



# Highly rigid extendable boom using corrugated structure for deployable mobile gantry robot system

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## Overall Proposal

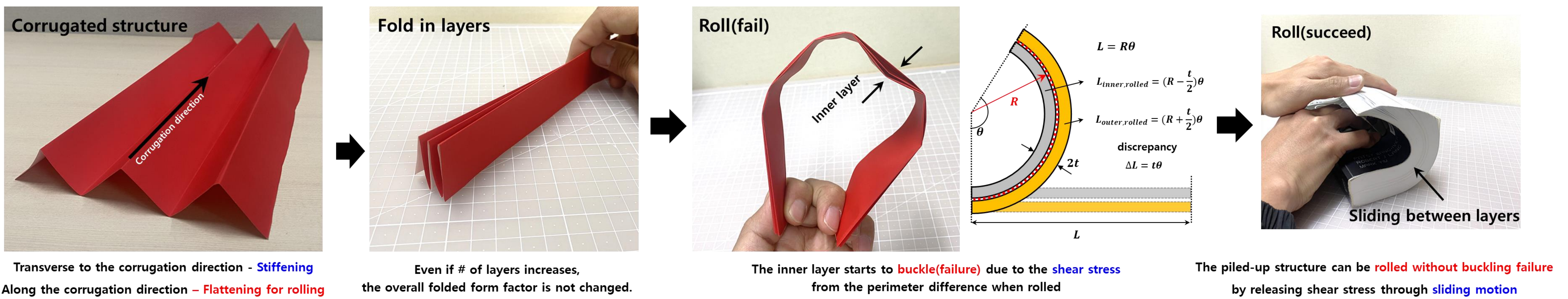
A deployable structure, which can be transformed into a target shape by extending or expanding the stored structure, serves as a strategy to address space and transportation issues. Meanwhile, the large-scale structure's self-weight has a significant impact on its implementation, necessitating two additional considerations: 1) scalability in rigidity and 2) automation in actuation.

Here, we are suggesting a corrugated structure with a Slide and Fold Enabling (SaFE) joint, which offers significant rigidity and compactness through rolling in a hub, working with simple actuation, as well as a scalable design property.

