Material Memex: Automatic Material Suggestions for 3D Objects User Study Results

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MPI Informatik

1 Introduction

In this supplemental document, further details on the results of the evaluation of our approach for automatic material suggestions for 3D objects are provided. Please kindly refer to the paper for the complementing description.

2 User Study Details

Task Performance In a first study, we compare task performance in terms of completion time achieved by users of our interface, perceptual sliders, and keyword search. The full user study instructions for this experiment are given in a separate document. Section 1 shows images of all the results generated by the users. Table 1 provides timing details for a comic character (11 parts) and a car (140 parts). The averaged result is shown in Fig 1a.

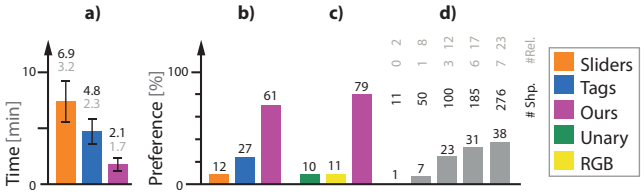


Figure 1: *Results of our user study* (left to right)*: a) time required by users to assign materials to an object using different interfaces, b) user ratings for results of material assignment with different approaches, c) comparison of other simpler approaches to our approach and d) results of change in database size to perceived quality of material assignment.*

Preference In a second study, 57 subjects were presented 10 random pairs of images produced with the different approaches in the previous study and had to choose the one with the better material assignment in a two-answer forced choice (2AFC) task. Results are given in Fig 1b.

Downgrades In a third study, we compare our approach against two simpler alternatives in how far users rate them worse than materials assigned by an artist. Section 2 shows the artist assigned materials. The first simpler alternative is a hypothetical method without a graphical model that only uses unary potentials but no pairwise potentials (images are show in Section 3). The second simpler alternative is a method that does not account for materials and uses only the diffuse RGB color during inference (images are show in Section 4). The final results of this study are shown in Fig 1c.

Database size In the last study, we investigate the dependency of quality on the database size (Fig. 1d). Subjects were presented images of objects with our material assignment, but produced from databases of increasing size. Again, subjects were asked to select the preferred material composition when presented 320 random pairs from all four database sizes in a 2AFC.

		COMIC			CAR		
User	Exp.	Sliders	Keyw.	Ours	Sliders	Keyw.	Ours
1	5	03:55	03:05	01:10	06:12	05:55	02:32
2	2	05:40	03:25	02:10	10:00	05:54	03:15
3	5	03:55	02:24	00:47	10:00	10:00	06:03
4	2	04:50	02:10	00:25	10:00	10:00	01:07
5	1	04:06	01:43	00:48	06:23	02:20	02:42
6	1	07:15	03:57	00:50	06:46	10:00	02:53
7	5	02:23	02:16	01:00	10:00	03:33	03:04
8	3	02:15	02:12	00:53	10:00	06:55	04:35
9	1	10:00	05:57	00:48	10:00	06:36	02:21
10	3	03:38	04:20	03:48	10:00	10:00	10:00
11	3	03:05	04:15	00:27	06:30	10:00	02:23
12	1	04:18	03:04	00:23	10:00	04:25	01:16
13	1	10:00	04:37	01:40	10:00	03:41	01:18
14	1	10:00	05:15	01:29	10:00	06:15	02:51
15	4	04:37	02:41	00:45	10:00	10:00	04:10
16	3	02:07	03:55	02:08	10:00	06:32	04:28
17	3	02:19	01:53	00:54	10:00	04:40	01:10
18	2	02:02	02:01	01:20	07:40	06:30	03:10
19	1	03:00	02:50	00:53	10:00	05:50	01:36
20	4	01:02	00:52	00:35	10:00	03:50	01:50
21	1	04:20	03:40	00:32	10:00	06:40	00:45
22	1	04:24	04:00	01:03	10:00	05:20	02:57
23	1	03:20	03:00	00:35	10:00	04:24	01:50
24	2	02:20	02:10	01:12	10:00	04:50	03:15
Mean	2.3	04:22	03:09	01:06	09:19	06:25	02:59
Median	2.0	03:55	03:02	00:53	10:00	06:05	02:47
Std. dev	1.4	02:33	01:13	00:45	01:23	02:24	01:57

Table 1: *Results for the task performace study per subject.*

DB size	CAR	COMIC
276	7	23
185	6	17
100	3	12
50	1	8
10	0	2

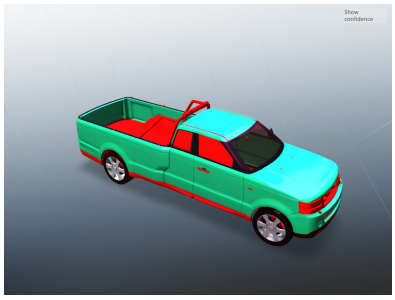
Table 2: *Number of relevant objects for the* CAR *model and the* COMIC *character for different database sizes.*

