MInf Project: Summary & Schedule

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1 Summary

The main goal of this project is to generate an algorithm that can compute the best next view when applying the space carving algorithm to objects with articulated shapes. Unlike the common largely convex shapes, articulated shapes are more tough to deal with due to their non-convexity and porosity. The original way of accumulating data from a number of evenly distributed views may fail in these cases, loosing both accuracy and efficiency. Therefore, we are designing an interactive and iterative process in which the next view is computed based on the partial model we already built with data acquired previously. Obviously, the algorithm that decide which is the best next view plays a crucial part in the process.

The work can be divided into three steps: First of all, a implementation of space carving algorithm, from extracting the silhouette of the object to projecting and carving, is needed. We will implement the algorithm based on RGB images but also make extension for depth maps as we are dealing with RGB-D images in the future work. We can use open source 3D datasets like Multiview Datasets , which provide photos from multiple views and their corresponding projection matrices, to test our program. After carving, we use tools like meshlab to visualize the result.

Then, we need to find a mathematical way to describe the procedure of carving and come up with reasonable algorithm to compute the next view. Many factors should be taken into consideration: the next view should not only provide as much information as possible but also should not be too far from present view so that it won't be too time-costly for the camera to travel to the next position. We can use RGB cameras and RGB-D cameras to get the photographs of the object from multiple views, and we are generating algorithms for both the two kinds of cameras. The tests of algorithms will be held in simulation environment first, and after that we can try to collect some real data in the laboratory and do tests in the real environment.

At last, we will analyse the algorithms. To be specific, we are going to compare the RGB-based algorithm and the RGBD-based algorithm by their accuracy and efficiency.

2 Schedule

Important time point:

- Fri 24 Jan: Submit interim report

- Thu 2 Apr: Submit final report

- Week of 27 Apr: Presentation/demo

Schedule:

<table>
<tr><th colspan="2">time</th><th>task</th></tr>
<tr><td rowspan="5">Sem1</td><td>wk2
wk3</td><td>implement a simple version of space carving algorithm</td></tr>
<tr><td>wk4
wk5</td><td>improve the implementation
prepare the simulation environment</td></tr>
<tr><td>wk6
wk7
wk8
wk9</td><td>finish the first version of algorithm
test it in simulation environment</td></tr>
<tr><td>wk10
wk11</td><td rowspan="4">improve the algorithm
write the interim report
(do tests in real environment if time available)</td></tr>
<tr><td>Rev/Exam</td><td>wk1
wk2</td></tr>
<tr><td>Vac</td><td>wk2
wk3
wk4</td></tr>
<tr><td rowspan="3">Sem2</td><td>wk1
wk2
wk3
wk4
wk5
wk6
wk7</td><td>test the algorithm in real environment
analyse the performance</td></tr>
<tr><td>wk8
wk9
wk10
wk11</td><td>finish the report</td></tr>
<tr><td rowspan="2">Vac</td><td>wk1
wk2</td><td rowspan="3">prepare for the presentation</td></tr>
<tr><td>Rev</td><td>wk1</td></tr>
<tr><td>Exam</td><td>wk1</td></tr>
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