



NVIDIA'S TURING: MORE THAN RAYTRACING AND AI

Yury Uralsky, Jul 08, 2019

NVIDIA TURING

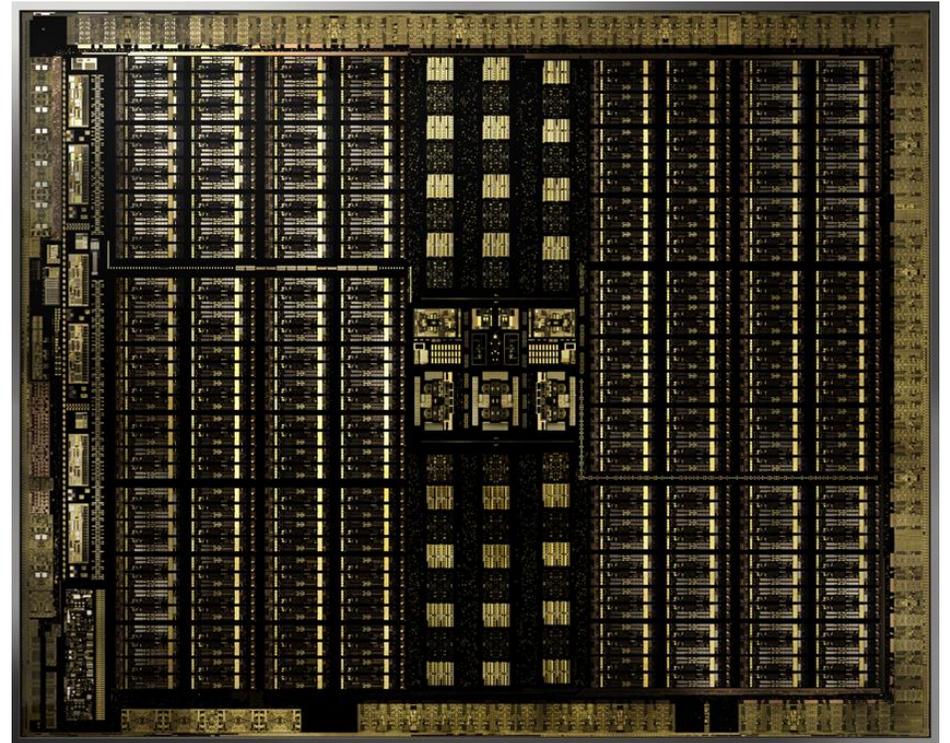
A major architecture refresh in almost a decade...

New processor core architecture

Enhanced memory subsystem

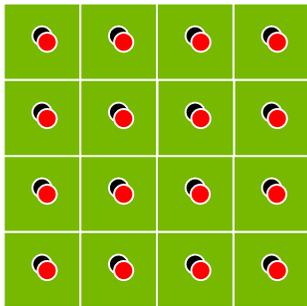
Big focus on acceleration for ray tracing and AI

.. But also advanced graphics pipeline features

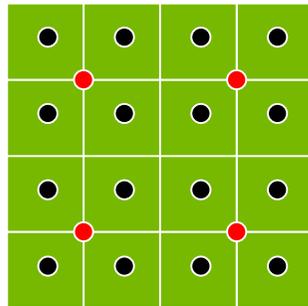
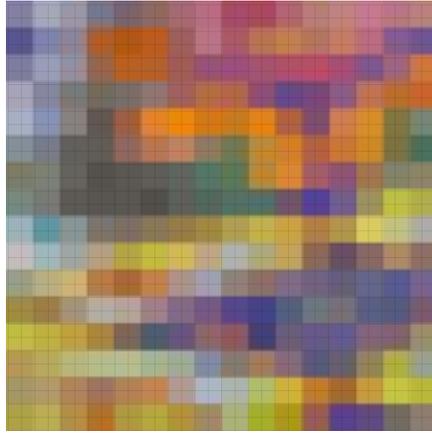