When the database size changes, the number of very similar objects in the database changes accordingly. In Table 2 and Fig. 1d we provide details on the number of relevant objects for different database sizes. In order to compute these numbers, we defined a fixed threshold for shape similarity. An object is relevant if

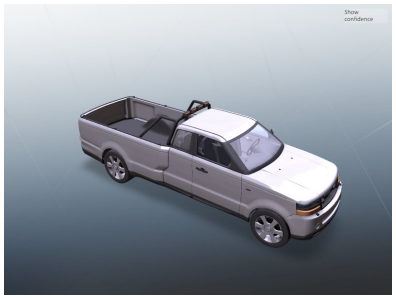
$$|\mathbf{s}(\hat{S}) - \mathbf{s}(S_m)|/\mathbf{s}(S_m) \leq 0.1.$$

1. User Interface Comparisons

Subject 1



Slider Interface



Keywords Interface

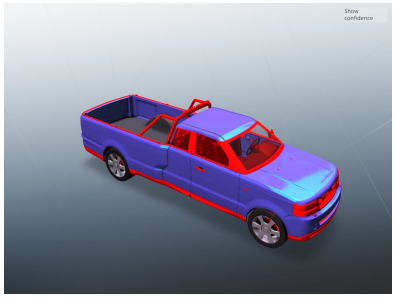
Our Interface

Slider Interface

Keywords Interface

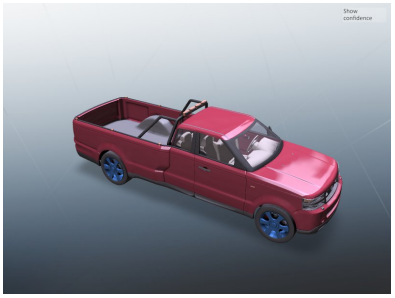
Our Interface

Subject 2



Slider Interface

Keywords Interface



Our Interface

Slider Interface

Keywords Interface

Our Interface

Subject 3

Slider Interface

Keywords Interface

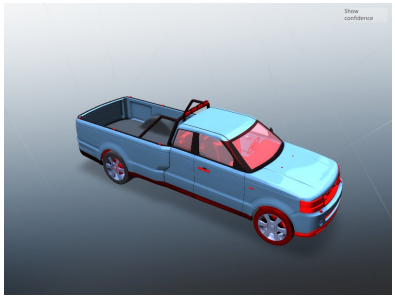
Our Interface

Slider Interface

Keywords Interface

Our Interface

Subject 4



Slider Interface

Keywords Interface

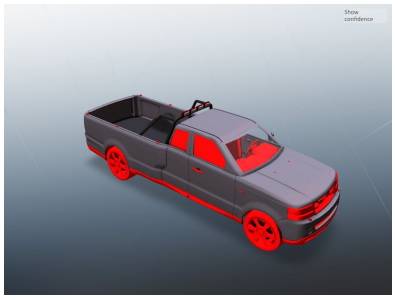
Our Interface

Slider Interface

Keywords Interface

Our Interface

Subject 5



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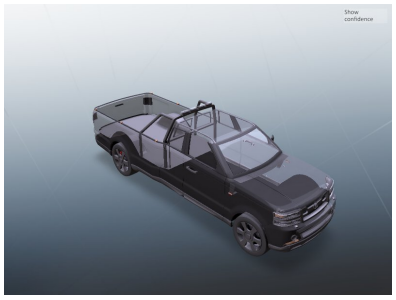

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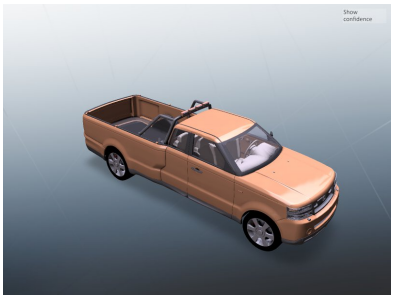


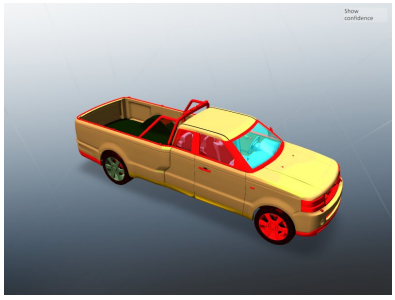
Our Interface

Slider Interface

Keywords Interface

Our Interface

Subject 6



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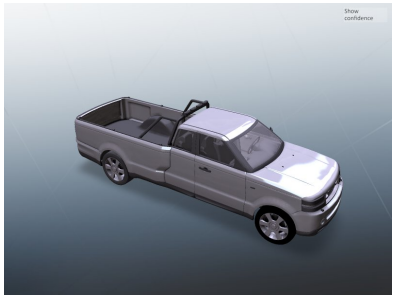

