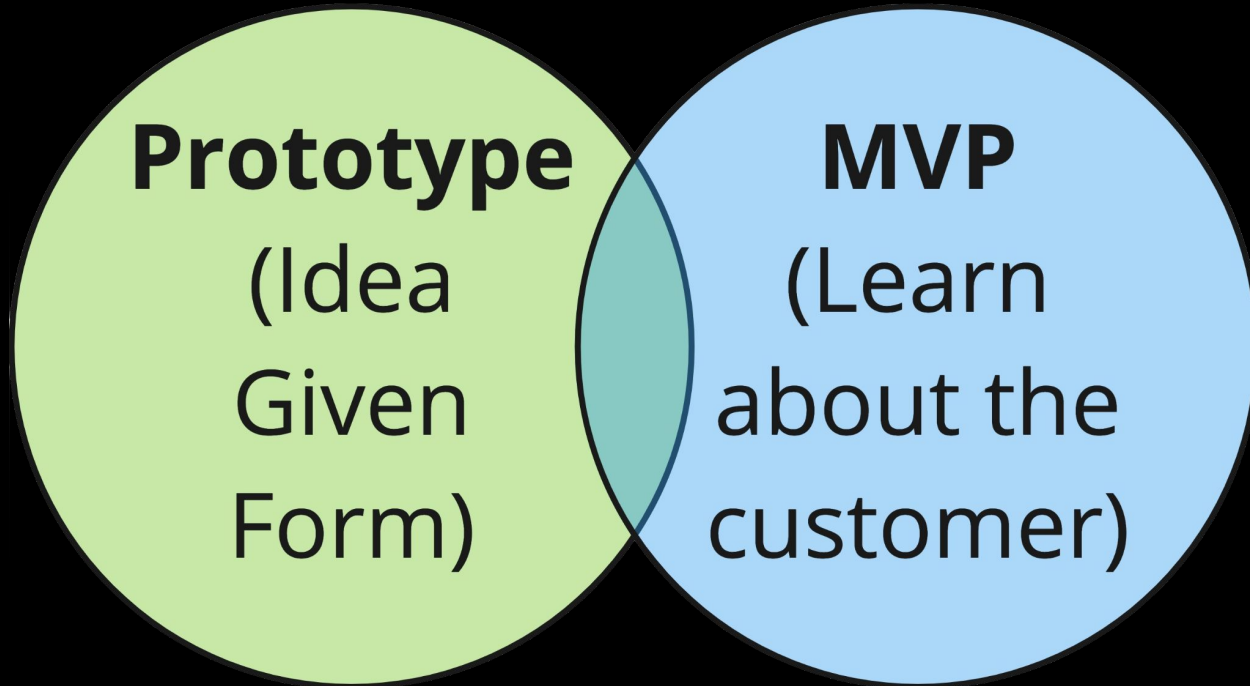
- Left Panel:** Contains three reverb types: "Reflections" (Space) with a value of 63, "Plate" (Space) with a value of 3.20, and "Hall" (Space) with a value of 5.00. Each has a circular knob and a play/pause button.
- Center:** A large, colorful triangular reverb field with a central knob. It has three dB indicators: -6.2 dB at the top, -0.2 dB at the bottom left, and -17.1 dB at the bottom right.
- Right Panel:** Includes a "Mod" section with a grid, "Rate" (1.80 Hz), "Depth" (43%), "Pre-Delay" (20), "Smooth" (100), "Dry/Wet" (vertical slider), and "Level" (vertical slider).
- Bottom Panel:** Features a "Masking" section with a "Select plug-in" dropdown, and two EQ sections: "Pre EQ" and "Reverb EQ". The "Reverb EQ" is currently active, showing a frequency response graph with a gain of 0.0 dB and a Q of 0.7. The graph has frequency markers at 100, 300, 1k, 3k, and 10k Hz, and gain markers at 12 and -6 dB.

Soundfile MVP



User testing

Learning while building



User Testing: Concept Videos



User Testing: Marketing Mockups

MIX IN THE MOMENT

Mix smarter and faster with iZotope's Neutron 4, your complete suite for crafting a professional mix. Sculpt sounds seamlessly while staying in your flow.

[Buy Now](#)

[Sign in](#) to see all discount and upgrade offers.



What's New
in Neutron 4

[See what's new in Neutron 4](#)

Meet your new mixing suite

Neutron 4 comes with 8 plug-ins including a mothership and 7 component modules. Use the component plug-ins individually or combine them in the mothership to sculpt your sound. Plus, you'll get Visual Mixer, Relay and Tonal Balance Control 2 plug-ins to assist your mixing process.



New! Unmask Module



Exciter Module (New! Trash Mode)



Compressor Module (New! Punch Mode)



