

Rabbithole Research (rbt_h0l): Towards a Hybrid Modeling Technique in Architecture

"The hand is the cutting edge of the mind." ¹

This research centers on architectural model-making as thought process traditionally occurring at the intersection of hand, materials, and space. At stake are

"not just the particular material from which (models) are made, but ... materiality itself as it confronts the creative human imagination." ²

This negotiation between material properties, spatial forces and spatial effects (perception, time, movement) fuels a critical architectural thought process and defines architectural form-making as an interlocking of object and space.

"Architecture ... is a mode of existential and metaphysical philosophizing through the means of space, structure, matter, gravity and light." ³

In digital model-making, mathematically based computational materials (meshes, surfaces, etc.) are engaged through parametric code and scripted software; all within an infinite, user-defined, digital environment with limited spatial characteristics – freeing form-making of material and spatial limitations.

This shift in modeling methods can be diagrammed as:

physical model-making, M_p = hand/material/ space
 digital model-making, M_c = eye/ computational materials/ reduced spatial characteristics

As a thought process, this shift represents a significant break in the feedback/critique between materials and space of physical model-making described above.

Therefore this research seeks to develop a hybrid-physical-digital-modeling technique combining: material agency, spatial characteristics, and modeling methods, of both physical and computational modeling.

Now in its 3rd year, this research has developed as a series of hybrid-modeling tools or "sensor-models" [image 1] – in which sensors are wired to physical models [image 4] and linked to parametric code which shape computational elements; resulting in models exist partially in physical and digital space [images 2, 3].

"space is the machine" ⁴

Further, this research has produced an unexpected outcome: adding digital sensors to physical models effectively places the sensors in spatial relationship. The type of sensors used (forces, light levels, distance, etc.) and the location of each sensor relative to the others creates a spatial network of data in which altering the physical model alters data collected which alters the digital model. By extrapolation, this creates a feedback loop between the physical and digital parts of the model in which data is a quasi-independent and autonomous actor.

Lastly, in attempting to integrate physical and digital methodologies, this research attaches to contemporaneous philosophies: *post-digital* ⁵ and *second turn* ⁶ – in which human characteristics (precariousness, intuition, chance, etc.) are intellectually valued and increasingly invited to inform the next generation of computational methods.

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1. Bronowski, Jacob, *The Ascent of Man*, Little, Brown & Co., 1973.
 2. Tim Ingold, (2007). 'Materials against materiality', *Archaeological Dialogues* 14, Cambridge University Press, United Kingdom, pp.1-16
 3. Pallasmaa, Juhani, *The Thinking Hand*, Wiley, 2009.
 4. Hillier, Bill, *Space is the Machine: A Configurational Theory of Architecture*, Cambridge University Press, 1998.
 5. Jacobs, S. *Architecture Enters the Age of Post-Digital Drawing*. March 21, 2017, Metropolis Magazine, New York, NY.
 6. Carpo, M. (2017). *The Second Digital Turn: Design Beyond Intelligence*. Cambridge, Mass. MIT Press.



