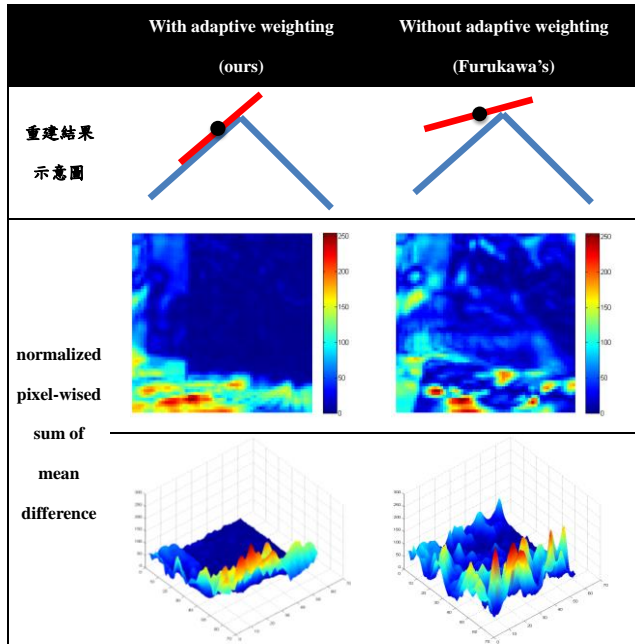# 以粒子群最佳化技術重建稠密式物體三維模型
Dense 3D Reconstruction with Particle Swarm Optimization
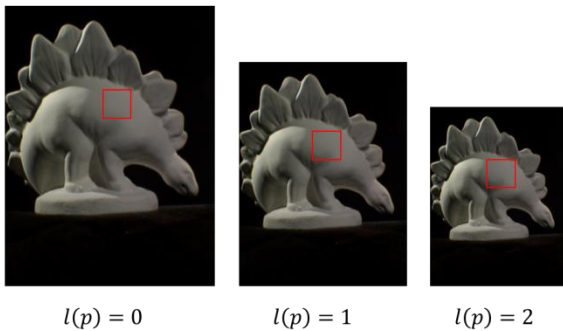
學生：宋秉一　　　　　指導教授: 陳稔 教授

This paper presents a stochastic optimization based multi-view stereo (MVS) approach for 3D dense reconstruction. We propose to apply adaptive weighted stereo matching functions to achieve more accurate optimization result. On the other hand, the reconstruction completeness falls short of the lack of enough visible views. We advocate allowing the child patch to borrow the parent visible view when needed even though the parent view is not in the specified viewing angle range. In addition, we shall adopt a GLN-PSO stochastic patch optimization method to avoid the local traps of a derivative based numerical optimization method. To improve the reconstruction quality we propose a patch priority queue to select the best patch to search for the next patch for the patch expansion process.
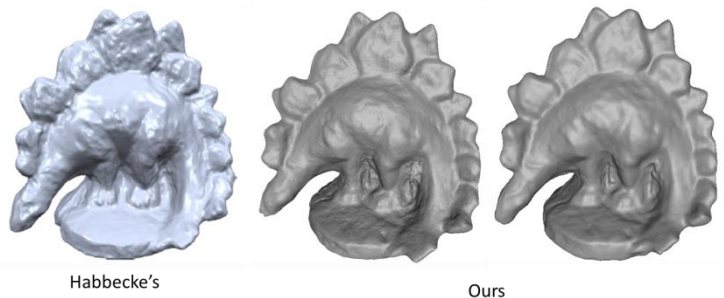
Adaptive Weighting

With adaptive weighting (ours)　　　Without adaptive weighting (Furukawa's)

重建結果示意圖

normalized pixel-wised sum of mean difference

Level of Detail

Scale ratio $\varepsilon = 0.8$

$l(p) = 0$　　　$l(p) = 1$　　　$l(p) = 2$

Optimization Strategy

- Inserting initial patch parameter to particle pool
  - Estimated $n(p)$
  - Estimated $d(p)$

Type	Average Fitness
GLN-PSO w/o initial particle	5.0581
GLN-PSO with initial particle	**4.1242**
PSO w/o initial particle	5.5116
PSO with initial particle	4.3865

Pawn dataset **10266** seed patch optimization with **60** iteration

Reconstruction Result

Habbecke's　　　Ours

Ours　　　Furukawa's