Gate Module



Improved: Sculptor Module



Transient Shaper Module



Equalizer Module



Visual Mixer Plug-in



Plus! Relay and Tonal Balance Control 2 Plug-ins

User Testing: UX Mockups



User Testing: A new focus



User Testing: A new focus



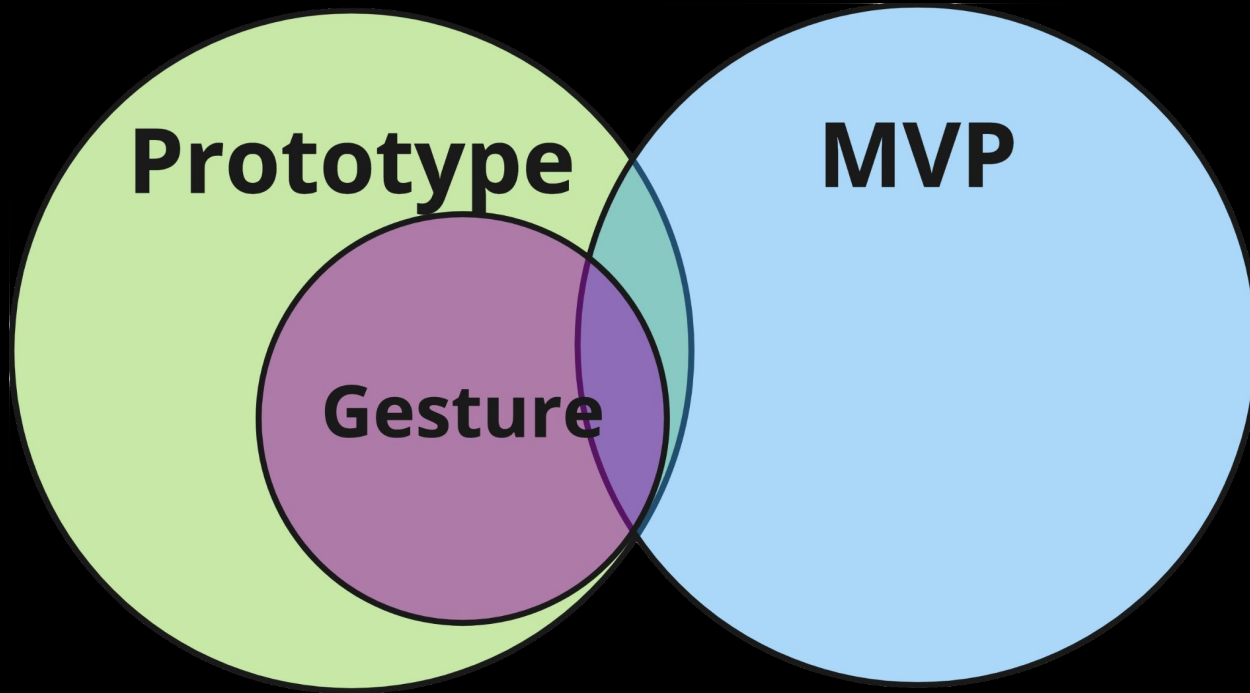
User Testing: A new focus





Ceci n'est pas une pipe.

Learning while building



Software Prototyping...

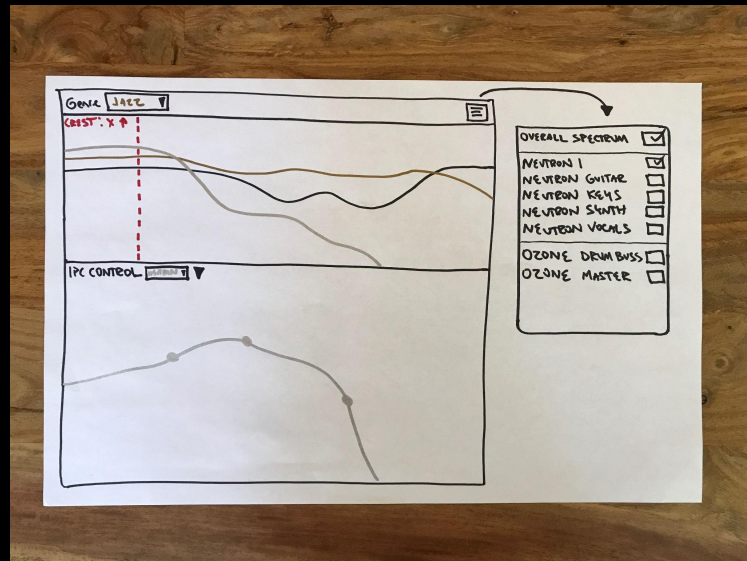
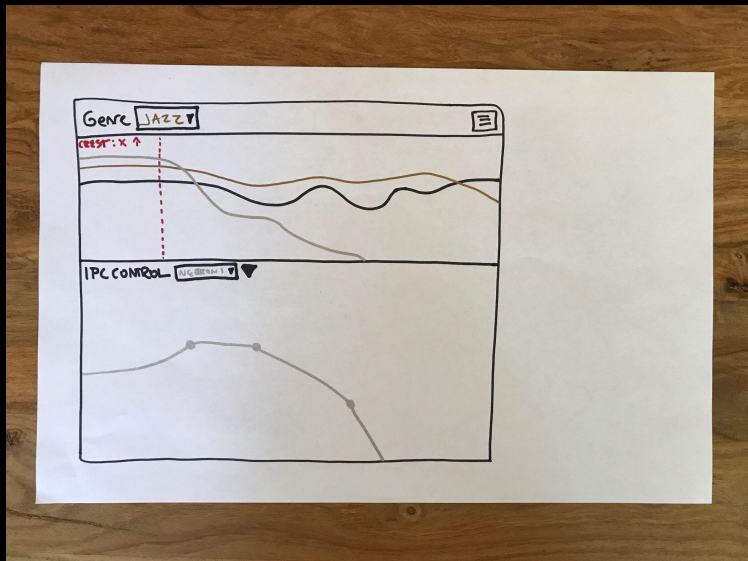
Prototyping tools from ADC



Cmajor



Paper prototypes



UI Mockups



Internal Tools

The screenshot displays a DAW interface with a reverb plugin control panel. The left side shows a waveform display for a track named "Decay Dry Vocal.wav". The right side shows the plugin control panel for "ReverbElements TestableDSP.bundle".