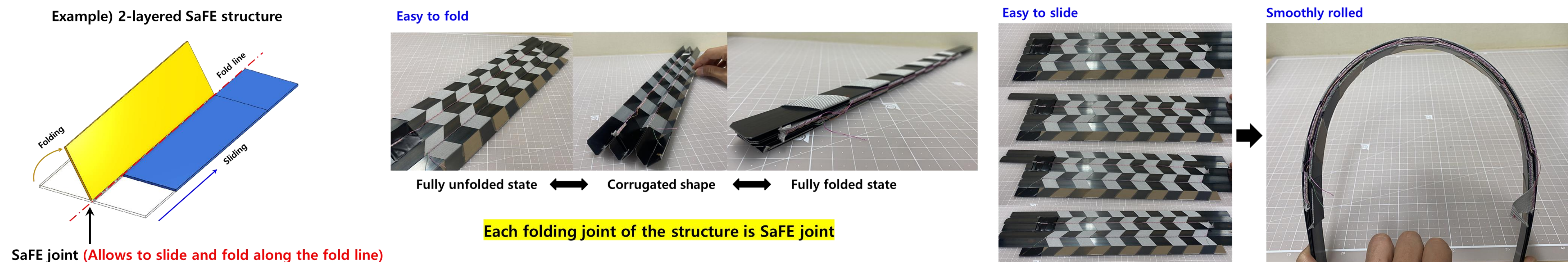
## Design & Principle

### Principle

- Sliding motion is necessary