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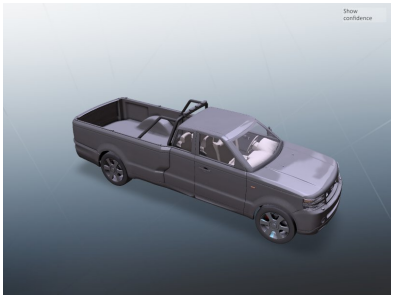

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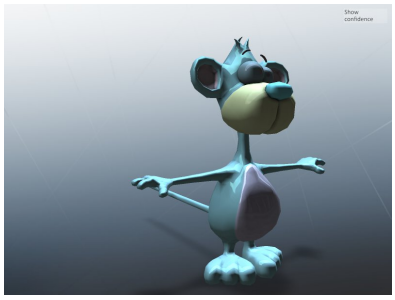
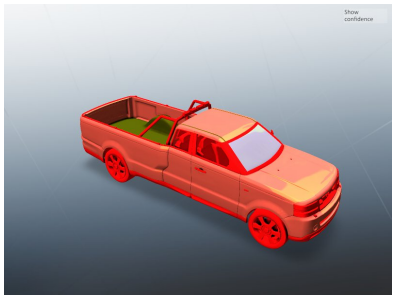


Slider Interface

Keywords Interface

Our Interface

Subject 7

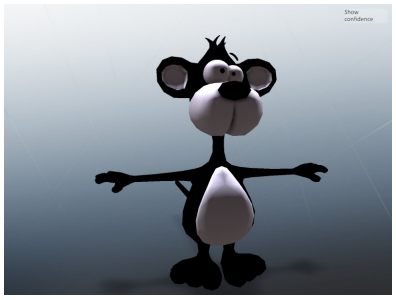


Slider Interface

Keywords Interface

Our Interface

Slider Interface



Keywords Interface

Our Interface

Subject 8

Slider Interface

Keywords Interface

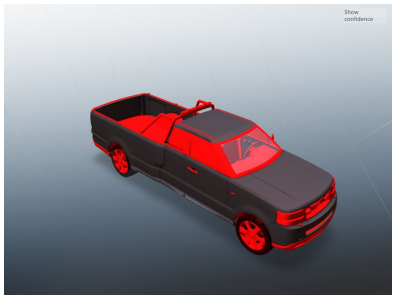
Our Interface

Slider Interface

Keywords Interface

Our Interface

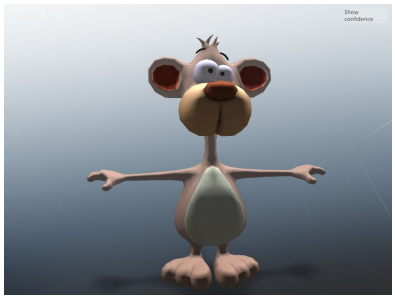
Subject 9



Slider Interface

Keywords Interface

Our Interface

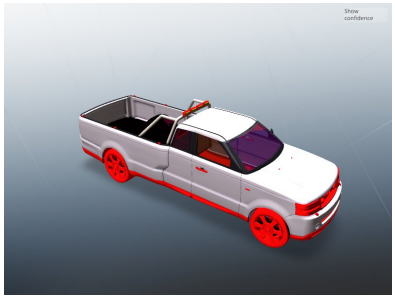


Slider Interface

Keywords Interface

Our Interface

Subject 10



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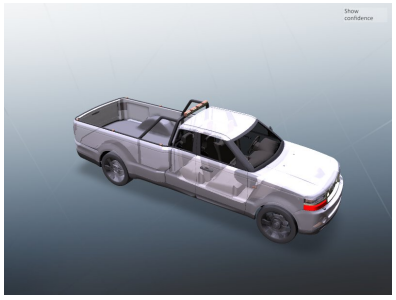

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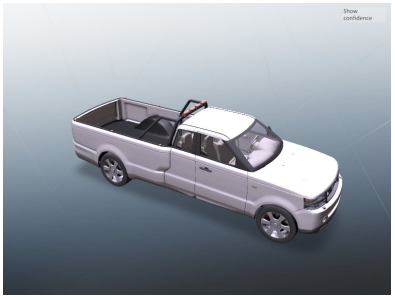


Our Interface

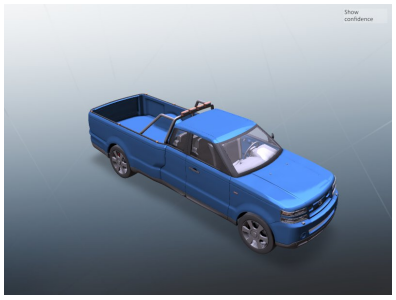
Slider Interface

Keywords Interface

Our Interface

Subject 11

Slider Interface



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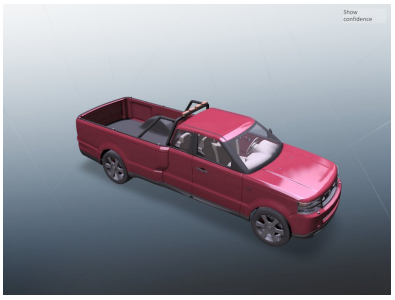


