Experiment Instruction: Shrinky dinks for self-assembly

Principles:

Please see https://en.wikipedia.org/wiki/Shrinky_Dinks for details. The Shrinky dinks will shrink upon heating. From reference [1], we select the structure shown in figure 1 as the example. The red layer of paperboard is covered by the transparent layer made by Shrinky Dinks. The two layers are bonded by the super glue (red dots in the figure). Once heated, the Shrinky Dinks will shrink over 50% and drag the paperboard layer to form a pyramid structure. The dimension relation of the pattern can be calculated by the mathematical expression shown in the figure 1.

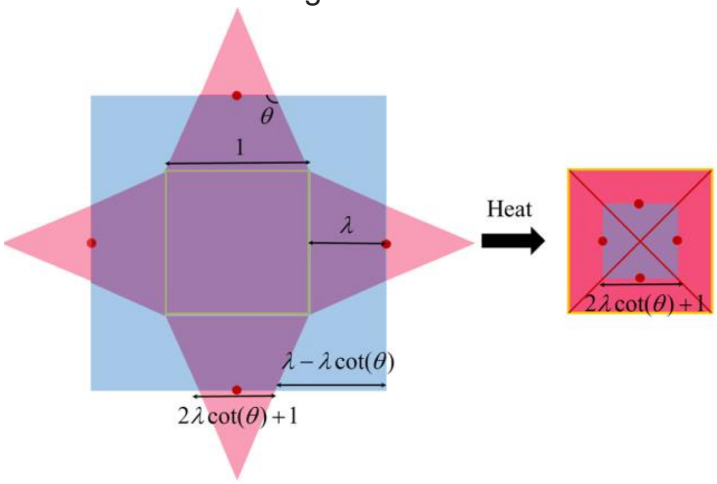

Figure 1. Schematic showing the assembly

Preparation:

The experiment process of the Shrinky Dinks for self-assembly needs the following items shown in figure 2:

- **Paperboard.**
- **Shrinky Dinks.**
- **Kapton tape** for connecting two panels of paperboard.
- **Scissor** for cutting paperboard and Shrinky Dinks.
- **Super glue** for attaching Shrinky Dinks onto paperboard.

Figure 2. Items for the experiment of Shrinky Dinks for self-assembly

Steps:

1. Select your preferred size value and use the mathematical expression shown in figure 1 to calculate the length values of every edge.

2. Use the scissor to cut out the pattern as shown in figure 3 and figure 4.

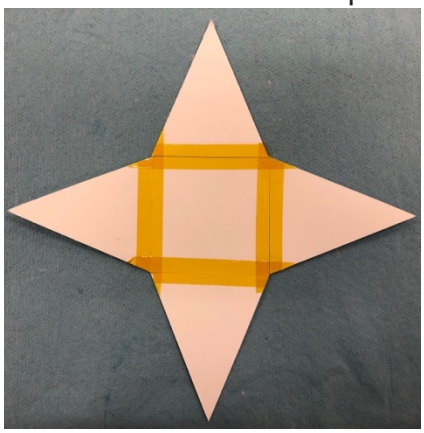

Figure 3. Shape of the paperboard

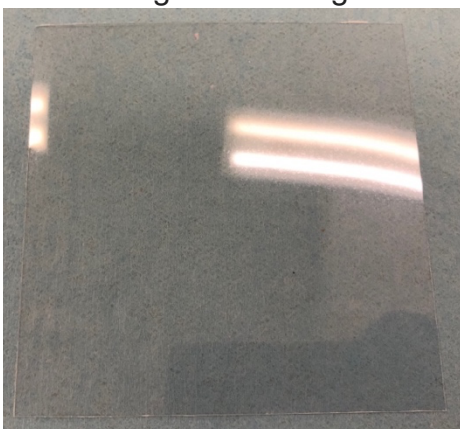

Figure 4. Shape of the Shrinky Dinks

3. Bond the paperboard and Shrinky Dinks together with the super glue as shown in figure 5. The super glue is located at the middle point of each edge of Shrinky Dinks. Heating can accelerate the curing process of the super glue. The gluing area is around 3 mm in size.

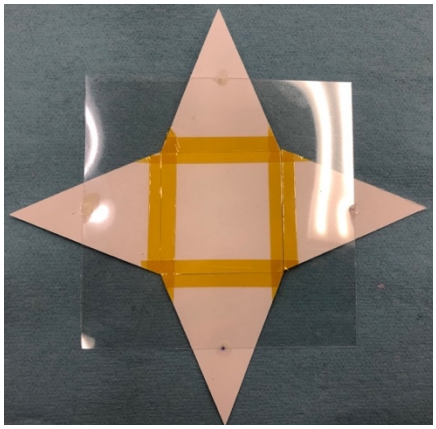

Figure 5. Paperboard and Shrinky Dinks

4. Heat the sample at 180 °C in the oven for 2 min. You will get a pyramid structure shown in figure 6.

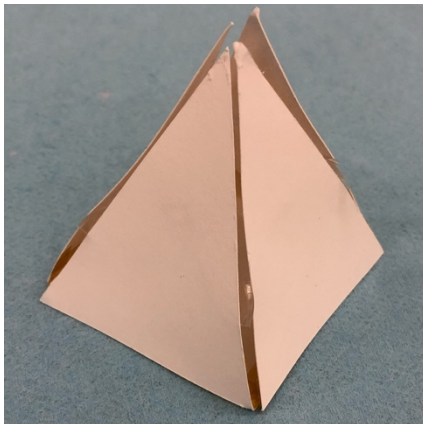

Figure 6. Self-assembly

Reference:

[1] J. Cui, J. G. Adams, and Y. Zhu, “Pop-up assembly of 3D structures actuated by heat shrinkable polymers,” Smart Materials and Structures, vol. 26, no. 12, p. 125011, 2017.