NVIDIA Material Definition Language

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One Scene for Different Renderers

Realtime Rasterizer

Interactive Raytracer

Pathtracer

Share scene and MDL materials for a consistent look

Switching renderers with no scene modifications
Procedural Programming Language
- Texture lookups
- Procedurals
- Uv-transforms
- Projectors
- Noise functions
- Math functions

Declarative Material Definition
- Glossy reflection
- Transparency
- Translucency

Renderer
- Rasterizer
  - Light loops / OIT
- Raytracer
  - Trace N rays
- Pathtracer
  - Ray-marching
MDL - Past, Present and Future

- MDL 0.x ...
- MDL 1.0
  - Iray 2013
- MDL 1.1
  - Public specification
- MDL 1.2
  - Nvidia Iray Plugins
  - mental ray (3ds Max, Maya)
- MDL 1.3
  - Bunkspeed
  - Substance Designer
- MDL 1.4
  - Catia V6
  - Vray
  - Adobe Dimension
  - Daz 3d
  - ESI IC.IDO
  - Unreal Studio 4.20
  - Solidworks Visualize


Public specification
Advisory Council
Public SDK
May the Source Be with You

NVIDIA Open Sources the MDL SDK

https://github.com/NVIDIA/MDL-SDK
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BSD 3-clause license

Full MDL SDK

• 48 modules, 570 files, 310 KLOC
• Excluding
  MDL Distilling and texture baking
  GLSL compiler back-end
• Added MDL Core API
• Includes MDL Core Definitions and more
MDL Distiller

MDL Material
- Complex BSDF layering
- Complex procedurals

Distiller

Fixed Material Model
- Simple BSDF structure
- One texture per parameter

MDL

UE4
Discussion Proposal for glTF

(A) Current PBR in glTF 2.0, fixed baseline, applications want more

(B) Full MDL requires a compiler

(C) Fixed set of flexible standard nodes, allow flexible yet simple interpreter

- **Texturing**
  - Subset of MDL core definitions

- **Materials**
  - Subset of MDL BSF, EDF, and VDF

Subsets of MDL core definitions:

- Value
- Texture coordinate
- Texture space

Plaster color

Material plaster

Backscatter Glossy
Specular Reflection
Fresnel Layer
Measured Curve Layer
Custom Curve Layer
Tint
Backup
MDL Advisory Council
Companies sharing our vision of MDL

Joint direction of MDL and the MDL eco system
Include expertise other companies have gained in the field and with MDL
MDL SDK 2018.1

Features

MDL 1.4
DB for MDL definitions
DAG view on materials
several compilation modes
MDL editing

Code generators
PTX, LLVM IR, x86, GLSL (fcts. only)
Distiller and texture baker

Samples
Documentation and tutorials

Editor

MDL source

Resolve, parse, store

Database of content

Compile Material

Generate code

Optimized DAG view on material

Bake textures

API

Distill

Renderer

MDL SDK

Samples

Docs
Distillation to Fixed Material Model

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- Complex BSDF layering
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Distillation

Fixed Material Model
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Material
- tex
  - diffuse
  - specular
- tex
  - glossy
- tex
  - kurtosis
- tex
  - normal
Distillation to Fixed Material Model

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Approximate render result: Some materials will look quite different
Distillation to Fixed Material Model

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Fast projection of material instances: Realtime editing

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**Distillation**

**Fixed Material Model**
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Fast projection of material instances: Realtime editing

Flexible framework to target different fixed models not a fixed MDL subset (no “MDL lite”)

Approximate render result: Some materials will look quite different
Distillation to Fixed Material Model

Results on vMaterials

diffuse-only
Fresnel (glossy, diffuse)
original
**MDL Distilling**

Released as part of Iray/MDL SDK

Example: UE4 target with clearcoat and transparency through alpha

GLSL rendering sample using Distilling and baking comes with MDL SDK 2018.1
MDL Conformance Test Suite

Syntactic conformance tests
Semantic conformance tests

Available on request