VARIABLE RATE PIXEL SHADING

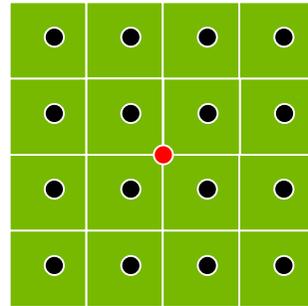
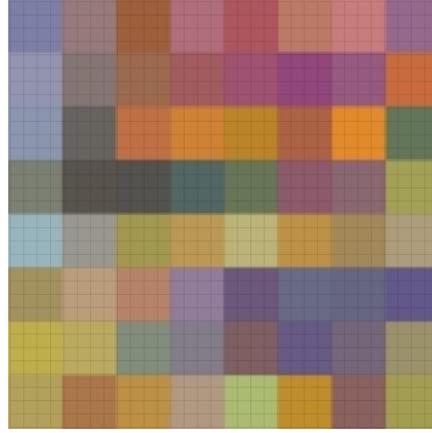
Screen-space shading rate control



1:1



1:4



1:16



VARIABLE RATE PIXEL SHADING

Shading rate selection options

Application selects from a palette of shading rates ...

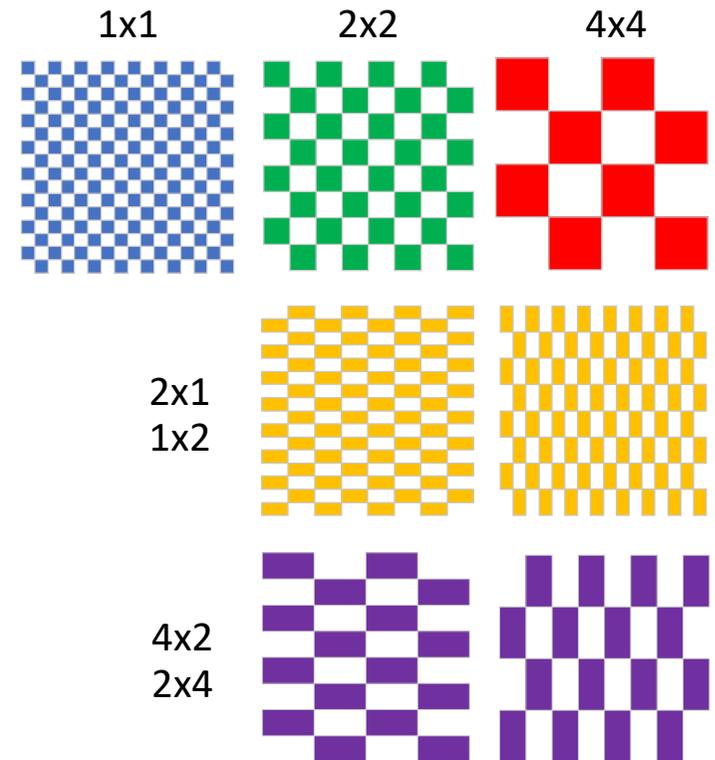
Per draw → Set on the command list

Per primitive → Attribute from the geometry pipeline

Per screen-space region → App-specified surface

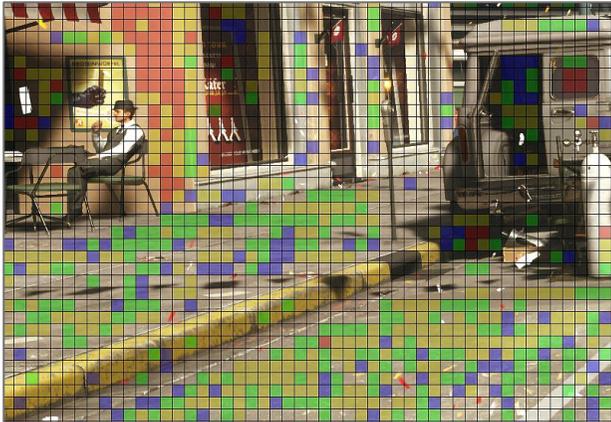
Each texel defines shading rate for a 16x16 region

