

# Soft modular robotic cubes: Toward replicating morphogenetic movements of the embryo

Vergara, Andrea

Lau, Yi Sheng

Mendoza-Garcia, Ricardo Franco

Zagal, Juan Cristóbal

© 2017 Vergara et al. This is an open access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited. In this paper we present a new type of simple, pneumatically actuated, soft modular robotic system that can reproduce fundamental cell behaviors observed during morphogenesis; the initial shaping stage of the living embryo. The fabrication method uses soft lithography for producing composite elastomeric hollow cubes and permanent magnets as passive docking mechanism. Actuation is achieved by controlling the internal pressurization of cubes with external micro air pumps. Our experiments show how simple soft robotic modules can serve to reproduce to great extend the overall mechanics of collective cell migration, delamination, invagination, involution, epiboly and even simple forms of self-reconfiguration. Instead of relying in comple