Plugin Control Panel Parameters:

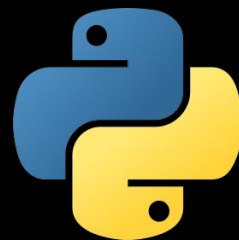
- Instance: Reverb
- Params Version: 0
- Buttons: Load Preset, Save Preset
- ChorusDepth: 25.0
- ChorusRate: 0.5
- Chorus Type: RandomFat
- GlobalBypass:
- HostSyncPreDelay: 1/32
- HostSyncPreDelayEnabled:
- PreDelay: 20.0
- ReverbEarlyOneBypass:
- ReverbEarlyOneDiffusionAmount: 100.0
- ReverbEarlyOneEarlyAttack: 40.2
- ReverbEarlyOneEarlyLevel: -3.0
- ReverbEarlyOneEarlySlope: 414.9
- ReverbEarlyOneEarlyTime: 30.6
- ReverbEarlyOneReverbSize: 4.9
- ReverbTailOneDiffusionFactor: 5
- ReverbTailOneDampingFrequency: 4016.0
- ReverbTailOneDiffusionAmount: 39.6
- ReverbTailOneEnvelopeTime: 24.6
- ReverbTailOneHiLoBalance: 0.4
- ReverbTailOneHostSyncReverbTime: 1/2
- ReverbTailOneHostSyncReverbTimeEnabled:

TestableDSPHostElement finished loading (17 ms)

Buttons: Preview, Bypass, Compare, Render

Timeline: 00:00:18.518

Audio Settings: -24-bit | 48000 Hz



Web based prototypes



Max/MSP4Live Prototypes

BalanceMeter-6b

Step 1: Turn On Audio

Step 2: Load Your Track

Step 3: Select a plugin from Macintosh HD/Library/Audio/Plug-Ins/VST

Step 4: Open the plugin and match the colors

Reverb blend demo [Reverb blend demo]

Lead Vocal 1_01

Track_01

Blend (presentation)

Drop soundfile list here, or press "open" below

open Toggle Playback

Click to open a Job R2 plugin UI

Job 1 Job 2 Job 3

Reverb Amount Dry/Wet Master Bus

DSP On/Off audio settings

Neoverb

Voice

Realistic Dramatic

Small Medium Large

Cancel Accept

Media files are missing. Please click here to learn more.

DDMF Metaplugin

The screenshot displays a DAW interface with a component list on the left and a signal flow graph in the center. The component list includes various audio processing modules such as AUMatrixReverb, AUReverb2, AUCompressor, and AUParametricEQ. The signal flow graph shows a complex network of connections between nodes, including MIDI Input, Audio Input, MIDI Output, and Audio Output, with intermediate processing blocks like EQ, Compressor, and Reverb. The text "DDMF Metaplugin64" is overlaid on the graph.

Name	Manufacturer	Type
AUMatrixReverb	Apple	AU
AUMIDI Synth	Apple	AUI
AUMixer	Apple	AU
AUMixer3D	Apple	AU
AUMultibandCompre...	Apple	AU
AUMultiChannelMixer	Apple	AU
AUMultiSplitter	Apple	AU
AUINBandEQ	Apple	AU
AUINotReceive	Apple	AU
AUInstSend	Apple	AU
AUNewPitch	Apple	AU
AUParametricEQ	Apple	AU
AUPeakLimiter	Apple	AU
AUPitch	Apple	AU
AUReverb2	Apple	AU
AURogerReeq	Apple	AU
AURoundTripAAC	Apple	AU
AUSampleDelay	Apple	AU
AUSampler	Apple	AUI
AUScheduledSound%	Apple	AU
AUSoundFieldPanner	Apple	AU
AUSpatialMixer	Apple	AU
AUSpeechSynthesis	Apple	AU
AUSphericalHeadPan...	Apple	AU
AUVectorPanner	Apple	AU
ChamberReverb	DDMF	VST3
ChamberReverb	DDMF	VST
ChamberReverb	DDMF	AU
Comprezzore	DDMF	VST3
Comprezzore	DDMF	VST
Comprezzore	DDMF	AU
Crossover	DDMF	VST
Crossover	DDMF	AU
DLSMusicDevice	Apple	AUI
DrumComputer	Sugar Bytes	AUI
Envelope	DDMF	VST3
Envelope	DDMF	AU
Envelope	DDMF	VST
HRTFPanner	Apple	AU
HEQ Pro	DDMF	AU
HEQPro	DDMF	VST
LP10	DDMF	VST3
LP10	DDMF	VST
LP10	DDMF	AU
MagicDeathEye	DDMF	VST3
MagicDeathEye	DDMF	VST
MagicDeathEye	DDMF	AU
MagicDeathEyeStereo	DDMF	VST3
MagicDeathEyeStereo	DDMF	VST
MagicDeathEyeStereo	DDMF	AU
Metaplugin	DDMF	VST3
Metaplugin	DDMF	VST
Metaplugin	DDMF	AU