... or a combination of the above



VARIABLE RATE PIXEL SHADING

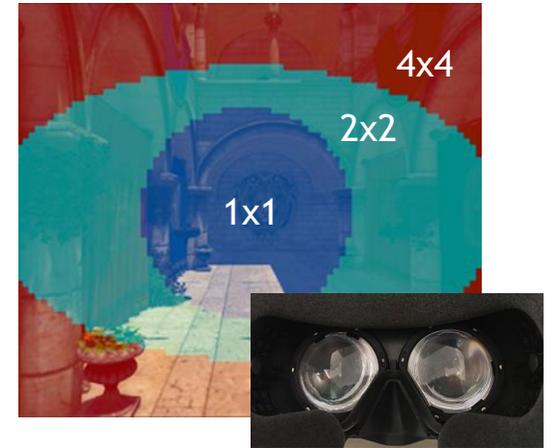
Adaptive shading scenarios



Content



Motion



Display

MESH SHADERS

A novel programming model for geometry processing

Combines vertex and primitive shading

Removes fixed-function at the top of the pipe

Two stage pipeline for geometry expansion

Cooperative thread groups outputting *meshlets*

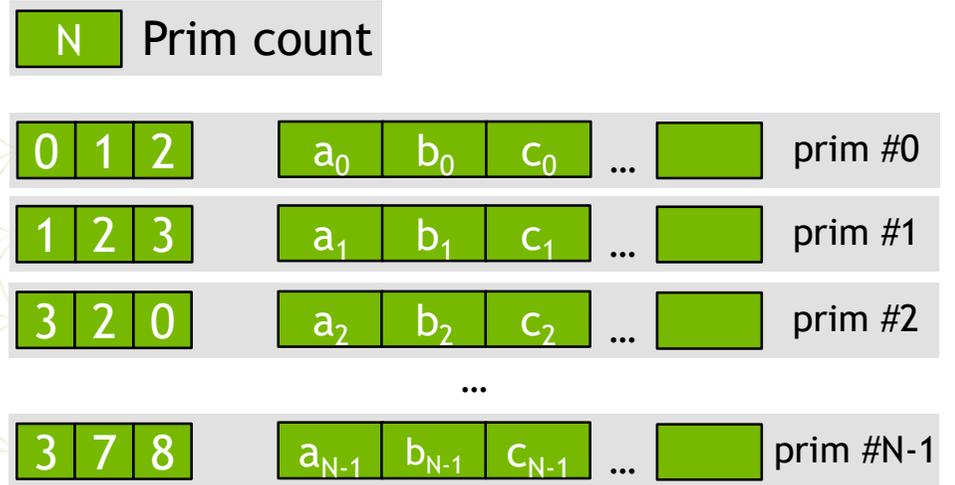
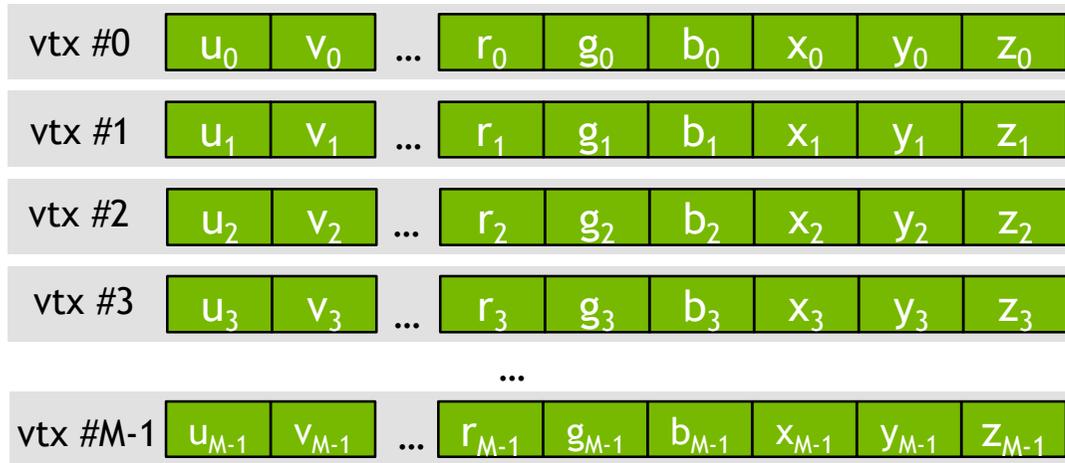
Directly pipelined to raster



