Tactile Connections in a Digital Era

Hannah Campbell

Submitted to the faculty of the Herron School of Art and Design
in partial fulfillment of the requirements for the degree
Master of Fine Arts in Visual Art
In the Herron School of Art and Design
Indiana University

May 2017

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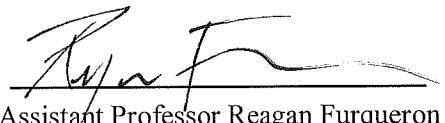
By
Hannah Campbell
Master of Fine Arts

Herron School of Art and Design
IUPUI
Indiana University

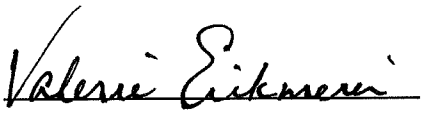
Assistant Professor Katie Hudnall
Advisor



Assistant Professor Reagan Furqueron
Committee Member

Associate Professor William Potter
Committee Member

Accepted: May 2017



Professor Valerie Eickmeier
Dean of Herron School of Art and Design

8/4/17
Date

As digital technology and virtual data continue to permeate modern culture, we find ourselves having to consolidate these new systems with our pre-existing ones. Much like the industrial revolution or any other technological paradigm shifts, advancements are successful when they incorporate the familiar in an innovative way, striking a balance between the new and the old. As such, my projects seek the harmony between the dichotomies of traditional vs. modern, urban vs. wilderness, analog vs. digital and mass produced vs. handmade.

The original point of entry to this research was my interest in camping/backpacking and my current lifestyle of moving residences often. When I examined these two activities together, it struck me that much of backpacking is basically the same as moving homes but more often and with fewer belongings. While being outdoors is most of the appeal when engaging in hobbies like camping, the act of setting up camp every night and packing everything up in the mornings holds a certain satisfaction for me. Part of the satisfaction derived from this experience comes from the familiarity built up between the user and their camping equipment combined with the puzzle of adapting to new locations. The camping gear is a comfortable ally for creating shelter in a foreign environment, therefore it receives the maintenance and care that is no longer commonplace with objects used in urban contexts. The practical and emotional attachments that are invested in camping gear is often missing when it comes to furniture, especially flat pack furniture that is often used by frequent relocators. This disconnect is what I investigate with my research and hope to bridge with the projects I have developed

My research began with looking at nomadic cultures both of traditional tribal communities and what is sometimes referred to as the ‘modern nomad’ or the demographic with the most residential migration. For the most part, traditional nomadic cultures have taken the

form of long term camping that involves living in tent structures that can be taken down and erected in a short time when relocation is called for. My main point of reference was the Mongolian nomadic lifestyle, which involves living in Gers (Yurts) made of felt pulled over wooden frames that get dismantled and transported by horse drawn carts. The living space is usually the one round room created by the Ger, with a stove in the middle for heat/cooking and various objects hanging from hooks on the wooden frame of the Ger structure to act as accessible temporary storage. The furniture in the Ger would often be smaller than the furniture found in sedentary homes to facilitate easy transport and there would be wooden chests for storing personal belongings. Groups would use their new surroundings to their advantage and fashion makeshift fences or tools if they needed them so they could keep the number of personal belongings to a minimum.

In contrast, the 'modern nomad' usually moves their belongings from shelter to shelter as opposed to moving with their homes. Most of the people who drive migration in this culture are in the 18-34 age range[1] and are moving both between and within different cities. There is a slew of flat-pack and other cheaply made furniture that enable the user to assemble a box of parts and a bag of hardware into practical furniture is what makes companies like IKEA so attractive both to the modern nomad as well as people who don't move often. The assembly process of this furniture is designed to be relatively straightforward and comes with detailed diagrams intended to be readable for consumers around the world.

[1] Benetsky, Megan J., Charlynn Burd, and Melanie Rapino. "Young Adult Migration: 2007–2009 to 2010–2012," *American Community Survey Reports*, (2015). ACS-31, U.S. Census Bureau, Washington, DC

The relatively low cost of these products means that if parts wear out or if the cost of transportation becomes too high or troublesome, they can be easily replaced after arriving at the new location. Since this concept of replaceability applies to everything with the modern nomad, one does not have the same limitations that the traditional nomad or a camper has because they will not be isolated from stores for any extended period of time, allowing them to freely engage with the culture of disposability. While there is an aspect of satisfaction derived from the act of assembling a piece of flat pack furniture for oneself, it lacks the familiar repeatability and toughness of materials that is present in camping equipment. The hardware used to hold these products together tend to be easily lost or are likely to break with multiple assembly cycles and many consumers are culturally conditioned to buy a new item when something breaks. There is a stark contrast to the traditional nomadic attitudes in how these items are valued by the individual, which is influenced heavily by the current culture of disposability.