Trash prototyped in Max

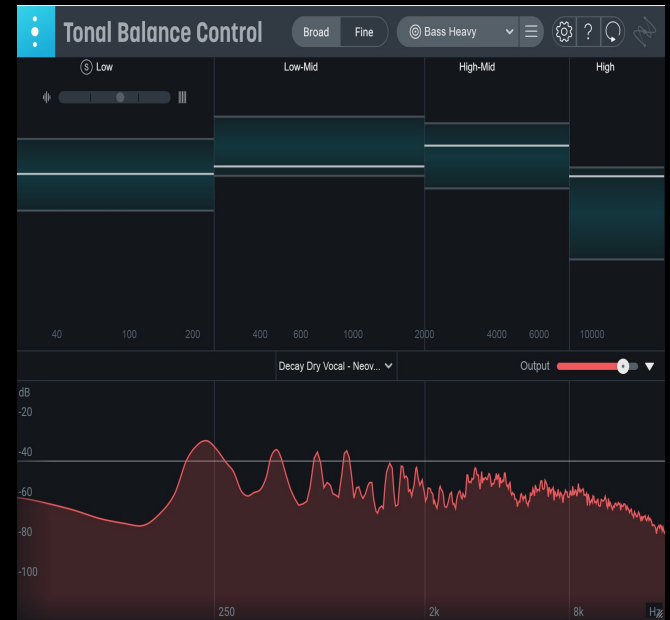
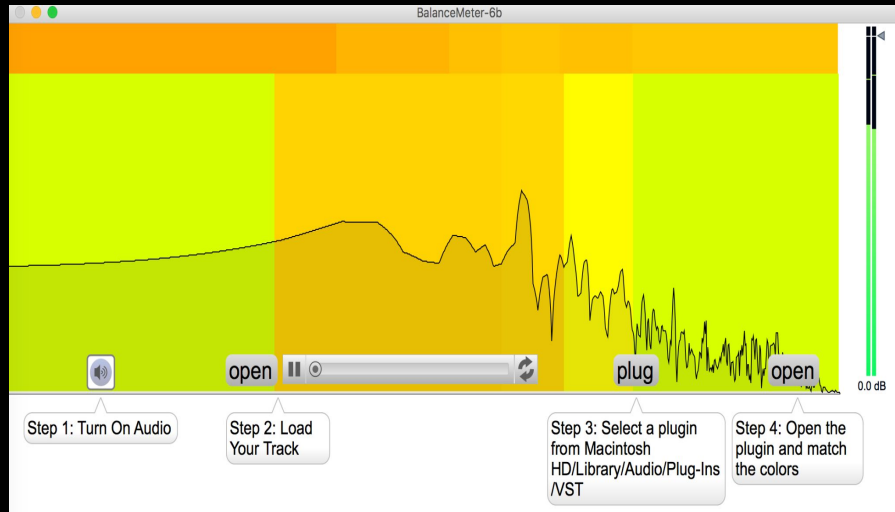
The image shows a screenshot of the 'Trash' audio processor interface, which is a software instrument or effect designed in Max/MSP. The interface is dark-themed and features several sections:

- Top Bar:** Includes the 'Trash' logo, a 'Presets' menu, a 'Bypass' button, a 'MIX' knob set to 100%, and various utility icons like settings, a refresh symbol, and a MIDI note icon.
- Signal Path:** A horizontal line with several knobs and a central red-shaded area. Frequency markers '403Hz' and '4103Hz' are visible below the path.
- TRASH Section:** Contains a 'Drive' knob with a lightning bolt icon, a 'Tilt' knob with a triangle icon (set to 1000 Hz), and a 'Mix' knob.
- Waveform/Graphs:** Two main visual displays. The left one shows a waveform with a pink circle and is labeled 'Grainy' and 'Hard Chip'. The right one shows a graph with a pink circle and is labeled 'Sharp' and 'TV Scoop'. Below these are 'Tube Drainer' and 'Amp Drainer' controls.
- CONVOLVE Section:** Features a 'Mix' knob, a 'Width' knob, and a 'Stereoize' knob.
- ENVELOPE Section:** Includes three vertical sliders for 'Modulation', 'Attack', and 'Release'.
- FILTER Section:** Includes three vertical sliders for 'Frequency', 'Scream', and 'Heat', and a graph with a pink circle and a '20000Hz' marker.
- IN/OUT Section:** Contains two vertical gain sliders and three toggle switches for 'Auto Gain', 'Limiter', and 'Oversample'.

Prototyping to get buy-in...

...and gain confidence.

Tonal Balance Control



Nectar Voices

The screenshot displays the Nectar Advanced software interface, which is used for processing vocal recordings. The interface is organized into several functional sections:

- Top Bar:** Features the Nectar logo, a Presets menu, and navigation icons for settings, help, and undo/redo.
- Key Section (Left):** Includes a 'Detect' button, a 'No Key' dropdown menu, a piano roll for 'Register', and a 'Medium' dropdown menu. Below these are 'Correction' controls for 'Strength' (set to 100) and 'Speed' (set to 20), a 'Transpose' control set to 0.0 st, a 'Formant' button, and 'Shift' (0.0) and 'Scale' (10) controls. A 'Mix' slider is located at the bottom left.
- Auto/MIDI Section (Top Middle):** Contains 'Auto' and 'MIDI' tabs, a multi-dot menu, and a refresh icon.
- Custom Style Section (Center):** Shows a 'Custom Style' dropdown, a 'Solo' toggle, and a piano keyboard. The keyboard has '123' and 'ABC' buttons. The style is currently set to 'Custom Style'.
- Filter Section (Top Right):** Includes a 'Filter' dropdown, 'L Gain' and 'H Gain' knobs (both at 0.00), and a 'Pitch Correction' grid with 'Amount' and 'Speed' controls.
- Variation Section (Bottom Right):** Features 'Variation' controls for 'Time' and 'Pitch' (both at 0%), and a 'Variation' knob.
- Vertical Controls (Far Right):** Contains four vertical sliders for frequency response, with values ranging from 0.0 to -Inf. Below these are 'Bypass' and 'Match' buttons, 'Pan' (set to 'C') and 'Width' (set to '0') controls, and a 'Mix' slider.