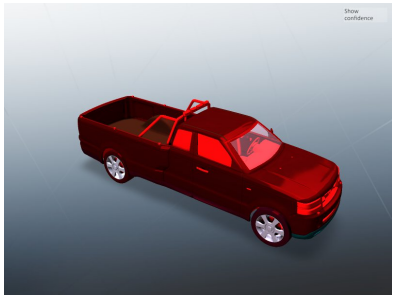
Our Interface

Slider Interface

Keywords Interface

Our Interface

Subject 12



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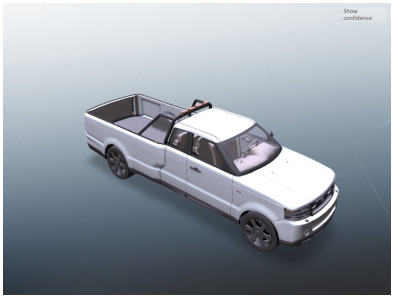


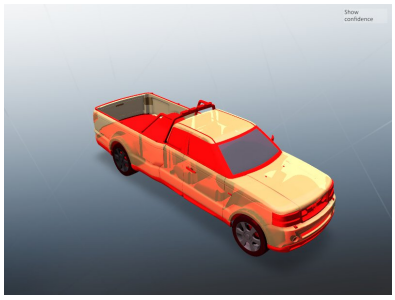
Our Interface

Slider Interface

Keywords Interface

Our Interface

Subject 13



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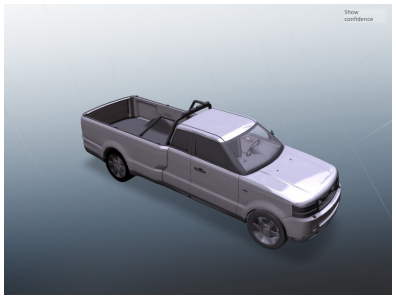


Keywords Interface

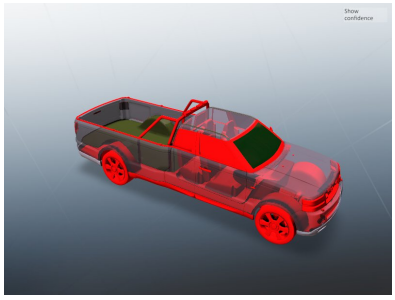
Our Interface

Slider Interface

Keywords Interface

Our Interface

Subject 14



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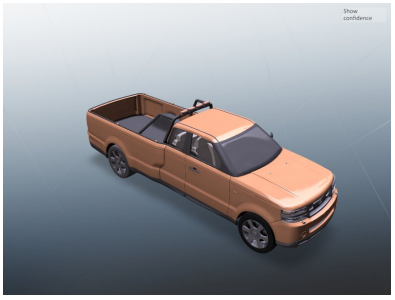

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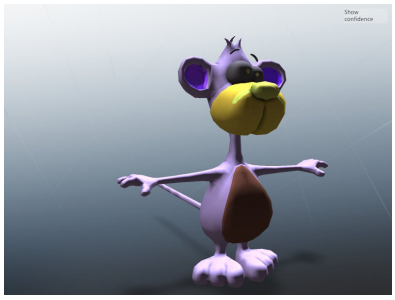

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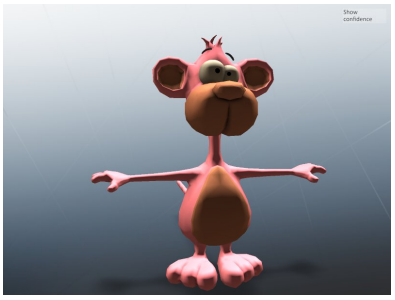
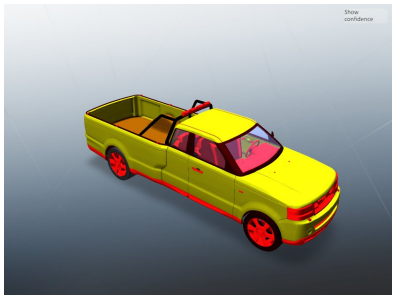


Our Interface

Subject 15



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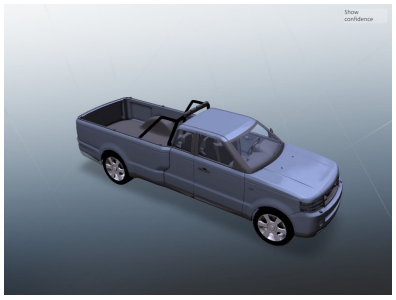

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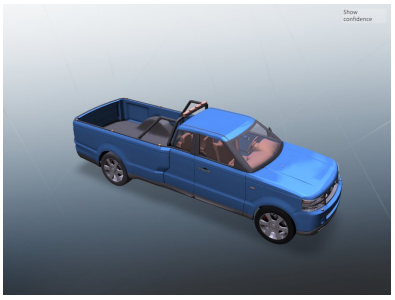


