Highly rigid extendable boom made with corrugated structure for deployable mobile gantry robot system

Sun-Pill Jung , Jaeyoung Song, Chan Kim, Haemin Lee, Inchul Jeong, Kyu Jin Cho*
Seoul National University

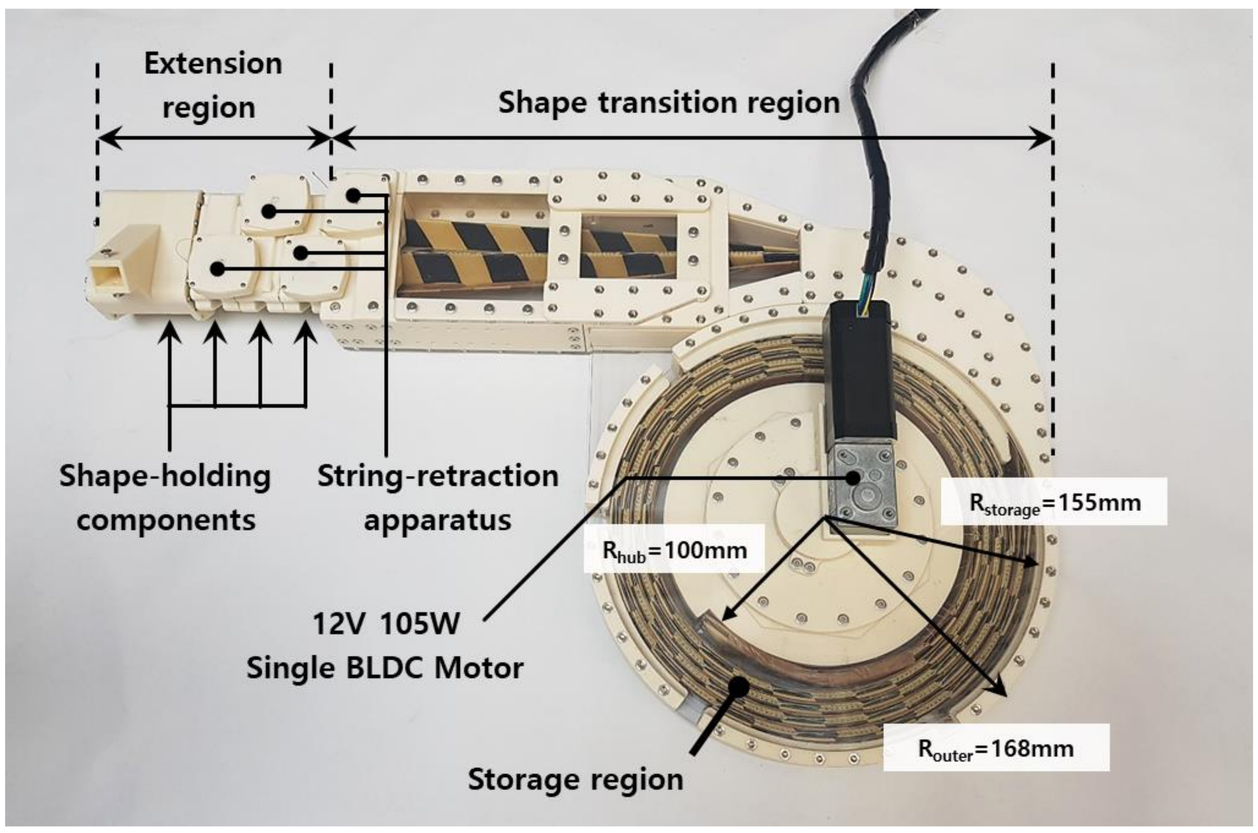
Overall Proposal

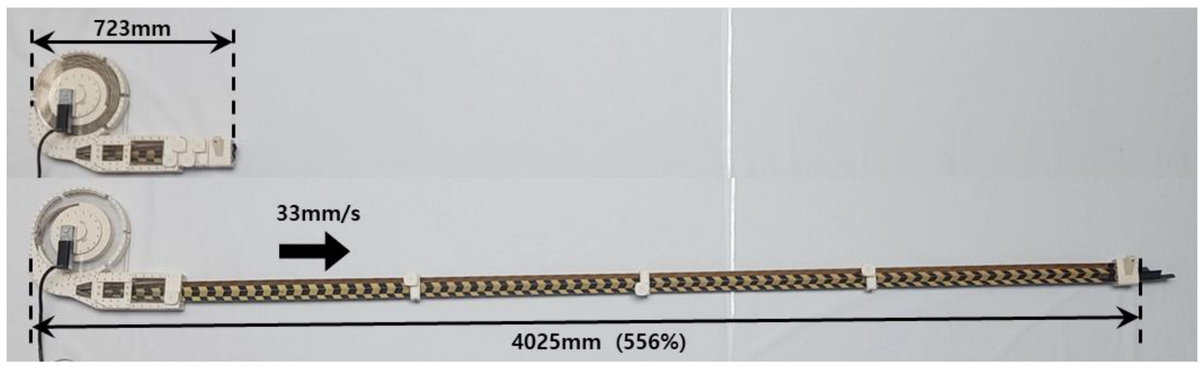
Since transporting large-scale construction equipment to the Moon for building a lunar base is challenging, many studies are exploring alternative construction methods. Deployable robots, which can unfold from a compact state to a larger structure, could be particularly beneficial for space construction tasks. Here, we present the concept of a deployable 3D printing robot that aims to automate the construction of lunar bases.

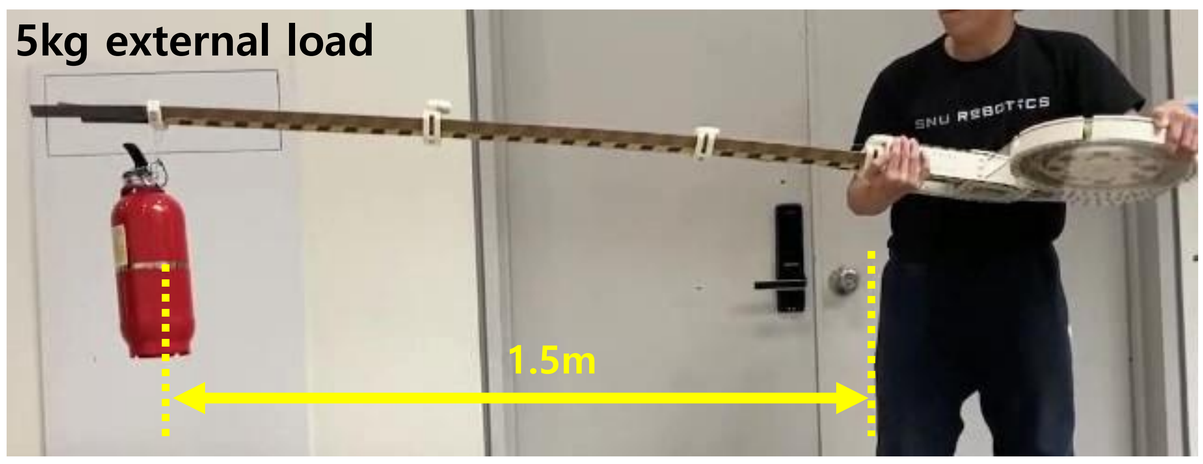
The robot operates in a step-by-step process:
1) travels to the target site in a compact state; 2) expands into a large gantry frame; 3) prints the required structure; 4) collapses back into a compact state; and 5) moves to the next site.

The key feature is the deployable frame, which is robust and can be actuated via a simple deployment mechanism manageable by the robot. We propose a deployable frame that extends from 0.75 meters to 3.6 meters in height, using a highly rigid extendable boom that we developed. The extendable boom can be coiled smoothly for storage into a hub with a radius of 100mm and a height of 30mm. When deployed, it has up to 100 Nm of ultimate moment strength. Both deployment and storage are actuated by a single motor.
The open-source 'Hangprinter' system is mounted on the frame to perform 3D printing tasks. This robot features a 1.2mm nozzle and can print structures up to 2 meters in size using PLA material.

Extendable boom







Deployable 3D printer