Similar ideas presented two ways

New feature ideation

- Idea presented by research
- Suggested algorithm
- Not much excitement

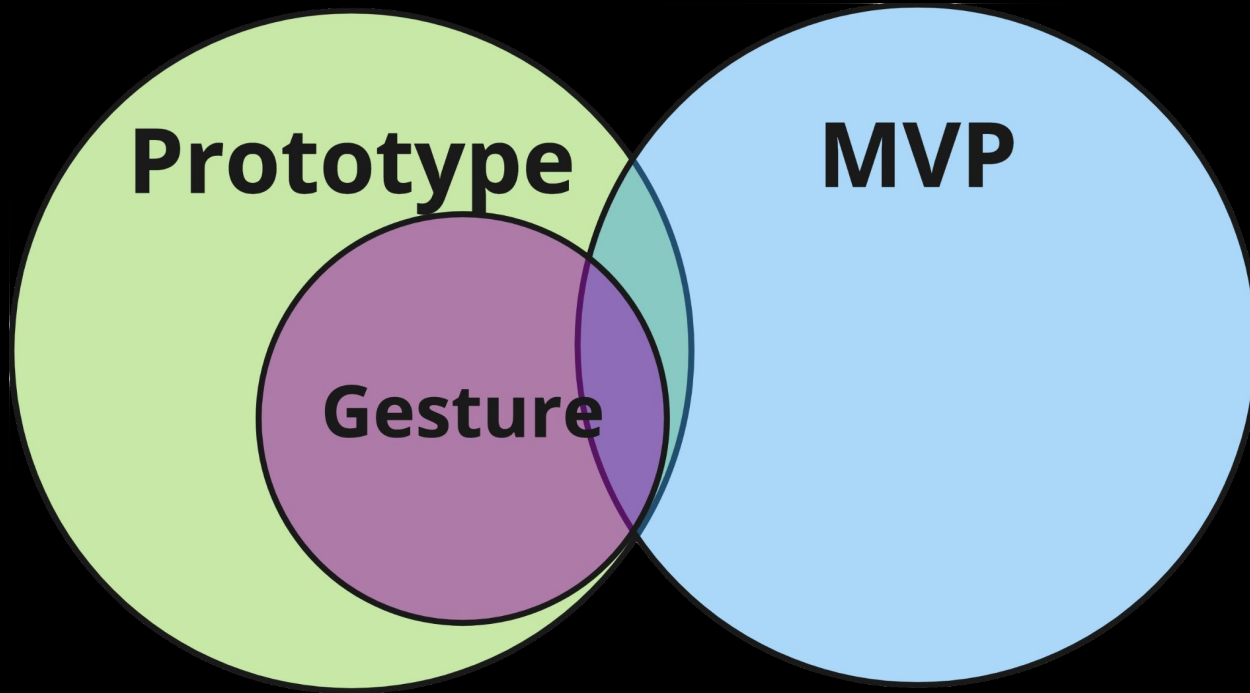
Innovation Sprint

- Max prototype
- Naive algorithm
- Lots of excitement

Prototyping for UX design...

...find the right gestures.

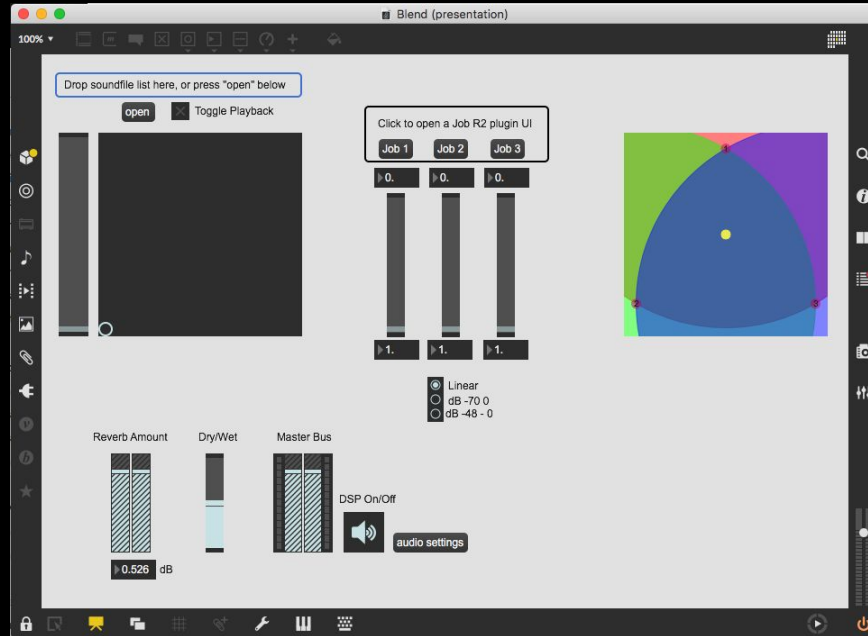
Learning while building



Lots of paper prototypes



Experiments in Max/MSP4Live



Reverb Blend Prototype

The screenshot displays the Ableton Live software interface for a project titled "Reverb blend demo". The main window shows a multi-track arrangement with two audio tracks: "Lead Vocal 1_01" and "Track_01". The "Lead Vocal 1_01" track is selected, and its mixer section is visible, showing parameters for "1 Lead Vocal" and "2 Track_01". The mixer section includes controls for "Ext. In", "In", "Auto", "Off", "Master", and "Post".

Below the main window, a "Blend" control panel is visible. It features a circular "Blend" knob with three colored segments (green, blue, purple) and a yellow dot in the center. To the right of the knob are three vertical sliders labeled "Reverb Amount", "Dry/Wet", and "Output Gain". Below these sliders are three buttons labeled "Job 1", "Job 2", and "Job 3".

