Supplementary Material - MIPNet: Neural Normal-to-Anisotropic-Roughness MIP mapping

ALBAN GAUTHIER, LTCI, Télécom Paris, Institut Polytechnique de Paris, France

ROBIN FAURY, Adobe Research, France JÉRÉMY LEVALLOIS, Adobe Research, France THÉO THONAT, Adobe Research, France JEAN-MARC THIERY, Adobe Research, France TAMY BOUBEKEUR, Adobe Research, France

$\label{eq:ccs} \texttt{CCS} \ \texttt{Concepts:} \bullet \textbf{Computing methodologies} \to \textbf{Reflectance modeling}; \\ \textbf{Texturing}.$

Additional Key Words and Phrases: Material Appearance, Mipmaps, Machine Learning

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In this supplementary material, we present a comparison of different network architectures for our method, and an extended comparison of the generation of prefiltered materials between the baseline, our method and competitors.

1 SPECIFIC RESULTS

For materials which showcase examples on complex setup such as cross-shaped micro-structures, please refer to these examples:

- beaded sbai fabric
- synthetic flipflop topstitch square
- nickel diamond emboss pattern
- aluminium braided cable
- copper honeycomb pattern
- ferrofluid labyrinth
- pearl paint organic emboss

In addition, we point out to examples where out method greatly improves over the baseline:

- taurillon leather topstitch diamond
- · pebble beach small

Authors' addresses: Alban Gauthier, LTCI, Télécom Paris, Institut Polytechnique de Paris, France, albangauthier25@gmail.com; Robin Faury, Adobe Research, France, faury@adobe.com; Jérémy Levallois, Adobe Research, France, levalloi@adobe.com; Théo Thonat, Adobe Research, France, thonat@adobe.com; Jean-Marc Thiery, Adobe Research, France, jthiery@adobe.com; Tamy Boubekeur, Adobe Research, France, boubek@adobe.com.

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- urban rubble ground
- aluminium scrap
- fdm ceramic

2 ARCHITECTURE COMPARISONS

In Figure 1, we compare different architectures of our network, trained using the GGX and Beckmann distributions and Ashikhmin-Shirley model. First, we see similar behaviors for all distributions trained. We noticed that adding more layers in \mathcal{H}_B has no influence on the resulting loss. In addition, there is a gap in loss values with \mathcal{H}_B using hidden layers of size 512 compared to 1024. Finally, we did not notice any benefit to increase the size of hidden layers of \mathcal{H}_A greater than 512.

3 ADDITIONNAL COMPARISONS

We show additional comparison with the GGX distribution in Figure 2, the Beckmann distribution in Figure 3, and the Ashikhmin-Shirley model Figure 4.

In Figure 5, we show additional qualitative comparison of renders with AutoLoD [Hasselgren et al. 2021] (middle right), and NeuMIP [Kuznetsov et al. 2021] (right). With respect to these two methods, we achieve reasonable material appearance preservation while being 3 to 4 orders of magnitude faster for pre-processing.

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Fig. 1. Mean L1 loss (Y-axis) of our network computed with different architectures depending to the number of epochs (X-axis). Top left: GGX distribution, top right: Beckmann distribution, bottom: Ashikhmin-Shirley distribution. For all graphs:

 $\begin{aligned} & \mathsf{XXX}_A_2\mathsf{x256}_B_3\mathsf{x512} \colon \mathcal{H}_A \text{ has 2 hidden layers of size 256, } \mathcal{H}_B \text{ has 3 hidden layers of size 512.} \\ & \mathsf{XXX}_A_2\mathsf{x256}_B_4\mathsf{x512} \colon \mathcal{H}_A \text{ has 2 hidden layers of size 256, } \mathcal{H}_B \text{ has 4 hidden layers of size 512.} \\ & \mathsf{XXX}_A_2\mathsf{x512}_B_3\mathsf{x1024} \colon \mathcal{H}_A \text{ has 2 hidden layers of size 512, } \mathcal{H}_B \text{ has 3 hidden layers of size 1024.} \\ & \mathsf{XXX}_A_2\mathsf{x512}_B_4\mathsf{x1024} \colon \mathcal{H}_A \text{ has 2 hidden layers of size 512, } \mathcal{H}_B \text{ has 4 hidden layers of size 1024.} \\ & \mathsf{XXX}_A_2\mathsf{x512}_B_4\mathsf{x1024} \colon \mathcal{H}_A \text{ has 2 hidden layers of size 1024, } \mathcal{H}_B \text{ has 4 hidden layers of size 1024.} \\ & \mathsf{XXX}_A_2\mathsf{x1024}_B_3\mathsf{x1024} \colon \mathcal{H}_A \text{ has 2 hidden layers of size 1024, } \mathcal{H}_B \text{ has 3 hidden layers of size 1024.} \\ & \mathsf{XXX}_A_2\mathsf{x1024}_B_4\mathsf{x1024} \colon \mathcal{H}_A \text{ has 2 hidden layers of size 1024, } \mathcal{H}_B \text{ has 4 hidden layers of size 1024.} \\ & \mathsf{XXX}_A_2\mathsf{x1024}_B_4\mathsf{x1024} \colon \mathcal{H}_A \text{ has 2 hidden layers of size 1024, } \mathcal{H}_B \text{ has 4 hidden layers of size 1024.} \\ & \mathsf{XXX}_A_2\mathsf{x1024}_B_4\mathsf{x1024} \colon \mathcal{H}_A \text{ has 2 hidden layers of size 1024, } \mathcal{H}_B \text{ has 4 hidden layers of size 1024.} \\ & \mathsf{XXX}_A_2\mathsf{x1024}_B_4\mathsf{x1024} \coloneqq \mathcal{H}_A \text{ has 2 hidden layers of size 1024, } \mathcal{H}_B \text{ has 4 hidden layers of size 1024.} \\ & \mathsf{XXX}_A_2\mathsf{x1024}_B_4\mathsf{x1024} \coloneqq \mathcal{H}_A \text{ has 2 hidden layers of size 1024, } \mathcal{H}_B \text{ has 4 hidden layers of size 1024.} \\ & \mathsf{XXX}_A_4\mathsf{x1024} \coloneqq \mathcal{H}_4 \mathsf{x1024} \coloneqq \mathcal{H}_4 \mathsf{x1024}$ \\ & \mathsf{XX}_4\mathsf{x1024} \rightthreetimes \mathcal{H}_4 \mathsf{x1024} \\ & \mathsf{XX}_4\mathsf{x1024} \\ &

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Ground Alien Soil





Carbon Fiber Wrap

Metal Bricks



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Leather Polyurethane

Car Paint

Fig. 3. Additional renderings using the Beckmann model.

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Bull Large Grain Salvage Seam



Fig. 4. Additional renderings using the Ashikhmin-Shirley model.

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(GCX)	Groundtruth (GGX)	AutoLoD (GGX)	NeuMIP	Ours (GGX)	Groundtruth (GGX)	AutoLoD (GGX)	NeuMIP
Ours (GGX)	Groundtruth (GGX)	AutoLoD (GGX)	NeuMIP	Ours (GGX)	Groundtruth (GGX)	AutoLoD (GGX)	NeuMIP
	Construction		NewNP		Constitution		Nadil
(GGX)	(GGX)	AutoLoD (GGX)	Neumip	(GGX)	(GGX)	AutoLoD (GGX)	NeuMIP

Fig. 5. Extended qualitative comparison of renders between our method (left), the groundtruth (middle left), AutoLoD [Hasselgren et al. 2021] (middle right), and NeuMIP [Kuznetsov et al. 2021] (right), with different viewpoints.