to roll corrugated structure in a hub

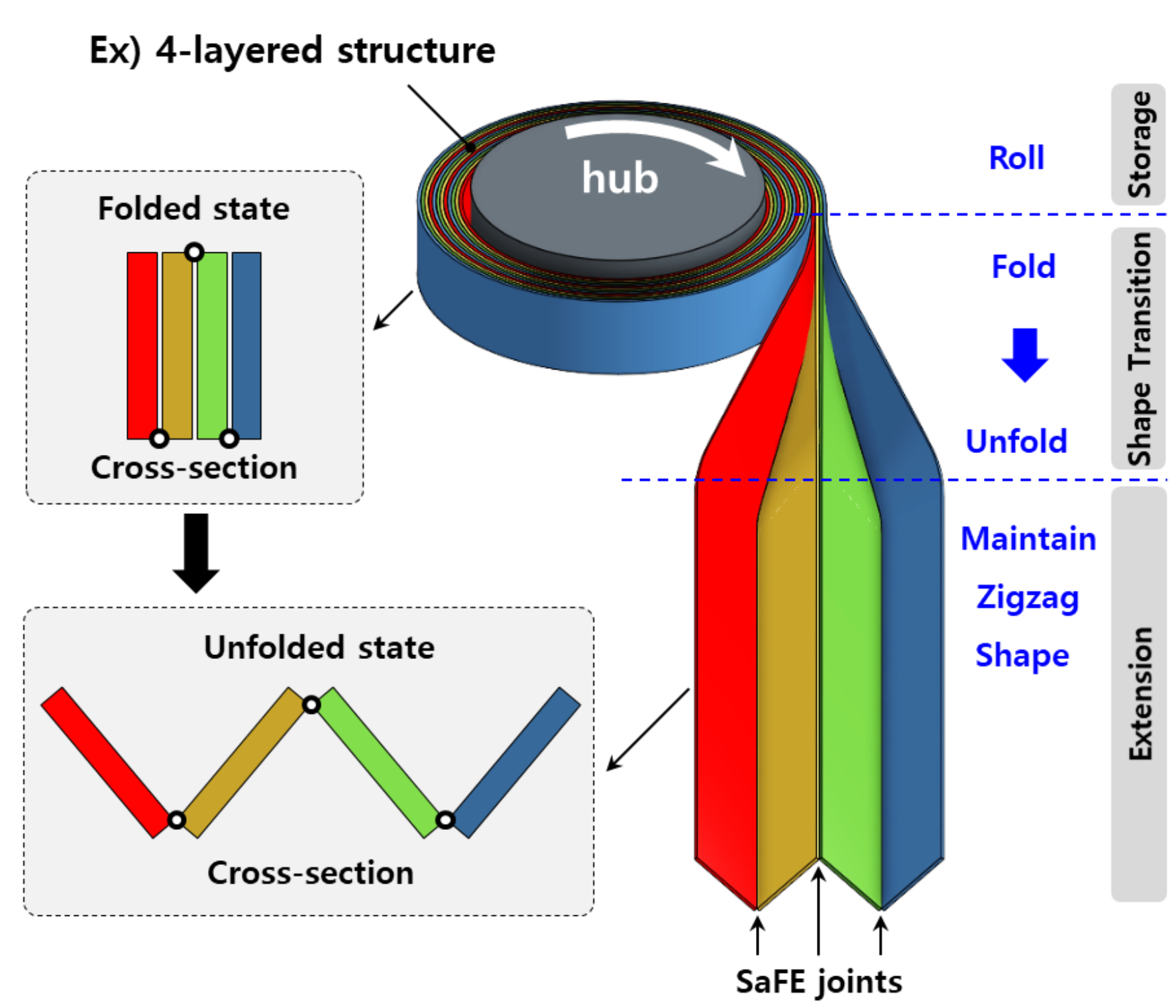


- Concept of the Slide-and-Fold