At the bottom of the interface, a red banner displays the message: "Media files are missing. Please click here to learn more." The bottom right corner shows the track name "1-Lead Vocal 1_01" and the "Blend" control.

Reverb Blend Prototype

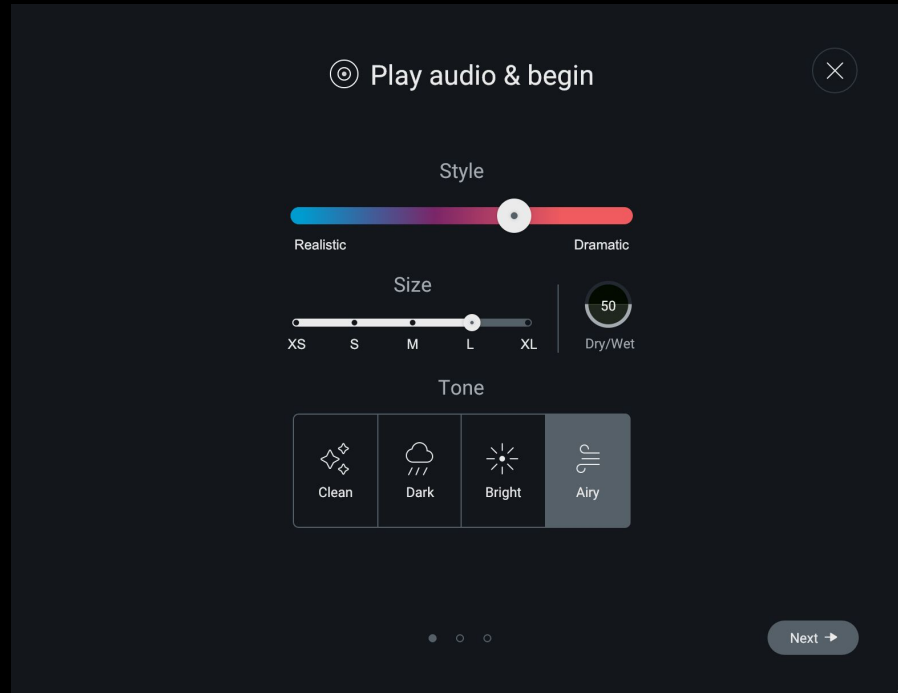
The screenshot displays the Ableton Live software interface for a project titled "Reverb blend demo [Reverb blend demo]". The interface is divided into several sections:

- Top Bar:** Shows transport controls (Link, Tap, 120.00 BPM, 4/4 time signature, 1 Bar), a play button, and a timeline with markers at 1, 5, 9, and 13.
- Browser (Left):** A search bar (Cmd + F) and a list of collections including "Blend.amxd", "Neoverb Room Boost.amxd", and "Neoverb.amxd".
- Arrangement View (Center):** Displays two audio tracks: "Lead Vocal 1_01" and "Track_01". Each track has a green waveform and a corresponding mixer strip on the right. The mixer strips include controls for "Ext. In", "In" (Auto/Off), and "Master".
- Mixer (Right):** Shows the mixer for the selected track, including a "Set" dropdown, "Ext. In" dropdown, "In" dropdown, "Auto/Off" buttons, and "Master" dropdown. It also features a "1/1" button and a "1/2" button.
- Metronome (Bottom Left):** A section with instructions: "Click here to activate the metronome. To adjust the metronome's volume, use the Preview/Cue Volume control in the Master track's mixer. Open the chooser to the right or Ctrl-click to change the metronome's settings." It includes a volume knob and a "Met" button.
- Blend Control (Bottom Center):** A section titled "Blend" with a volume knob and three sliders: "Reverb Amount", "Dry/Wet", and "Output Gain". The "Reverb Amount" slider is set to approximately 50%. The "Dry/Wet" slider is set to approximately 25%. The "Output Gain" slider is set to approximately 50%. There are also three buttons labeled "Job 1", "Job 2", and "Job 3".
- Bottom Bar:** A red warning message: "Media files are missing. Please click here to learn more." and a track selection bar showing "1-Lead Vocal 1_01" and "Blend".

Reverb Assistant Prototype

The image displays the Neoverb Reverb Assistant interface. The top bar includes the Neoverb logo, a track name "Decay Dry Voca...", and a "Reverb Assistant" button highlighted with a purple box. The main area features a 3D visualization of a reverb space with a color gradient from blue at the top to red at the bottom. A white circle is positioned in the center of this space. Several dB values are displayed: -6.2 dB at the top, -0.2 dB at the bottom left, and -17.1 dB at the bottom right. On the left side, there are three vertical sliders for "Reflections" (63), "Plate" (3.20), and "Hall" (5.00), each with a "Space" label and a play/pause icon. On the right side, there are controls for "Mod" (1.80 Hz, 43%), "Pre-Delay" (20), "Smooth" (100), "Dry/Wet" (a vertical slider), and "Level" (a vertical slider). At the bottom, there is a "Masking" section with a "Select plug-in" dropdown, and two tabs: "Pre EQ" and "Reverb EQ". The "Reverb EQ" tab is active, showing a frequency response graph with a white curve and a grey curve. The graph has frequency markers at 100 Hz, 300 Hz, 1k Hz, 3k Hz, and 10k Hz. The y-axis ranges from -6 to 12. Below the graph, there are controls for "Freq" (100 Hz), "Gain" (0.0 dB), and "Q" (0.7).