These concepts were the inspiration behind the dark blue *Splay Chair* (Figure 1), which was cut using the CNC router and is put together with tension fitted slots. While the chair is a little heavy to be considered easily moved furniture, the pieces can be disassembled and moved as parts, though the slots will eventually start to break due to the nature of the material. This piece in particular was an attempt at translating the stereotypical ‘easy chair’ into an object that built up a similar mass but could still be taken apart and moved in pieces rather than as one bulky unit. In my own observations, it is the cumbersome comfort furniture like La-Z-Boys and couches that get abandoned at the curb because they are too inconvenient to transport.

Figure 1. *Splay Chair*

Along a similar vein, I made two small ottomans (Figure 2) that were held together with parachute cord (paracord) to allow for easy breakdown once the tension is released. These were easy to assemble and disassemble, especially because of their small scale, which was a reference to the scaled down objects used by Mongolian nomadic groups. Another in this series of pieces is the *Sling Chair* (Figure 3), with canvas fabric stretched between the chair frame and tied on with paracord. The frame is held together with wood pins in the horizontal braces, which can be popped out to flatten the chair. This piece perhaps reads as the most direct reference to camping because of the canvas and paracord, but the plywood chair frame references prefabricated furniture. All of these pieces were made with plywood and cut using the CNC router to emulate the aesthetic of mass produced furniture. This was in order to explore this idea of the mass produced having value because how functional it is in the user's life and how the user develops an attachment to it through multiple homes and assemblies.

Figure 2. *Collapsible Ottomans*

Figure 3. *Sling Chair*

The link between disposable culture and frequent migration led me down the path of comparing highly crafted objects with manufactured items. In modern society, crafted objects hold a much higher value than products created with mass production techniques. This is in part because the means of production are so far removed from the consumer that it is as if these products have come out of machines fully formed. With low prices and the propensity for planned obsolescence, the assumption is that very little time and labor was put into mass produced objects so they are less valued. Objects that are handmade and highly crafted on the other hand, are highly valued for the time and labor that a skilled individual or group has poured into them and they are priced accordingly. These items tend to bear different intentions from the manufactured ones, such as a longer life expectancy and higher quality materials. In the case of furniture, this tends to mean well crafted pieces that are made with sturdy joints that are not designed to come apart, making them inconvenient to move. This means there is a higher cost to the owner when it comes to a risk of damage while moving, which would not be as prevalent with flat pack furniture. Someone that migrates frequently will be well aware of that risk and choose to purchase mass produced furniture for that reason.

A piece that developed to bridge the gap between craft and mass production was the *Tension Table* (Figure 4), which was made of out cedar and was cut on the CNC with 3D printed brackets to assist in making assembly easier and to house the paracord that holds the legs in via tension. The paracord is tied with sliding knots that the user can loosen when they need to take the table apart. This piece is practical when it comes to assessing its portability as it is relatively lightweight and easy to put together and take apart. The wood parts harken to traditional furniture forms and natural materials, aiming to make it a comfortable piece in a home, while the

3D printed brackets are a cutting edge technology associated with a modern lifestyle that includes increased migration. While this table took advantage of modern technology to create the rough cut parts, a sense of the handmade was employed to shape and finish the piece into its final form. With this piece, the focus began to shift from the practical problems associated with producing collapsible furniture without traditional hardware and became more about the user experience, as they learn to assemble and disassemble this furniture.

Figure 4. *Tension Table*

A niche that has emerged as an alternative to the dichotomy of the manufactured and the highly crafted is the 'hacking' and DIY movement. This can include anything from repainting a chest of drawers your favorite color to building a slide for a child's lofted bed to attaching an old door to two cabinets to make a desk. In these cases, the user is limited only by the resources they have access to and they can personalise any product however they want. Often users value the products they have put some work into more than a prefabricated object they paid money for. In a study aptly named "The IKEA effect: When Labor Leads to Love"[2], participants were asked to make origami cranes, build Lego sets and assemble IKEA boxes then to assess the monetary value of both their finished projects and that of their partner's. Despite their projects being from identical kits, the participants would consistently bid their own projects up to 62% higher than their partner's. In the case of the origami cranes, the authors noted that the participants valued their projects especially high (up to 460% more) and thought others would value their cranes highly as well, despite not doing so with their own partners. Even though these participants were simply assembling parts and following instructions, they were engaging enough with the object to form an attachment to it that led them to value it more than they normally would, or as the authors of the study put it - "Labor leads to love."