MESHLET

A standardized interface to screen-space pipeline

struct {



Topology

Primitive attributes

}

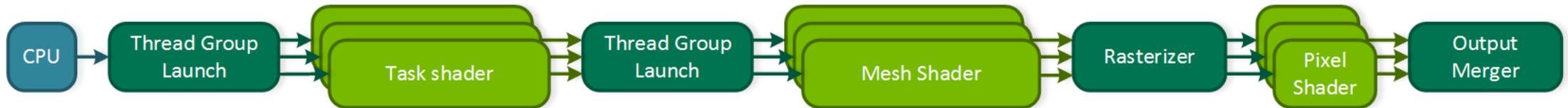
Vertex attributes

MESH SHADERS

Unified geometry processing pipeline



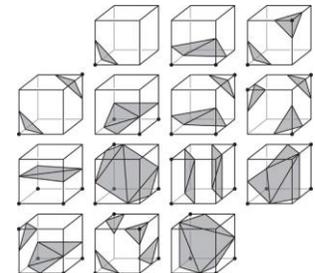
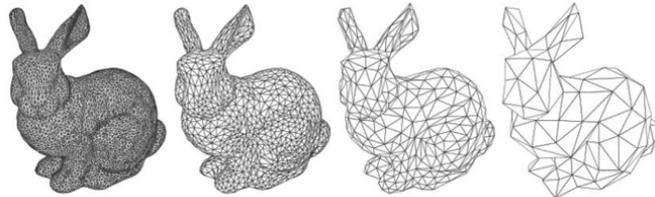
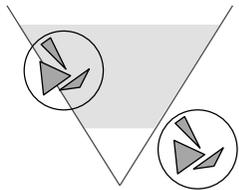
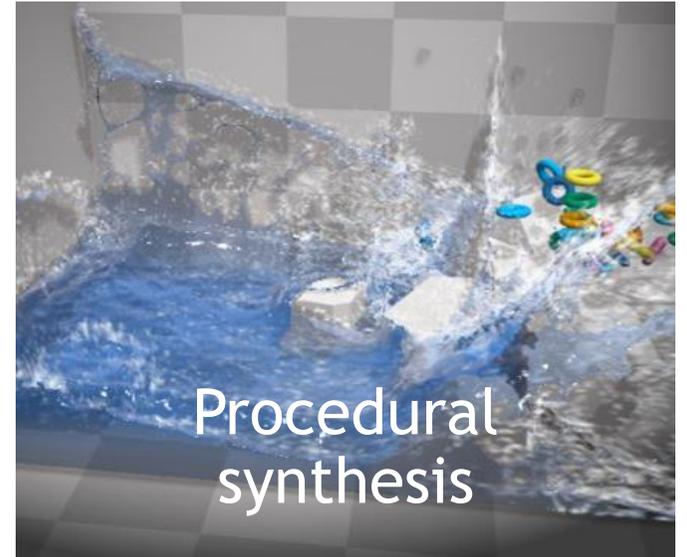
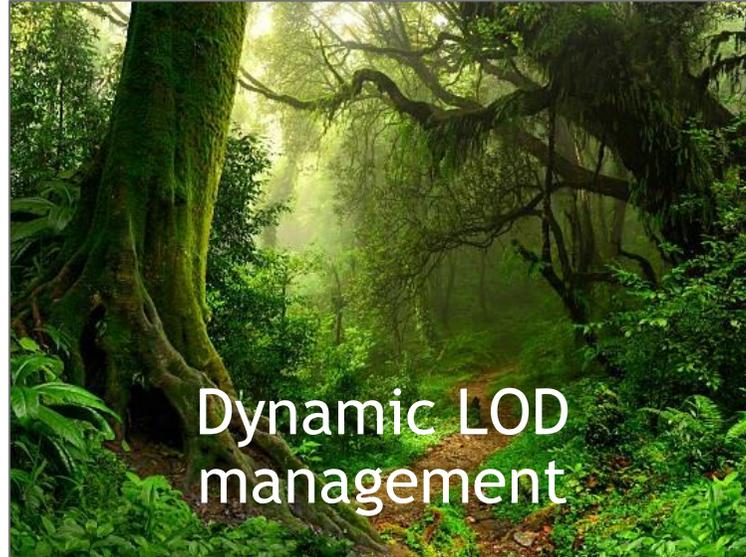
Traditional graphics pipeline