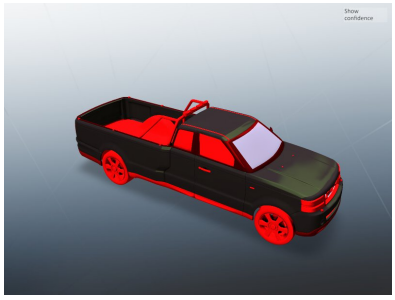
Our Interface

Slider Interface

Keywords Interface

Our Interface

Subject 16



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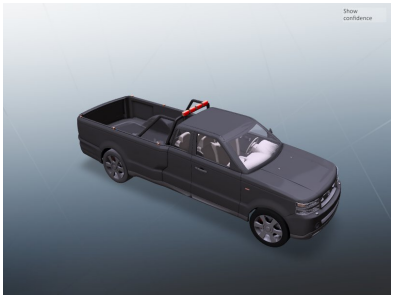
Keywords Interface



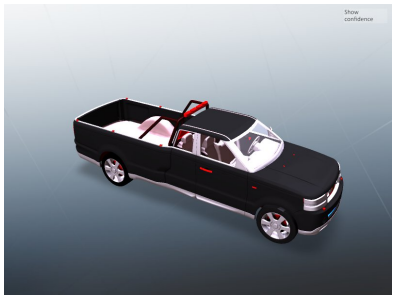
Our Interface

Slider Interface

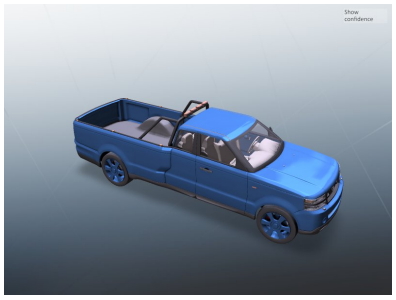
Keywords Interface

Our Interface

Subject 17



Slider Interface



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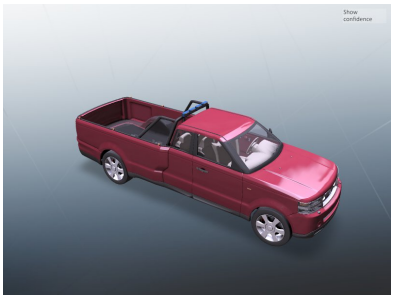


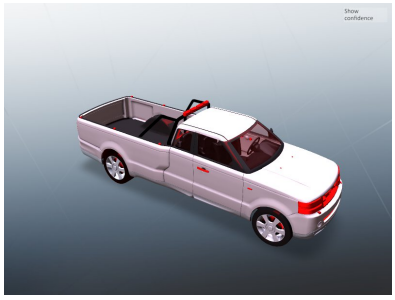
Our Interface

Slider Interface

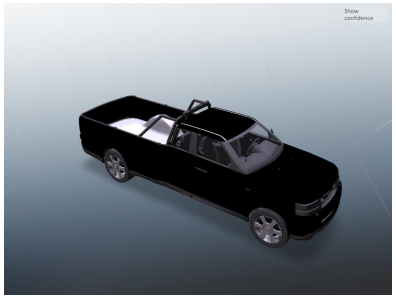
Keywords Interface

Our Interface

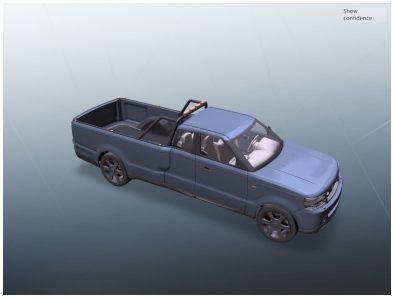
Subject 18



Slider Interface



Keywords Interface



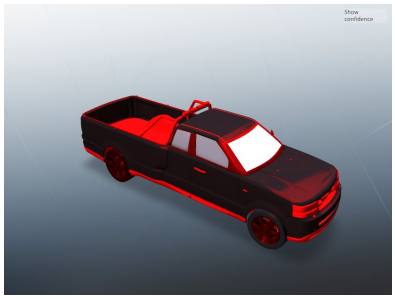
Our Interface

Slider Interface

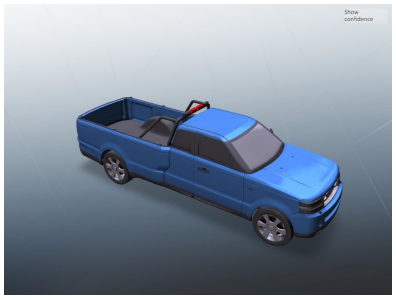
Keywords Interface

Our Interface

Subject 19



Slider Interface



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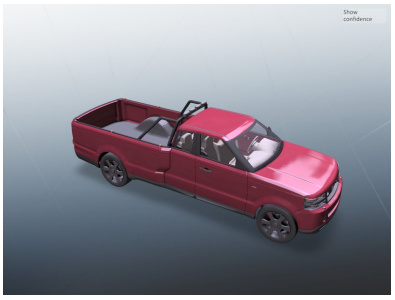