Enabling (SaFE) joint

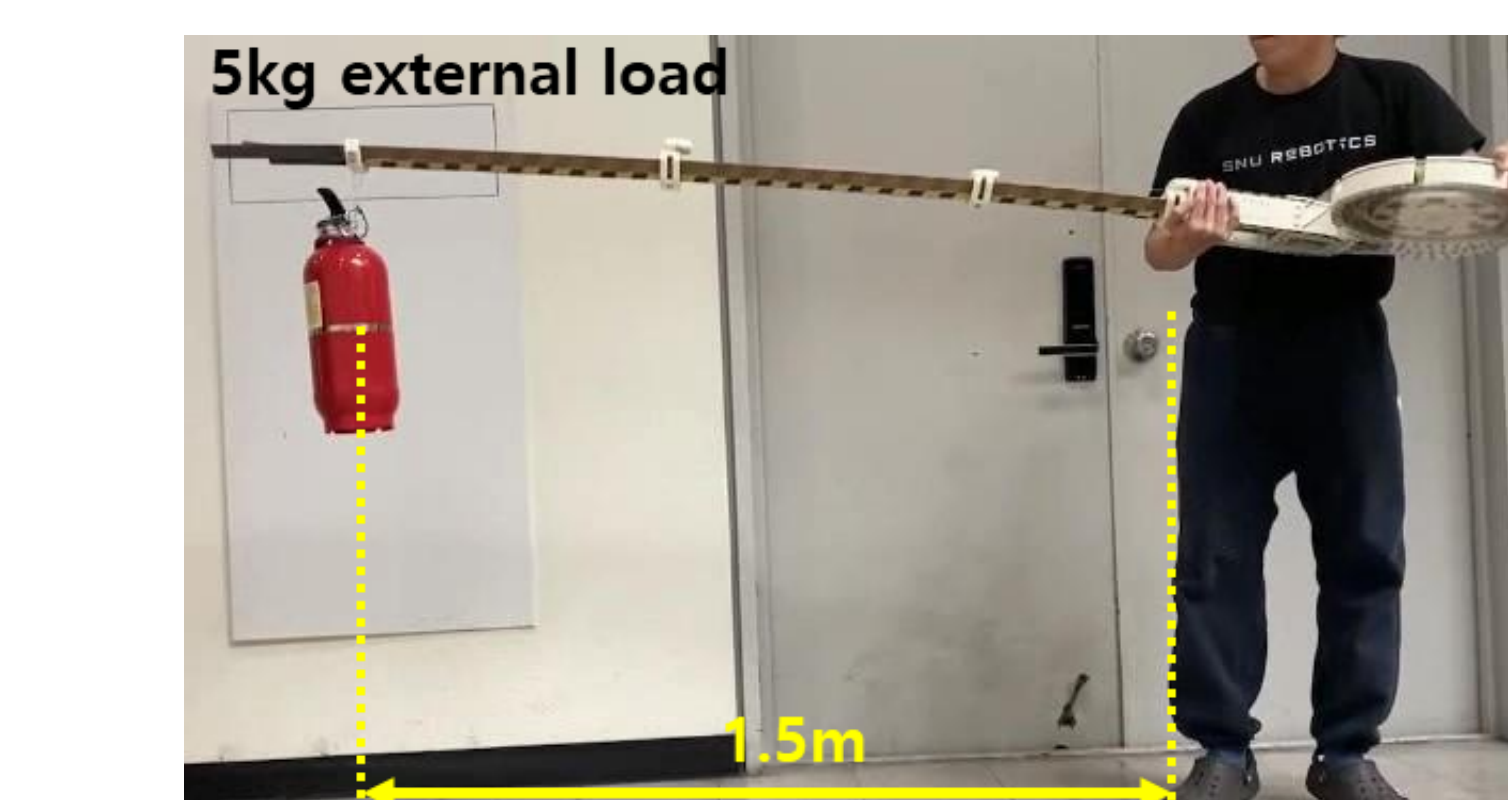
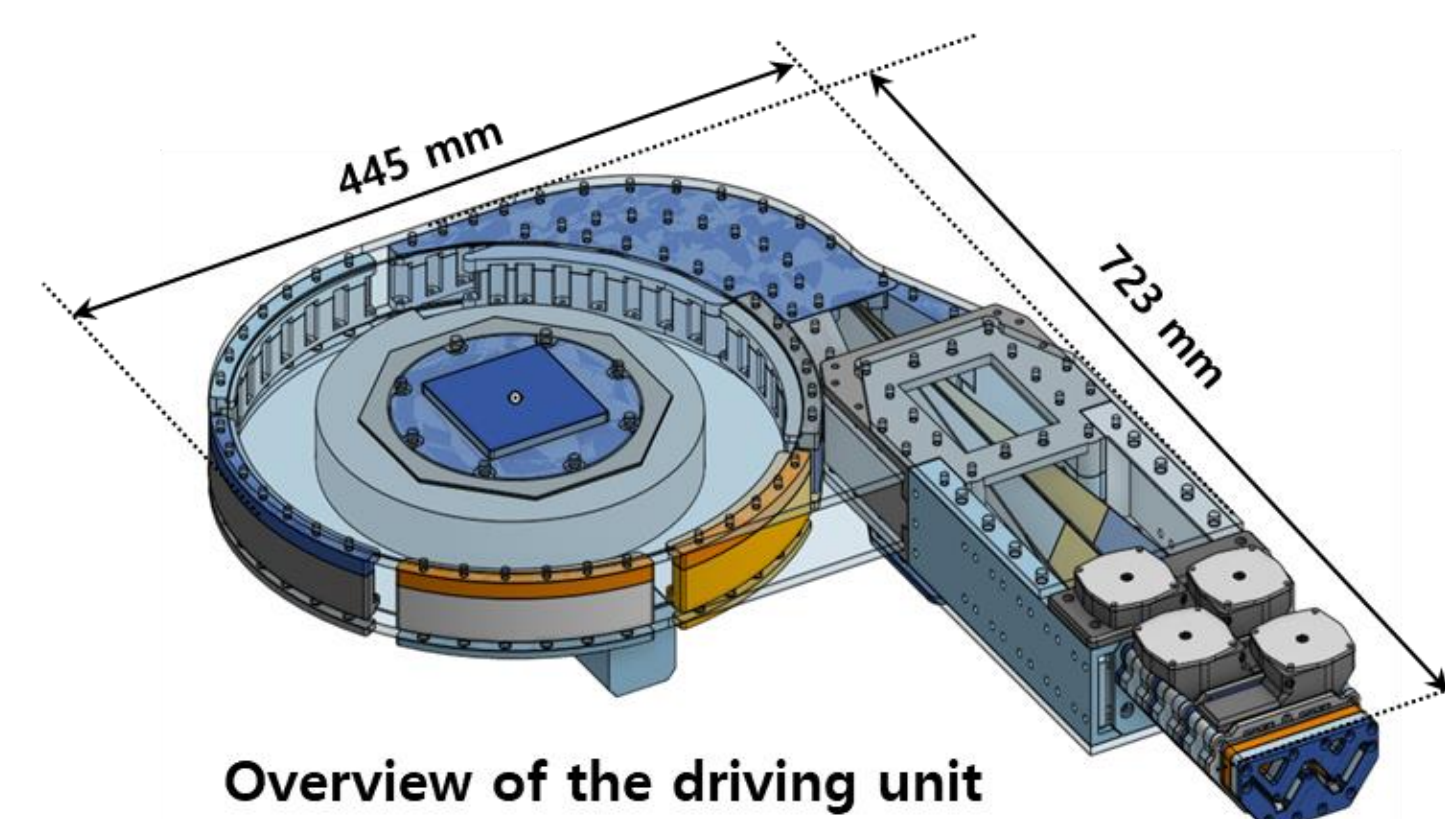


