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Third homework of fundamentals of computer graphics

I made 2 extra credits:

1. Adaptive Rendering;
2. Ray-Patch Intersection.

Adaptive Rendering

In order to complete this extra credit, I made:

- a new file: “yscenetracer_adp.cpp”;
- modified in “**yocto_pathtrace.h**” these structs:
  - pathtrace_state;
  - pathtrace_params.
- added in “**yocto_pathtrace.h**” the following variables:
  - struct trace_info;
  - struct pixel;
  - variable time_point;
  - struct sample_spread;
  - struct statistic.
- added in “**yocto_pathtrace.h**” the sign of the following functions:
  - function progress_callback_2;
  - create_sample_spread;
  - all_image_ij;
  - parallel_pixels_in_list;
  - checkEnd;
  - trace_until_quality;
  - trace_by_budget;
  - trace_image;
  - trace_sample;
  - collect_statistics;
  - get_max_progress;
  - get_actual_progress.
- in “**yocto_pathtrace.cpp**” I implemented the functions:
  - create_sample_spread;
  - all_image_ij;
  - parallel_pixels_in_list;
  - checkEnd;
  - trace_until_quality;

    - trace_by_budget;
    - trace_image;
    - trace_sample;
    - collect_statistics.
- in “**yocto_pathtrace.cpp**” I also modify:
    - init_state.
- in “**yscenetrace_adp.cpp**”:
    - added a settable parameter :”**--quality,-q**” to set the quality.

