Review of Manuscript MRC-D-23-00249: "Design of Tensegrity Torus Based on Bilevel Optimization Model" by Jinyu Lu, Zhiyin Xu, and Junwei Pan, submitted for publication on Mechanics Research Communications.

The paper titled "Design of Tensegrity Torus Based on Bilevel Optimization Model" presents a novel design method for a tensegrity torus using a bilevel optimization model.

The tensegrity torus is assembled from multiple deformed three-rod prismatic tensegrity units, which can be uniquely determined by five geometric parameters: $h, r, \varphi_0, \varphi, \beta$. These parameters are used as optimization variables in a bilevel optimization model, which incorporates two optimization objectives: minimizing the number of different component lengths and achieving uniform prestress.

The paper provides three numerical examples with different equal divisions, and the optimization results indicate the effectiveness of the optimization model. Further parameter analysis of the bilevel optimization model shows that reasonable constraints can enhance the optimization effect of the model.

Among the different equal divisions, the prestress of the 18-division torus is found to be the most uniform.The paper also discusses the property of the tensegrity unit, the method of assembling the torus, the calculation of prestress, and the optimization of the structure.

The paper concludes with numerical examples and analysis, including the impact of constraints on optimization results and parameter analysis of the number of equal divisions.

I think that the paper is not well written, and requires major review in order to be acceptable for publication.

Here are a few example that demonstrate that the paper is still not ready for publication.

P1L30. The following sentence is unclear:
[...] However, the optimization only considered the overall structure but not component, which possibly lead to problems such as uneven prestress of components.

P2L51. Eq (1). From Figure 1.(b) it is clear that the cartesian coordinates of A are $x_A = r\cos\varphi_0$ and $y_A = r\sin\varphi_0$. On the other hand, $z_A$is $\tan\beta$ multiplied by the distance between the projections of points A and C on the plane x-y in Fig. 1 (b). However, it is not clear to me why this distance should be $y_A + r$. Similar consideration apply to the z coordinate of all other points. In general, a more detailed deduction of Eq.s (1) is needed.

P2L57. The sentence: "[...] where D_{ij} represents the distance between rod i and rod j, D_{con} is tolerant minimum value of D_{ij} set by designer." Here "tolerant" should be replaced by "tolerance"

P3L76. Equation (1), namely

$$2\beta = 2\pi/n$$

is a necessary condition to guarantee that a stack of n tensegrity blocks generates a closed loop, which forms a torus. However, I think that this condition is not sufficient, because when going from one face to the next one, there is an axial rotation ψ between the faces of each block, and the total rotation should guarantee that the nodes in the terminal faces of the torus match.

P3L83. The following statement is not clear:
"[...] According to Eq. (5), $s \geq 3$ is absolutely satisfied, the prestress of the structure is a linear combination of the independent states of self-stress: $t = V_s\alpha, \alpha = (\alpha_1\alpha_2 \dots \alpha_s)^{\mathrm{T}}$."
In particular, I do not understand the notation $V_s\alpha$. In fact, V_s should be a column vector. As such, I dont see how it can be multiplied by the column vector α.

P3L79. It seems that the inner radius of the torus is

$$r = h/\tan\beta - 2r,$$

which should give

$$d = 2\frac{h}{\tan\beta} - 4r,$$

which is different from Eq. 7.

P3L87. In equation (8), is it really true that all rods need to be in compression?

P4L94. What is the rationale behind the functional defined in Eq. 9:

$$f = \frac{\sqrt{\frac{1}{3-1}\sum_{i=1}^{3}\left(t_i - \overline{t_{\mathrm{rod}}}\right)^2}}{|\overline{r_{\mathrm{rod}}}|} + \frac{\sqrt{\frac{1}{12-1}\sum_{j=1}^{12}\left(t_j - \overline{t_{\mathrm{cable}}}\right)^2}}{\left|\overline{t_{\mathrm{cable}}}\right|}$$

In particular, why the factors $1/(3-1)$ and $1/(12-1)$?

P4L99. What do we know about the optimization problem (10)?

P4L111. Considering the constraint

$$f < f_{\mathrm{con}}$$

what guarantees that the admissible set is nonempty?

P4L116. The following sentence is unclear to me:
"Since the number of component lengths is a positive integer, it is necessary to process the value of f to assure that $0 < f < 1$, which can reduce its priority in the optimization function [19]."

P5L121. How do we prove that the inner optimization problem has unique solution?

P5L124. Considering the two-stage optimization problem:

$$\min_{h,r,\varphi_0,\varphi,\beta} F$$

$$\text{s.t.} \begin{cases} z_D > 0, z_E > 0, z_F > 0 \\ D_{ij} > D_{con} \\ d = h/\tan\beta - 4r \\ t = V_s\alpha, \alpha \text{ corresponding to } \min_{\alpha_i} f \\ f < f_{con} \\ h \in R_h, r \in R_r, \varphi_0 \in R_{\varphi_0}, \varphi \in R_\varphi, \beta \in R_\beta \end{cases}$$

what is the definition of the variables z_D, z_E, and z_F?

P5L130. What is the motivation for the choice of the parameters $f_{con} = 0.35$, $D_{con} = 0.1$?