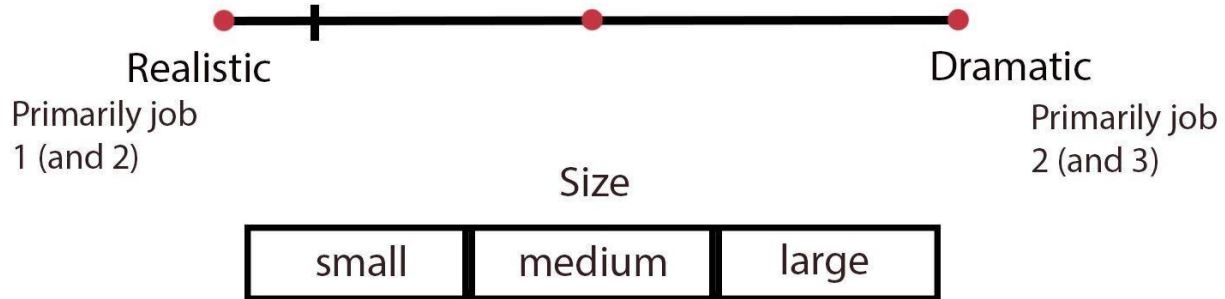
Reverb Assistant Prototype



Reverb Assistant Prototype

Automatic Job Selection

Inst. Type ▾



Reverb Assistant Prototype

The screenshot displays a music production software interface with a reverb assistant prototype. The main window is titled "Reverb blend demo [Reverb blend demo]". The interface includes a top transport bar with a tempo of 120.00, a 4/4 time signature, and a 1 Bar duration. The track list on the left shows "Lead Vocal 1_01" and "Track_01". The waveform editor shows two tracks with audio waveforms. The reverb assistant dialog box is open, showing a "Voice" dropdown menu, a "Realistic" to "Dramatic" slider, and buttons for "Small", "Medium", "Large", "Cancel", and "Accept".

Track List:

Name	Ext. In	1	S	0	C
1 Lead Vocal	1	0			
2 Track_01	2	-7.5			
A Reverb	A		S	Post	
B Delay	B		S	Post	
Master	1/2	0		0	

Reverb Assistant Dialog:

Voice

Realistic Dramatic

Small Medium Large

Cancel Accept

Media files are missing. Please click here to learn more.

UI aReverb Assistant Prototype

The screenshot displays a DAW interface titled "Reverb blend demo [Reverb blend demo]". The top transport bar shows a tempo of 120.00, a 4/4 time signature, and a 19.1.3 measure. The left sidebar contains a search bar and a collection of audio files: "Blend.amxd", "Neoverb Room Boost.amxd", and "Neoverb.amxd". The main workspace features two tracks: "Lead Vocal 1_01" and "Track_01". The "Lead Vocal 1_01" track has a volume of 1 and a reverb amount of 0. The "Track_01" track has a volume of -7.5 and a reverb amount of 0. The mixer section shows three reverb settings: "A Reverb" (0), "B Delay" (0), and "Master" (0). The bottom panel includes a metronome control and a reverb blend knob. A red message bar at the bottom states "Media files are missing. Please click here to learn more."

Reverb Assistant Prototype

The screenshot displays a music production software interface with a reverb assistant prototype. The main window is titled "Reverb blend demo [Reverb blend demo]". The interface includes a top transport bar with a tempo of 120.00, a 4/4 time signature, and a 1 Bar duration. The track list on the left shows "Lead Vocal 1_01" and "Track_01". The waveform editor shows two tracks: "1 Lead Vocal" and "2 Track_01". The reverb assistant dialog box is open, showing a "Voice" dropdown menu, a "Realistic" to "Dramatic" slider, and buttons for "Small", "Medium", "Large", "Cancel", and "Accept".

Track List:

Name	Ext. In	1	S	0	C
1 Lead Vocal	1	0			
2 Track_01	2	-7.5			

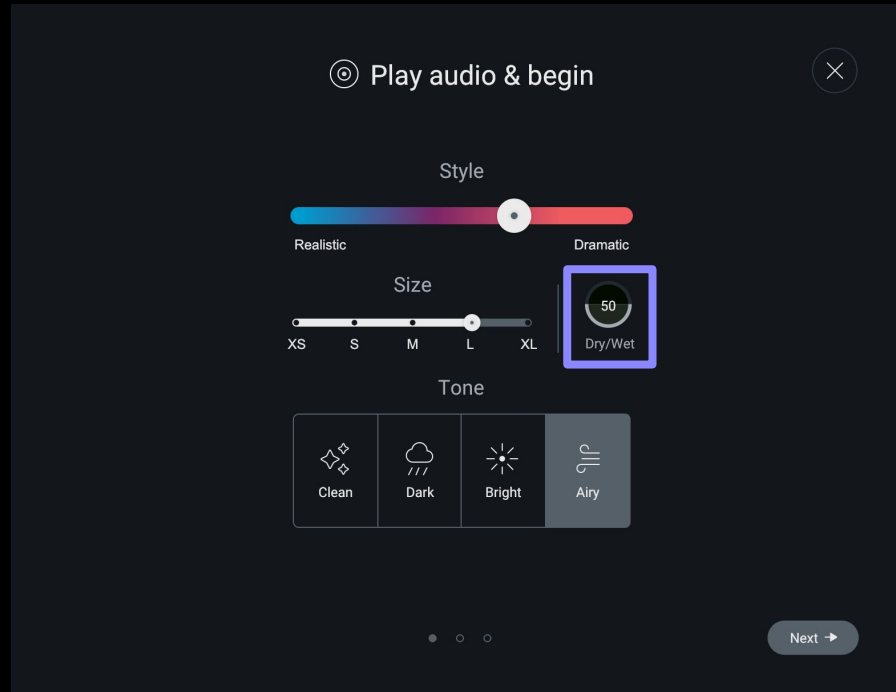
Reverb Assistant Settings:

