Sketch-Based Modeling of Planar Linkages

PAPER ID# 0314

1 Solution Distribution

Figure A shows the effect on the solution distribution of adding Gaussian noise σ to the input poses. For up to four poses, there are an infinite number of solutions that traverse the input poses exactly. However, for five poses there is only one solution. Hence, by adding a Gaussian noise $\sigma > 0$ to the input poses, a greater variation of solutions can be obtained in all cases potentially producing a more desired linkage solution.

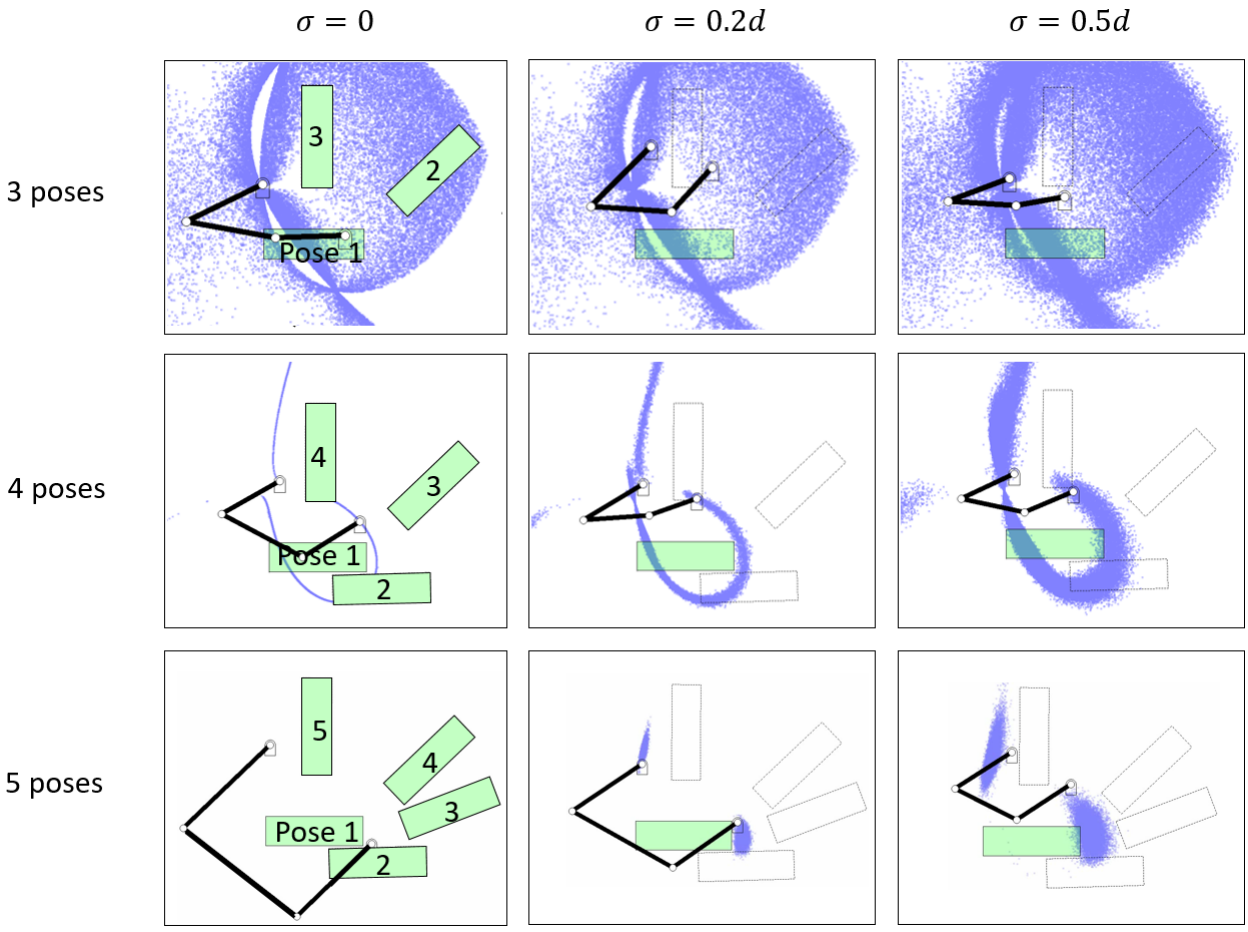

Figure A. **Solution distribution**. The blue dots represent the solutions for the fixed joints at the initial pose, and the best linkages are shown. As the Gaussian noise σ for the input poses increases, more variation of solutions can be obtained, which enables our approach to find a better solution.

2 Cost Evolution with the Particle Filter

As discussed in Section 6, we use $\lambda = 20$ to facilitate the convergence of the particle filter. Figure B shows the cost evolution using the particle filter for some of our examples. The high value of λ in Equation 10 helps a quick convergence of the cost distribution of the particles. One hundred particles are resampled at each iteration.