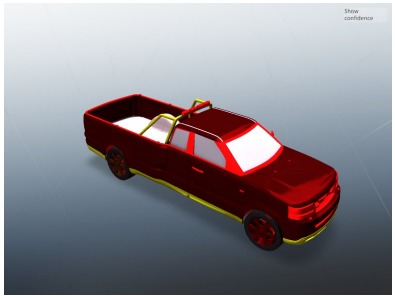
Our Interface

Slider Interface

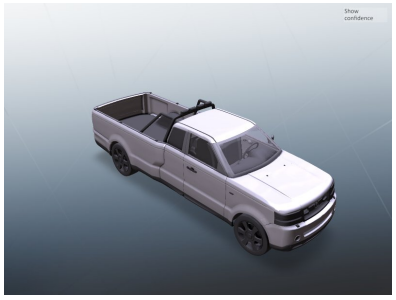
Keywords Interface

Our Interface

Subject 20



Slider Interface



Keywords Interface

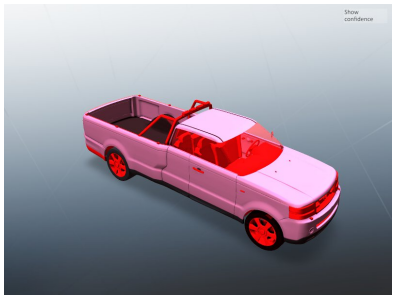
Our Interface

Slider Interface

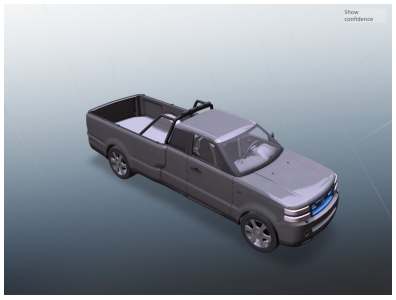
Keywords Interface

Our Interface

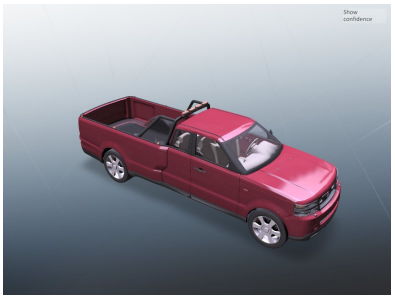
Subject 21



Slider Interface



Keywords Interface



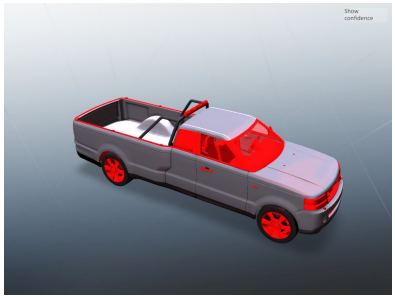
Our Interface

Slider Interface

Keywords Interface

Our Interface

Subject 22



Slider Interface

Keywords Interface

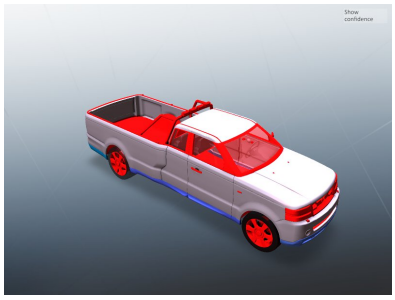
Our Interface

Slider Interface

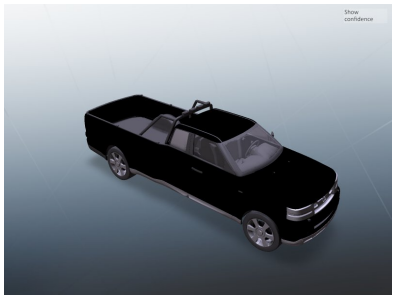
Keywords Interface

Our Interface

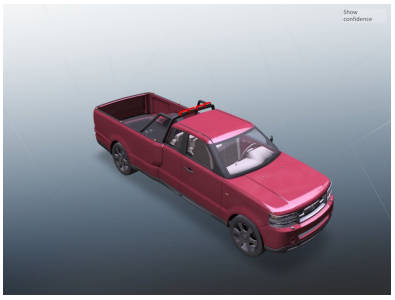
Subject 23