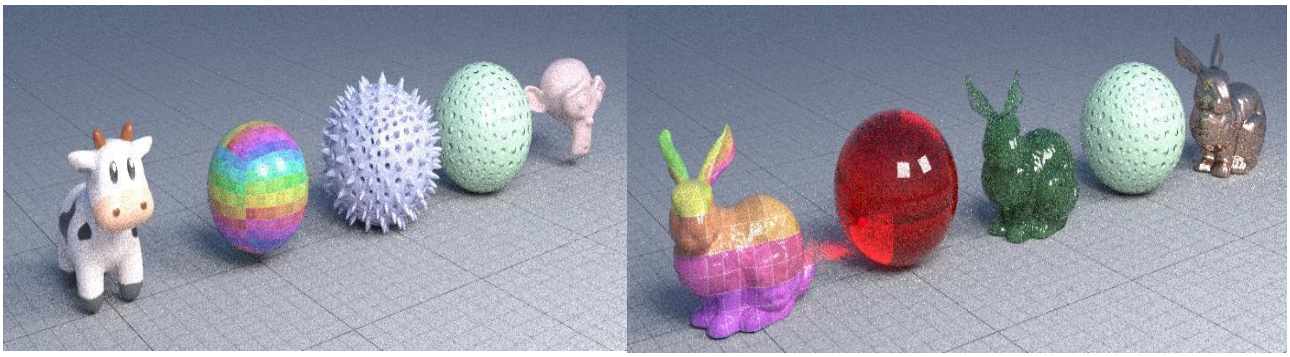

Figure 3 setting: -q 1

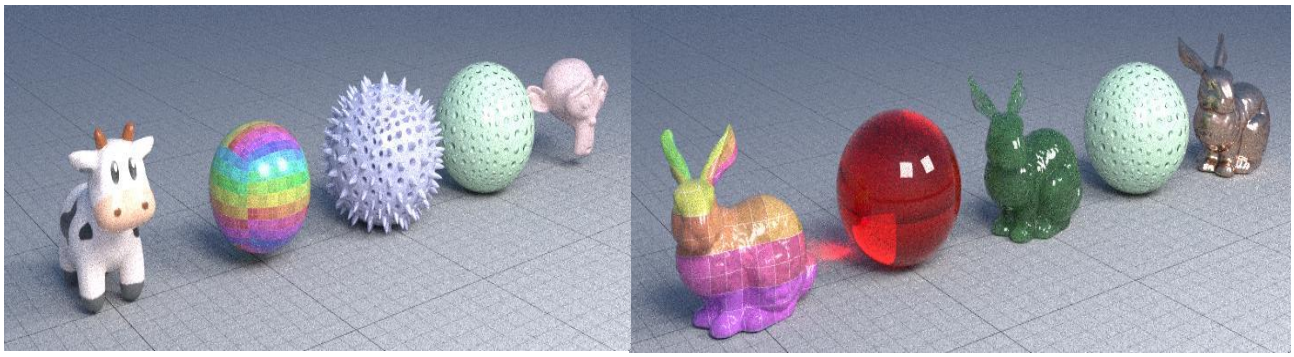

Figure 2 setting: -q 2

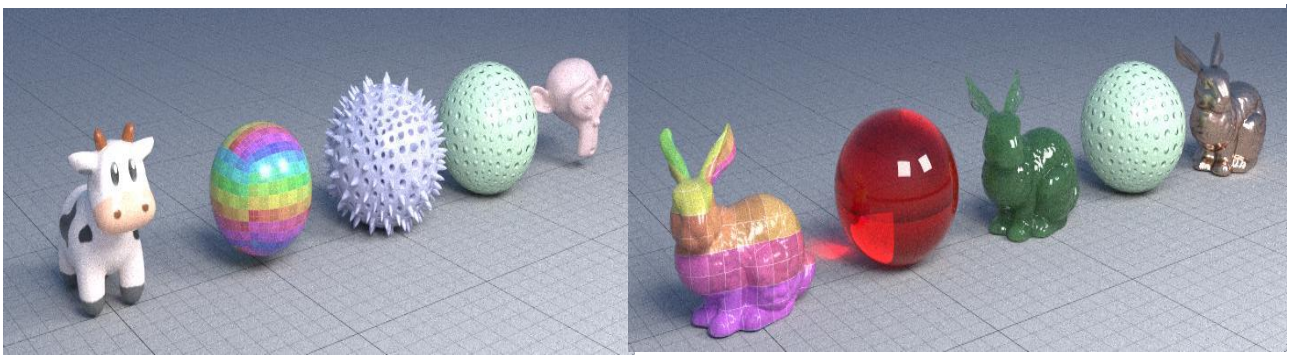

Figure 1 setting: -q 3

Figure 4 setting: -q 1 | setting: -q 2 | setting: -q 3

Ray-Patch Intersection

In order to complete this extra credit, I made:

- modified in "**yocto_pathtrace.cpp**":
  - Eval_element_normal;
  - Eval_element_tangent;
  - Eval_position;
  - Eval_texcoord;
  - Eval_normal;
  - Eval_normal_map;
  - Eval_shading_normal;
  - Init_bvh;
  - Init_lights;
  - Intersect_shape_bvh;
  - Sample_lights;
  - Tesselate_shape.
- Implemented in "**yocto_pathtrace.cpp**":
  - Function intersectPatch.
- added in "**yocto_pathtrace.h**" the sign of the following functions:
  - intersectPatch;
  - function set_quads.
- added in "**yocto_pathtrace.h**":
  - quads in the structure "pathtrace_shape".
- modified in "**ypathtrace**", "**yipathtraces**" and "**yscenetrace_adp**" **.cpp**:
  - init_scene;
  - and added a settable parameter :"**--ray-patch,-rp**" to use (or not) intersectPatch.