### Design

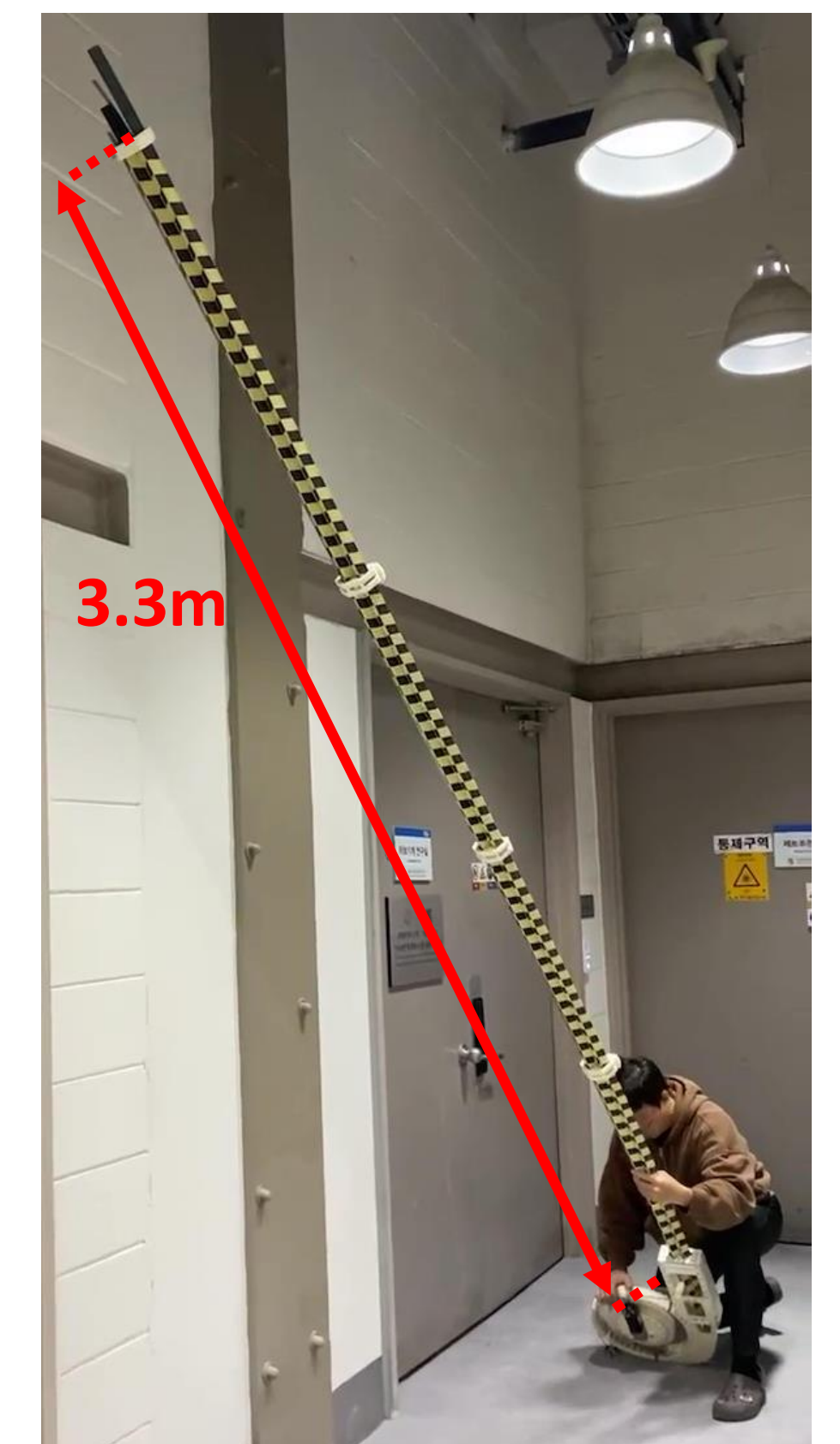
- Design schematic: corrugated structure rolling in a hub



Specifications of made	
SaFE structure	Density: 869g/m EI(main dir.): 632.67 Nm <sup>2</sup> (expected) <b>*2020 aluminum profile: 492 Nm<sup>2</sup></b>
Hub radius	100mm (0.5% strain)
Stored state (Minimum)	723mm * 445mm * 75mm (without motor)
Extended state (Maximum)	Length: 4025 mm (556%) (3300mm extension)
Motor	BLDC 12V 105W
Speed	100mm/s (extend/retract)