image 1 - hybrid modeling technique artifacts

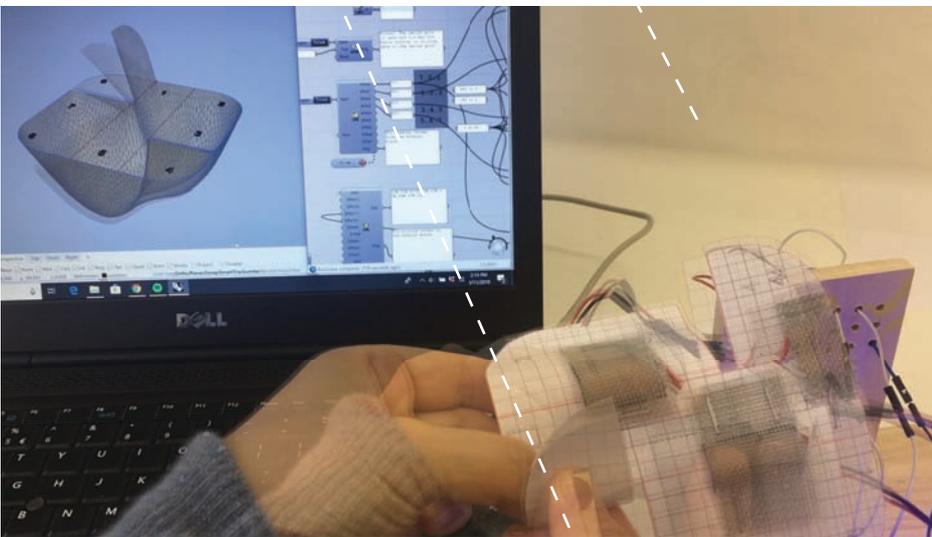


image 2_Hybrid Model Case Study 01

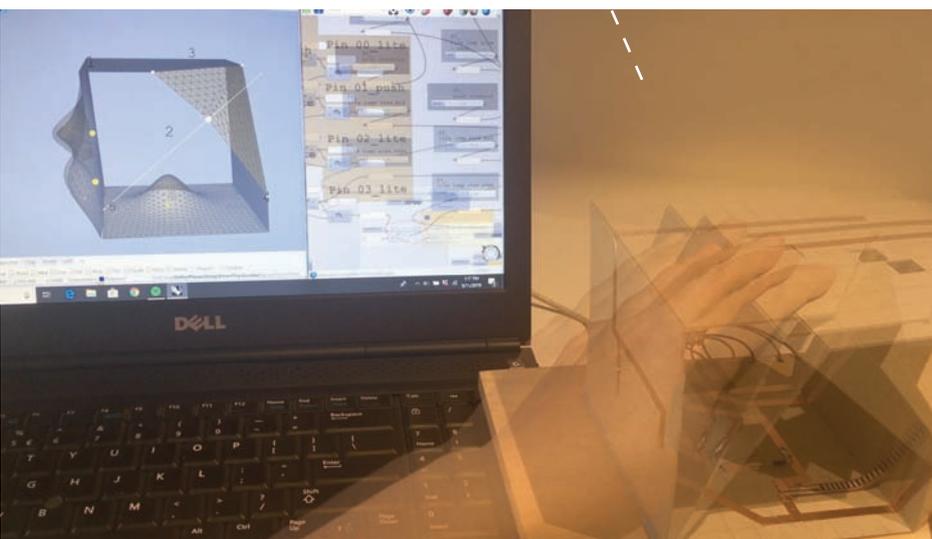


image 3_Hybrid Model Case Study 02

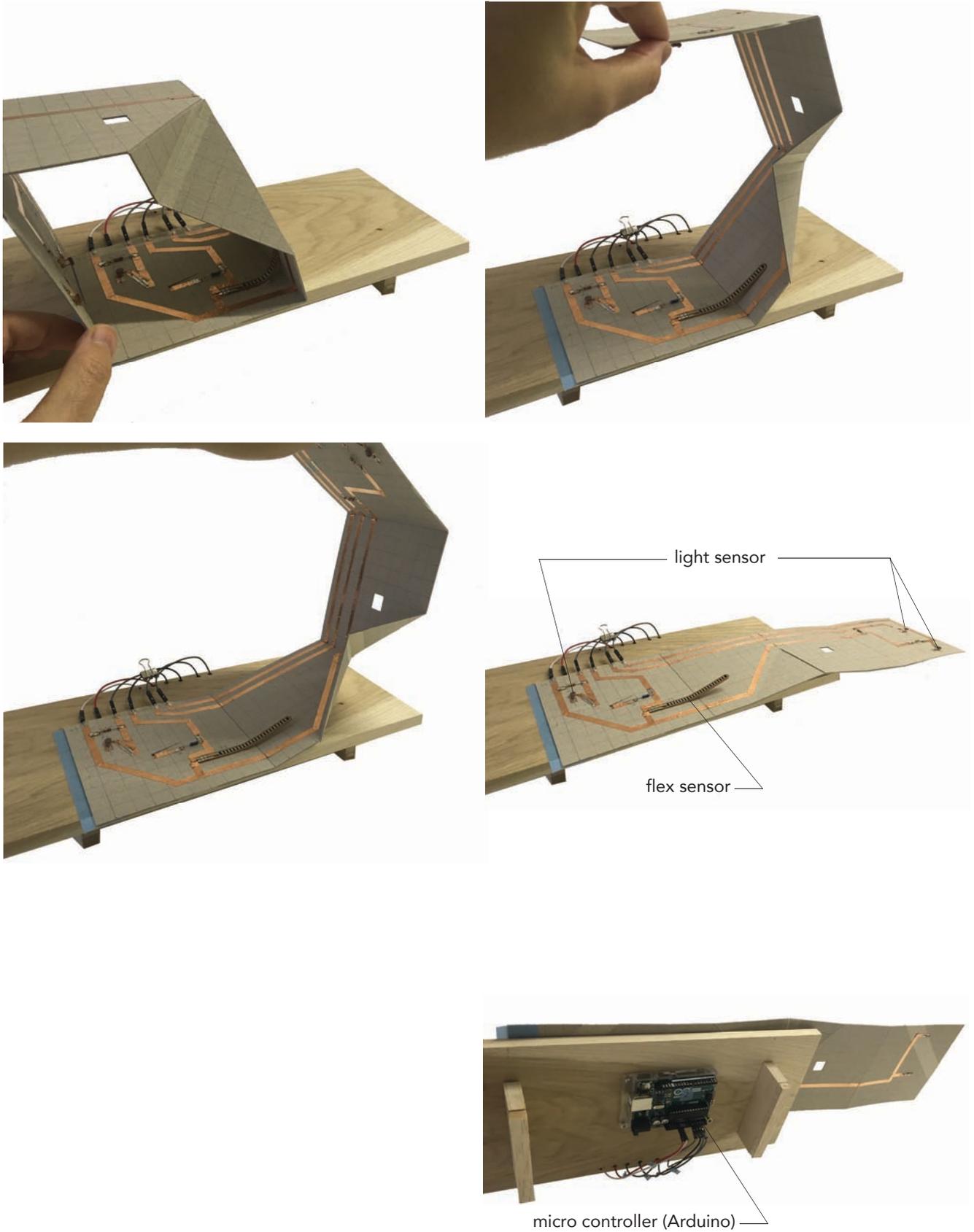


image 4_Hybrid Model Case Study 02 - physical model wired to sensors