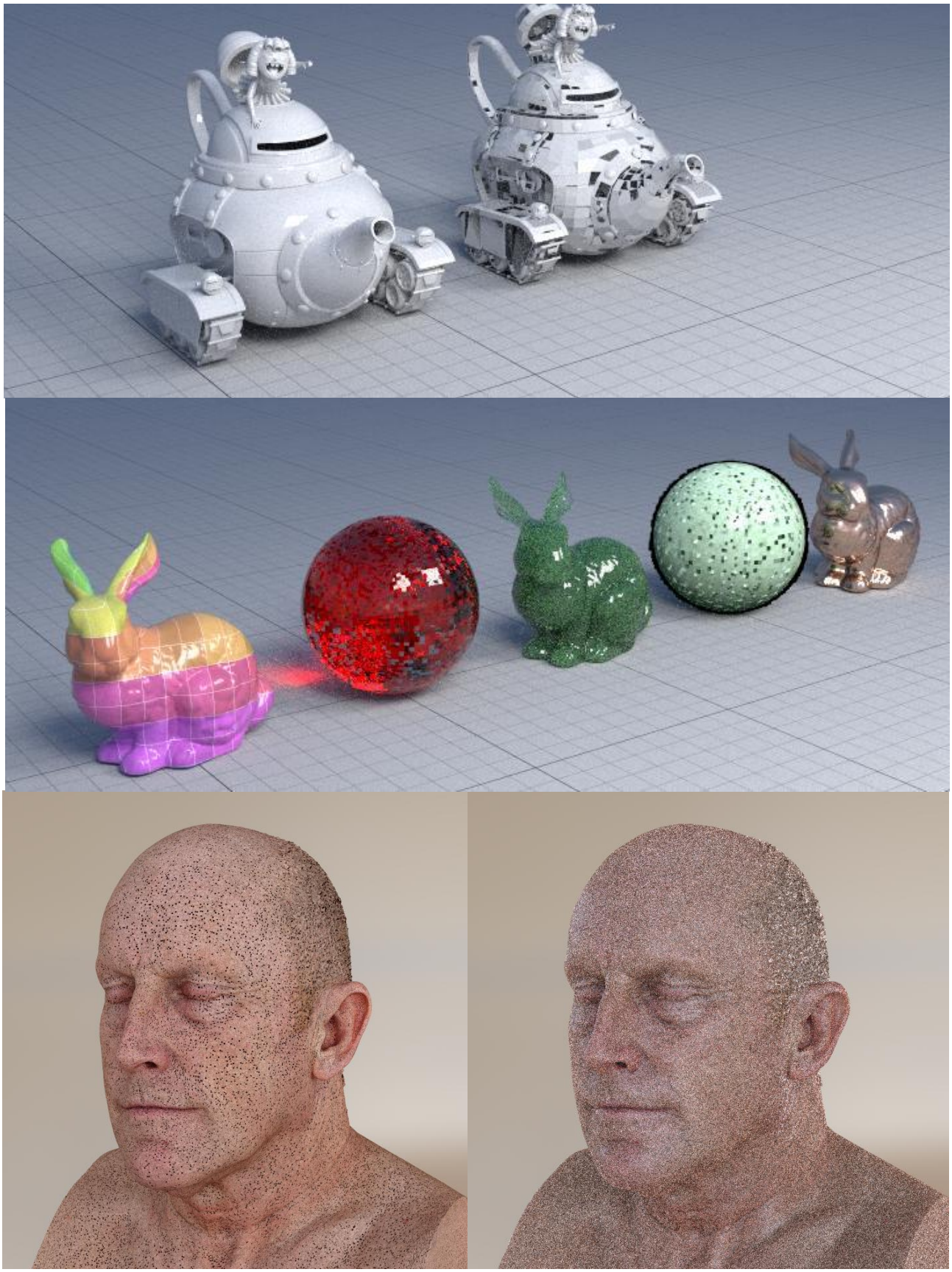

Figure 5 these are some examples of images generated with Ray Patch Intersect

Comparison

I also compared “02_rollingteapot_720_256” with and without Ray Patch Intersect in terms of time and this is the result:

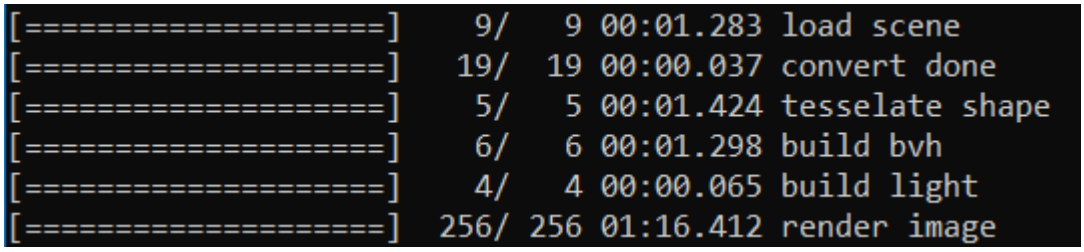

Figure 6 Time without Ray Patch Intersection

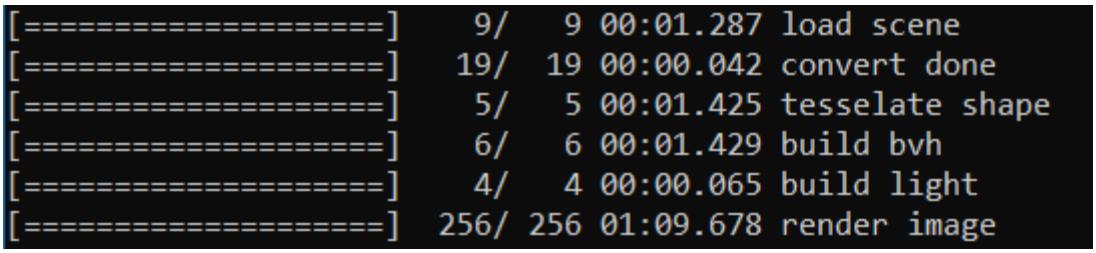

Figure 7 Time with Ray Patch Intersection