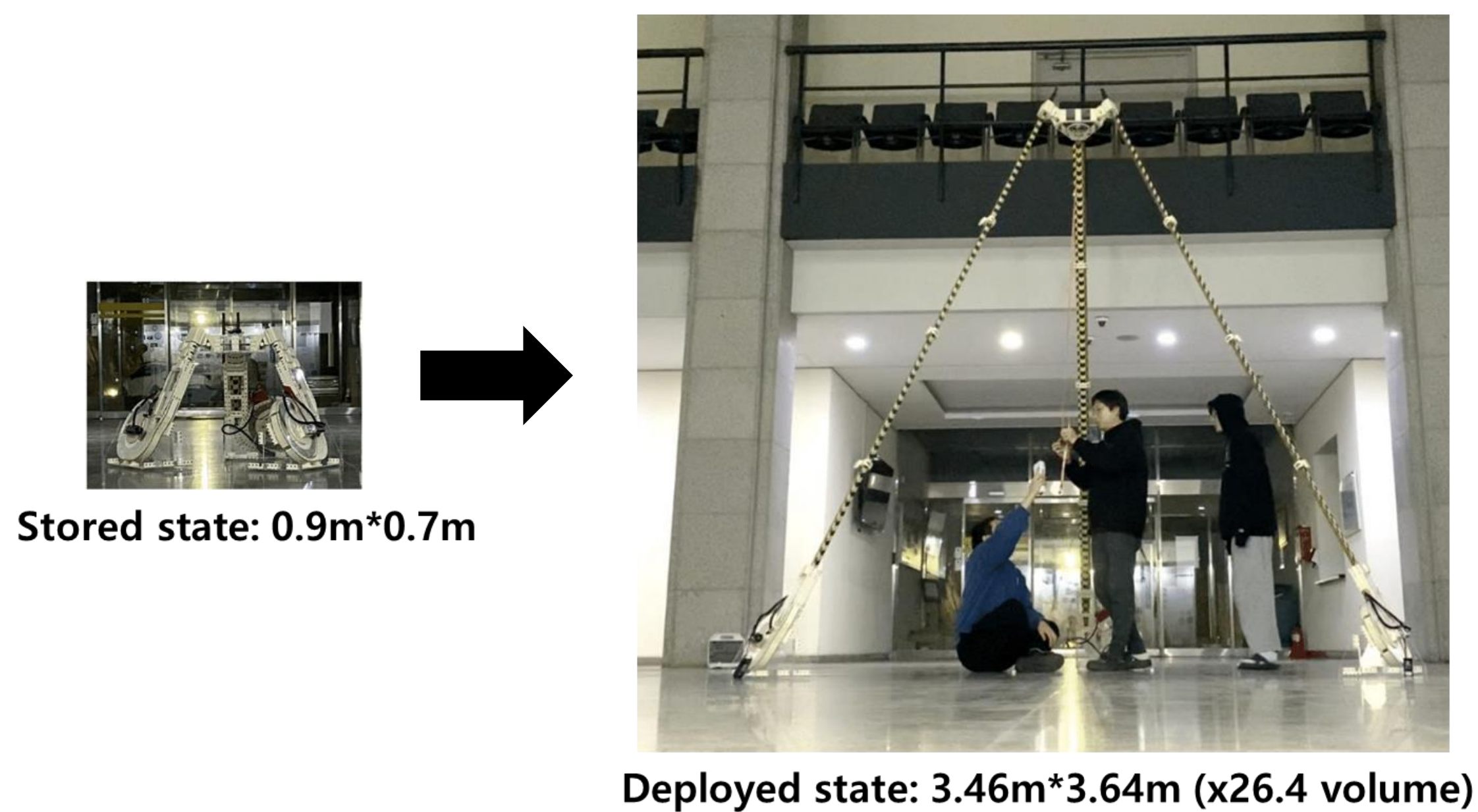
SaFE structure's gravity directional ultimate strength > 85Nm (external load + maintaining components + self-weight)



SaFE structure's fully extended state

## Application

- Deployable mobile gantry robot system



- Utilizing it as a hang printer