Slider Interface



Keywords Interface



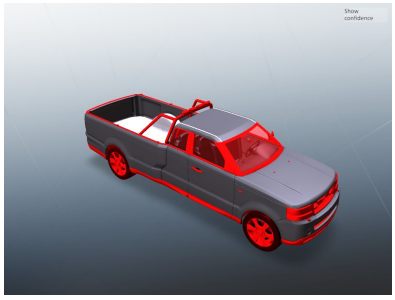
Our Interface

Slider Interface

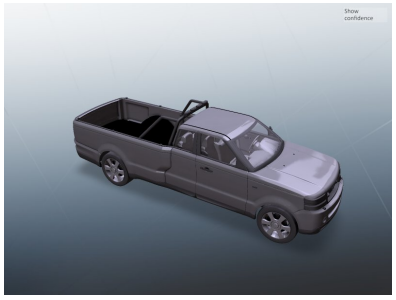
Keywords Interface

Our Interface

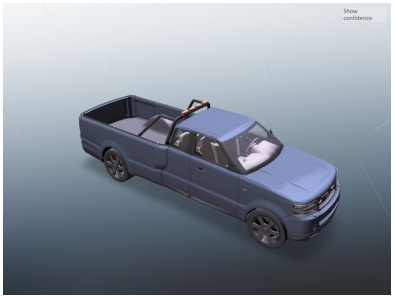
Subject 24



Slider Interface



Keywords Interface



Our Interface

Slider Interface

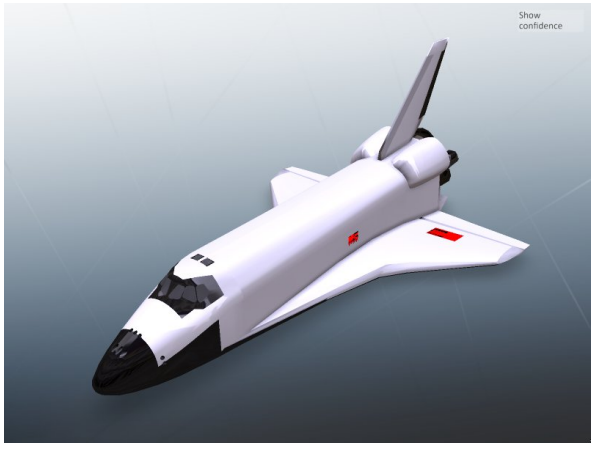
Keywords Interface

Our Interface

2. Ground Truth Images

Artist assigned materials for Pickup Truck

Artist assigned materials for Comic Character



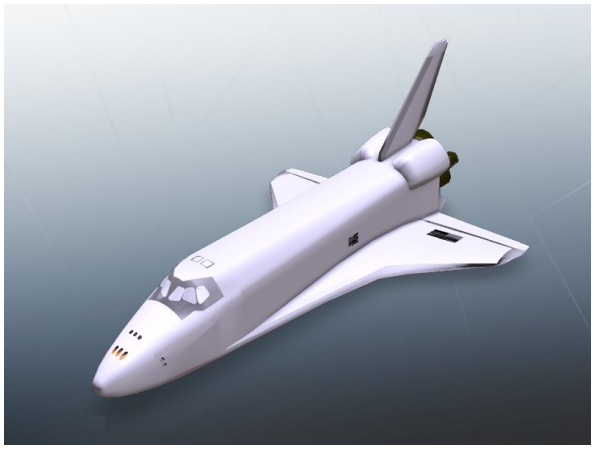
Artist assigned materials for Shuttle

3. Downgradings

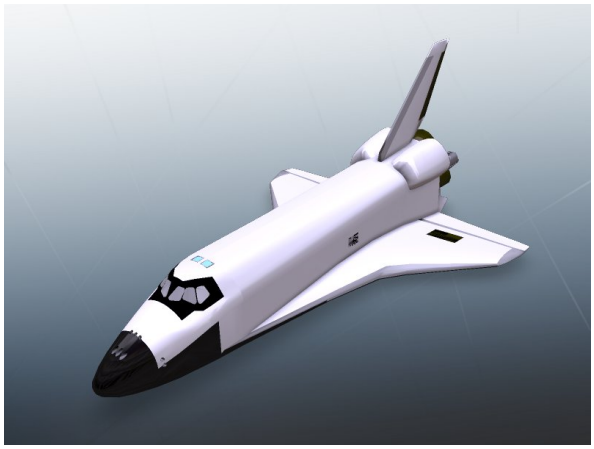
Downgrading 1: Unary Only

Without pair-wise factors

With pair-wise factors



Without pair-wise factors

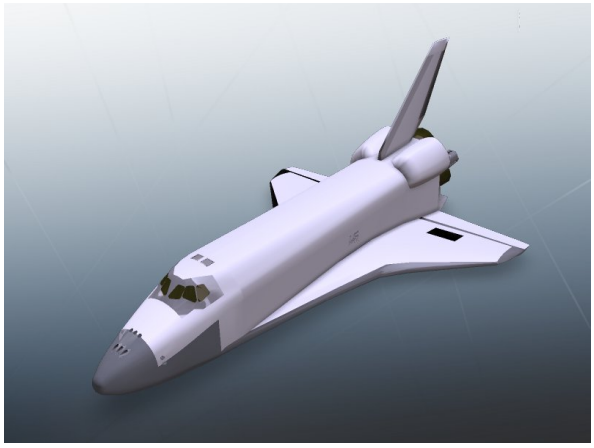


