Literature Review 1
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Primary Paper:
"Interactive Modeling of Mechanical Objects" by F. G. Ureta, C. Tymms, and D. Zorin.

Secondary Paper:
"Design and Fabrication by Example" by A. Schulz, A. Shamir, D. I. W. Levin, P. Sitthi-amorn, and W. Matusik

Paper Review:
By using the off-the-shelf tools, it is effortless to model the static shape of an object. However, in order to model mechanical objects with joints such as lights and drawers, it becomes complicated and requires a great deal of time and effort for error-prone experimental and geometrical calculations. Specifically, users must repeatedly try different locations, directions, and sizes. Since mechanical objects are operable, the user must imagine these movements and carefully match them to the model. Current tools do provide the capability to perform mechanical modeling, but it requires expertise in mechanics and modeling to manipulate the low-level geometry and motion of joints.

In order to solve this problem, the author in the main paper introduced many kinds of algorithms and proposed a novel software that allows novice users to interactively model mechanical objects [2]. With the rigid parts and joint types given by the user, the software deduces the position, orientation, and size of the joint. Proposed multiple joint configuration, the user can also change the configuration until satisfied. In addition, the movement of a mechanical object is visual and it helps the user to find errors before the object is printed and physically attempted. The author conducted user experiments to show the inexperienced users the efficiency of the software.

For the benefit of this article, the software has done a great deal of work in simplifying the time-consuming and error-prone design process of mechanical objects, and in particular, by reducing trial and error in the design of connectors. This work also enables non-professional users to simulate mechanical objects. Another advantage of this article is that the authors did not introduce any new algorithms to make the software happen, but carefully selected and widely used some recent and existing heuristics. However, the authors did not publish their work for people to use, but simply left the work on paper. The software interface is also not discussed, nor provide the screenshots.

In the bibliography, I chose an earlier-published paper, the author tried to solve the same problem, but adopted a different approach. The authors explored a data-driven approach by collecting three-dimensional models of mechanical objects from experts and converting them into parametric templates for use by users [1]. In the interface, users can drag any template part onto the 3D model working and change the position, orientation, and size of the part. Parts are automatically aligned and connected. To prevent the printout from crashing, perform a stability analysis.

Compared with the secondary paper, the advantages and disadvantages of the data-driven approach are obvious. The joints that the user can drag are limited to the collected models, which themselves need to be built by experts. Compared to [2], the latter provides only three basic joint types, and more joint types must be programmed, and the former user can choose any joint that appears in the template. The advantage of [1] is that it provides a comprehensive range of joint types and enables a more complex and stable model. This strength is also a weakness, and users can not print all types of connectors or connectors, but must purchase it from a retailer.

References

[1] A. Schulz, A. Shamir, D. I. W. Levin, P. Sitthi-amorn, and W. Matusik, “Design and Fabrication by Example,” ACM Transactions on Graphics (TOG) - Proceedings of ACM SIGGRAPH 2014, vol. 33, no. 4, pp. 62:1–62:11, 2014.
[2] F. G. Ureta, C. Tymms, and D. Zorin, “Interactive Modeling of Mechanical Objects,” Computer Graphics Forum, vol. 35, no. 5, pp. 145–155, 2016.