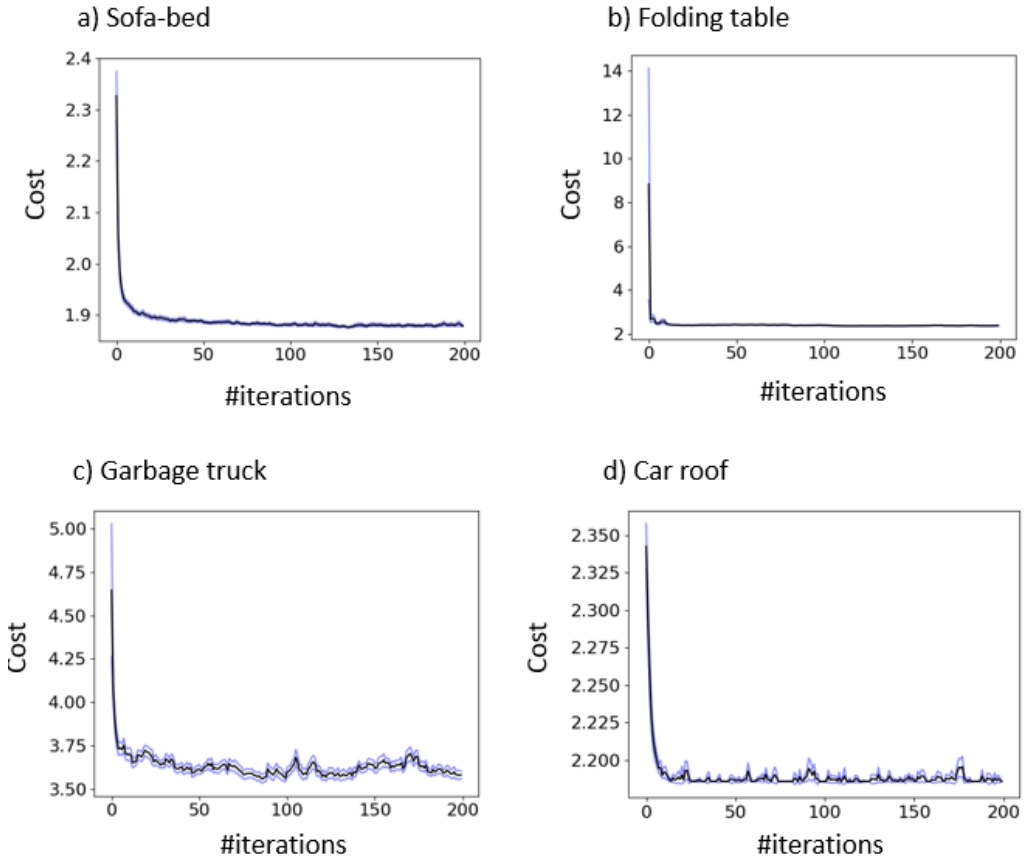

Figure B. **Cost evolution through the particle filter.** The cost distribution quickly converges thanks to a high $\lambda = 20$. The blue lines represent the 95% confidence interval, and the black lines represent the mean cost.

3 User Study

Figure C shows the linkages designed by the participants of the user study. While all eight participants successfully finished the first task, three did not complete the second task; hence, only five linkages are shown for the second task.

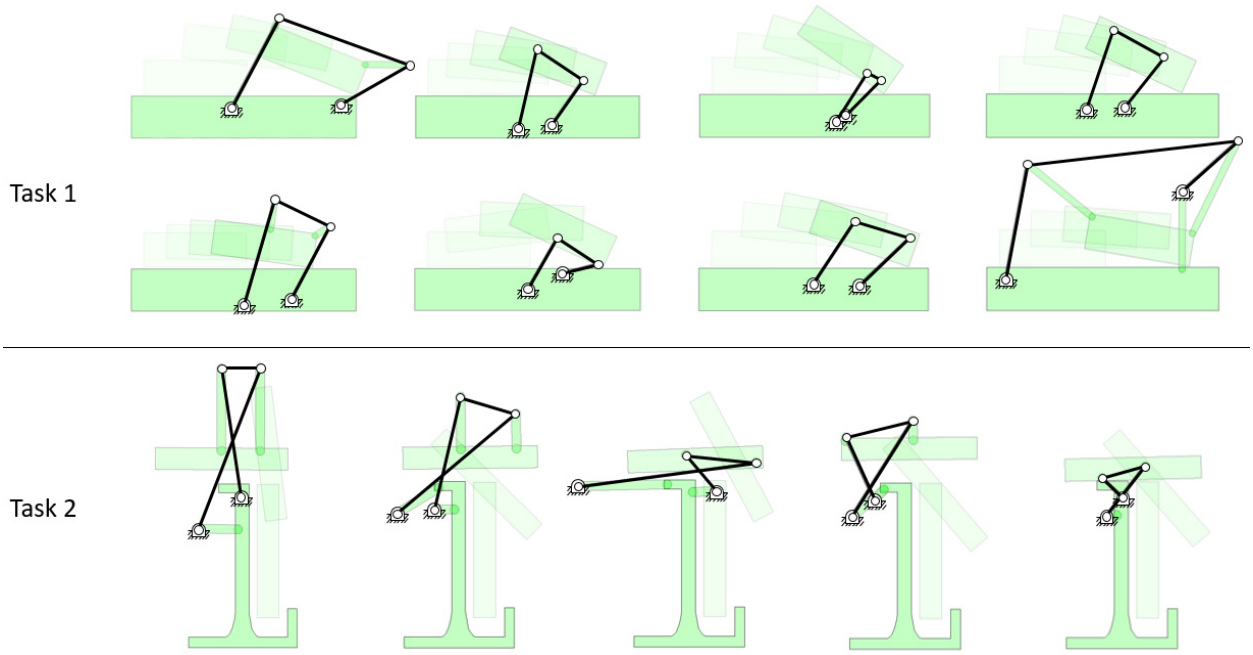

Figure C. **Linkages designed during the user study**. All the linkages designed by the eight participants are shown for Task 1. For Task 2, three participants gave up without completing the task, so only five results are shown.