Graphics pipeline with task and mesh shaders

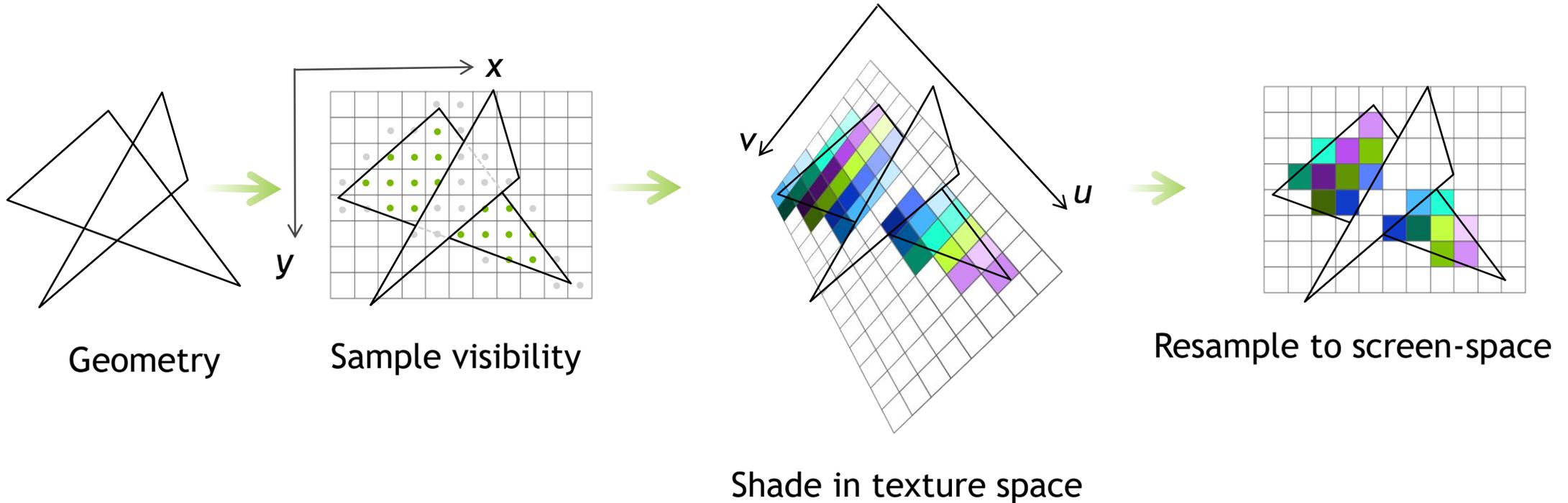
MESH SHADER APPLICATIONS

Sophisticated geometry processing approaches possible



TEXTURE SPACE SHADING

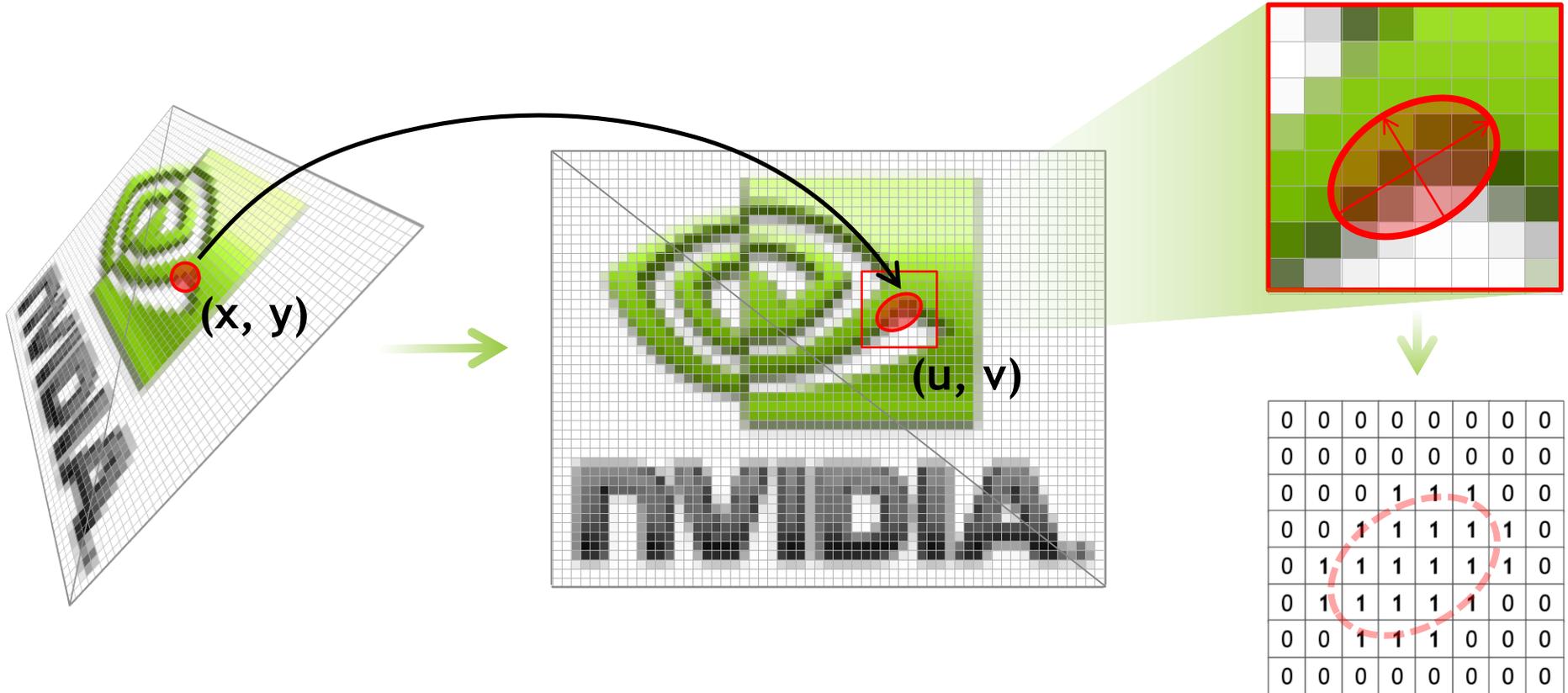
Decoupled shading pipeline



Can be cached and reused!

TEXTURE SPACE SHADING

Texture footprint return



NVIDIA TURING

Summary

Raytracing and AI is here, but don't overlook other cool toys in the design!

Hybrid techniques become more interesting than ever before

Go explore!

For more information, check out

Turing architecture whitepaper (just Google it)

Turing extensions for Vulkan and GL: <https://developer.nvidia.com/vulkan-turing>

Questions?

Email me at yuralsky@nvidia.com

?

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