With pair-wise factors

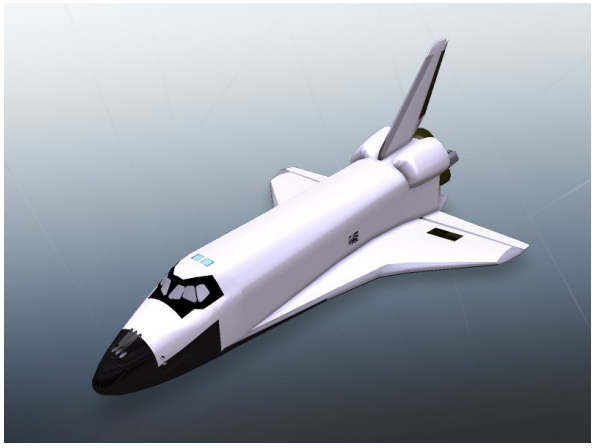
Downgrading 2: Only Diffuse Component for Color-Difference

With diffuse only material distance

Complete material distance



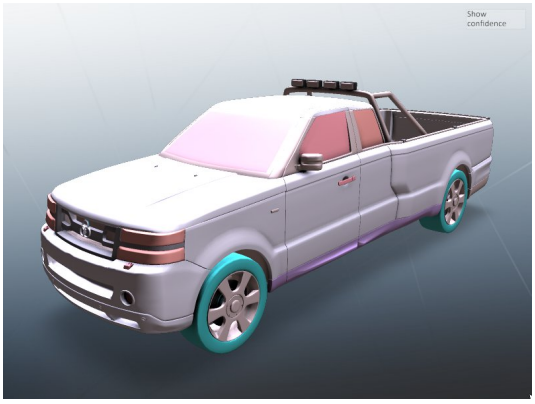
With diffuse only material distance



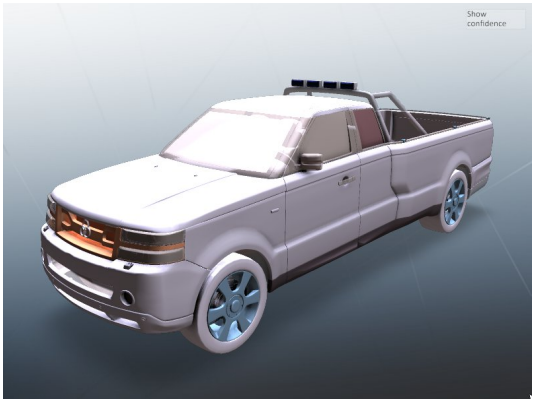
Complete material distance

4. Varying Database Size

Object 1: Pickup Truck



With 10 objects in database



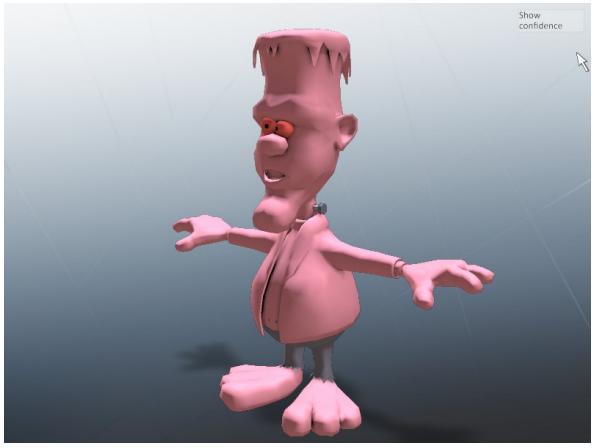
With 50 objects in database

With 100 objects in database

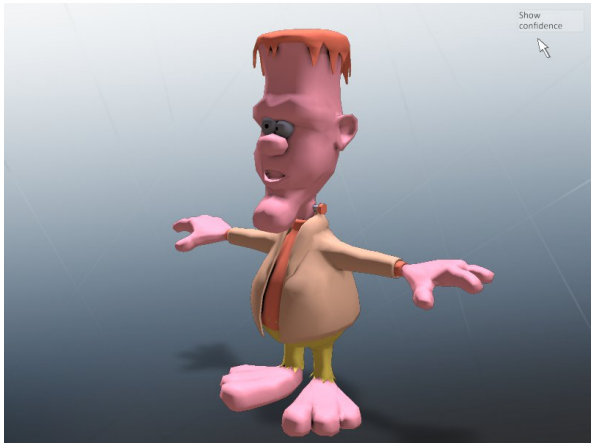
With 185 objects in database

With 275(all) objects in database

Object 2: Comic Character



With 10 objects in database



With 50 objects in database

With 100 objects in database

With 185 objects in database

With 275(all) objects in database