1. 我们用什么打印机，什么线材，什么精度打了多少模型。
2. 模型的规格（与乐高材料相匹配）
3. 生成3d模型的过程
4. 两种打印机的区别，【高精度】和【低精度快速度轻量】
5. 模型的组装

*Fabrication.* We fabricate six pairs of non-circular gears results using a desktop FDM printer (Ultimaker 2 plus) with polylactic acid material (diameter: 2.85 ± 0.10 mm, printing resolution: 0.1mm) and a high-resolution SLA printer (Formlab 2) with photopolymer resin material (printing resolution: 0.05mm). Figs. Xxx show the semi-hollow gears quickly printed by the FDM printer at lower costs. Figs. Xxx shows a pair of solid gear with higher resolution printed by the SLA printer. It took around fourteen hours to print three pairs of gears with the FDM printer and seven hours to print one pair of gears with the SLA printer.

The results using our method are given as coordinates of a set of planar points that serve as exterior vertices and axles of a pair of gears. We scale the pair of gears by a certain factor that is determined by the distance between two axles and extrude the two-dimensional shapes into three-dimensional geometries using polygon mesh format to make them printable and compatible with standard LEGO technic components.

A pair of fabricated models are two prisms whose upper and lower surfaces are polygons with both exterior and interior boundaries (or inner holes). The shape and size of interior boundaries are consistent with the cross section of a LEGO Axle component (see Figs. Xxx), allowing our models to be firmly installed onto such components. The distance of two axles is usually an integer multiple of LEGO Units, enabling the gear pair to be assembled onto various LEGO components, including LEGO Beams and Bricks. The height of our fabricated models equals to that of a LEGO Beam component (7.76 mm) to feature compatibility and aesthetics.

After the fabrication, the gears can be assembled along with LEGO components easily. Please watch the supplementary video for the animations.