- Voice: Voice
- Realistic: [Slider]
- Dramatic: [Slider]
- Small: [Button]
- Medium: [Button]
- Large: [Button]
- Cancel: [Button]
- Accept: [Button]

Bottom Bar:

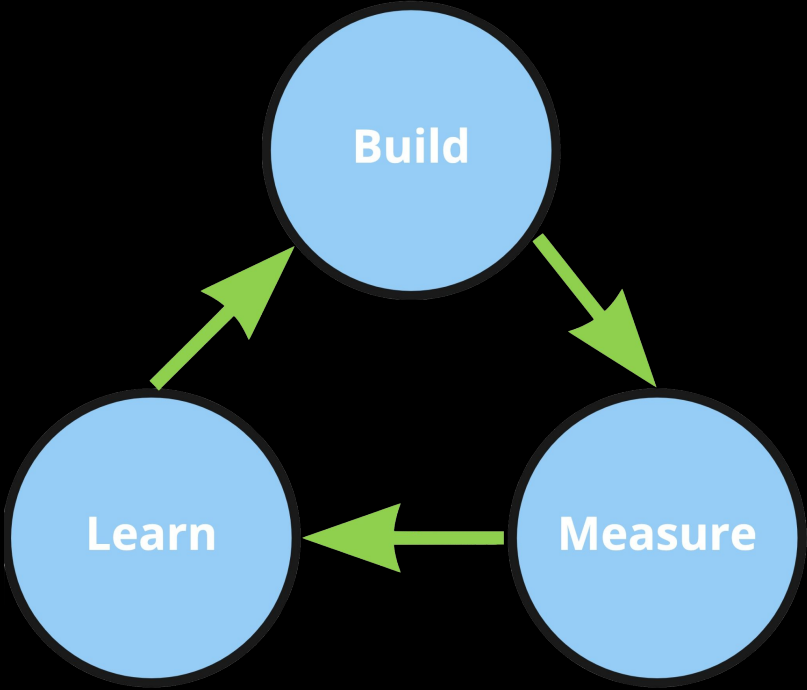
Media files are missing. Please click here to learn more. 1-Lead Vocal 1_01 Neverb

Learning: Add dry/wet

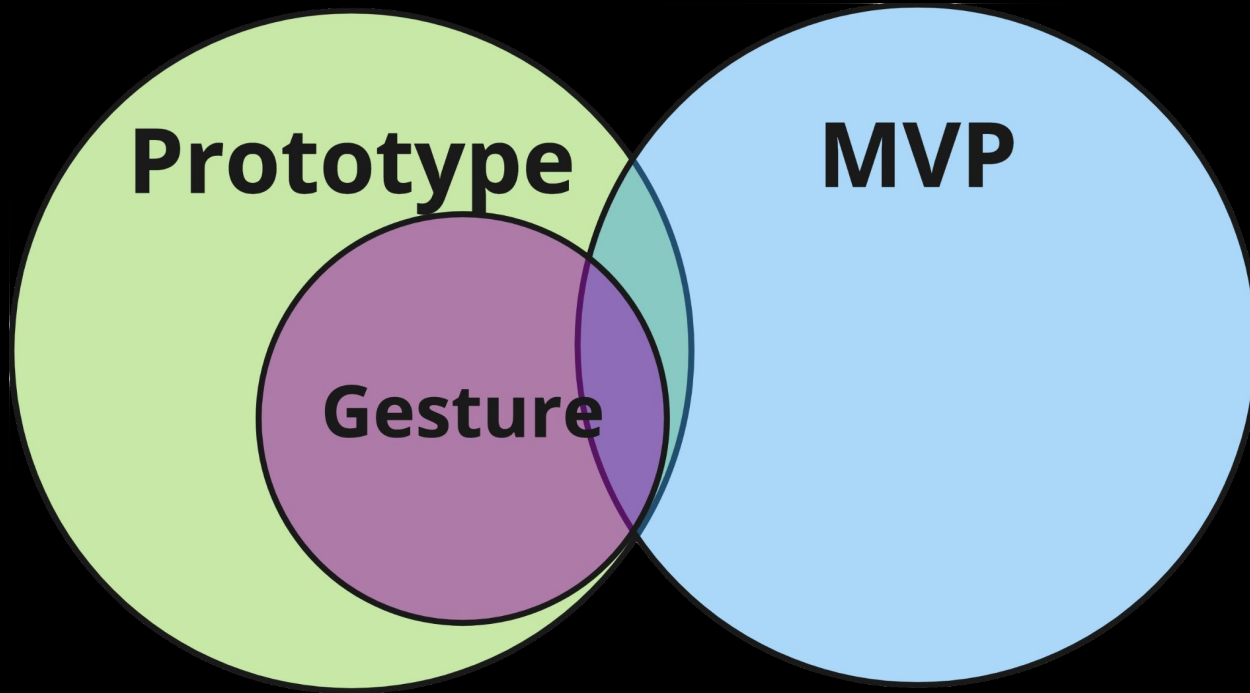


Conclusion

Learning while building



Learning while building



What are you trying to learn...

...should drive the tools and techniques.



Thank you!

Roth Michaels

Principal Software Engineer

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[@thevibesman](#)