This study helps to explain the phenomenon of camping equipment and the interesting space it occupies where the more wear and tear it accumulates, the more personal value it gains. Camping equipment is mass produced and the high quality gear is quite expensive so users tend to put the effort into maintaining it properly. From the nature of the activity, equipment is often repaired or repurposed on the go because there are no stores to buy what you need in the

[2] Norton, M., Mochon, D., & Ariely, D. "The IKEA effect: When labor leads to love" *Journal of Consumer Psychology,* (2013) DOI: 10.1016/j.jcps.2011.08.002

wilderness. After assembling and breaking it down multiple times, then adding in the labor of repairing and maintaining it, it makes sense that these objects would have a very high personal value to whoever owned them. In this case, the repairs become signs of the user's labor of love as opposed to unsightly damage. In a theoretical sense, these are phenomenological experiences in which a person's labor becomes a part of 'them' in the object, as opposed to objects they simply own. Through repeated tactile interaction, the body develops the muscle memory that allows them to assemble these products without putting much conscious thought into it and the time invested in both assembly and repair are an embodiment of the user within the object.

Figure 5. Table Models

Throughout these projects, I had been making a variety of small models out of thin plywood that slotted together and helped to facilitate my design process (Figure 5). From the small scale and the ability to switch the different legs and table tops around to make different combinations, they took on an interesting toylike quality that made them very engaging to studio visitors. The fact that people could pick them up and interact with them in a straightforward way

made them compelling in a manner that did not translate to the larger pieces. The same held true when it came to my joint tests, which were also easy to handle and allowed for the repeated motion of sliding the pieces together and apart, perhaps satisfying a compulsion for fidgeting. The small scale and motion of assembly triggered an affective experience, reminding people of fitting Legos together or building blocks or sliding shapes into their corresponding holes.

This satisfaction derived from pieces coming together and apart perfectly fit in the context of the other research I have been doing, since it is likely the reason I found putting up a hammock or tent every night only to take it down in the morning so satisfying, as another aspect of labor leading to love is knowing that you have the ability to repeat the motion and get it right consistently. The user is learning a specific skill and is deriving a sense of gratification as they improve and eventually master that skill. There is a potential for the user to exert some of their own creativity within the framework of the system set up by the designer, reminiscent of Legos and other building oriented toys. This is an aspect I have explored further in my *Furnipuzzle* prototype project (Figure 6), which involves 3D printed puzzle pieces as joints for wood furniture. It still has the idea of furniture that can be taken apart easily as its core but also delves into the toy affects that have emerged from my previous projects by turning the assembly of the piece into an actual puzzle. While the construction is relatively straightforward, there is a bit of a learning curve due to the nuances that lock up the structure so it would need a simple guide for the first few assemblies. What did become apparent through this project was that the puzzle nature of the joinery was lost in its final construction, effectively hiding the most engaging parts of the piece. After this experiment, I set out to focus audience attention on the sliding joinery.

Figure 6. *Furnipuzzle*

In terms of audience engagement, what I have discovered is most effective about my handheld experiments is the nostalgic affects that stimulates an urge to play and experience the same action over and over again. It is also linked to the act of fidgeting: when the hands are performing motor actions mindlessly it actually helps to cognitively focus the mind on more 'intellectual' tasks.[3] This latter feature has some interesting phenomenological connotations as far as the mind/body question is concerned; is the mind separate from the body or a part of it? This phenomenon is in support of the idea that consciousness cannot be separated from the body and perception is intertwined with the object, if the simple act of sliding something back and forth with one's hands can significantly improve productivity or provide an outlet for stress relief. What seems like an unrelated fidget while engaging in 'real work' will have a measurable

[3] Karlesky, Michael, and Katherine Isbister. "Designing for the physical margins of digital workspaces." *Proceedings of the 8th International Conference on Tangible, Embedded and Embodied Interaction - TEI '14* (2013): n. pag. Web.

effect on the mind because we do not perceive or think in a vacuum and the environmental stimuli acting on our bodies have a huge impact on our thoughts and emotions.[4]

This is where I have inadvertently created my own disconnect between the experiences of my small experiments and the experiences with the furniture pieces I have made. While the experiments contain the unconscious satisfaction of constant repetition, the furniture pieces have a more complex puzzle solving interest that occurs with less frequency. It is almost appropriate that I have developed my body of work in such a manner, as my research has involved an exploration of the opposite ends of various spectra; from the duality of the urban to the wilderness, the mass produced and the handmade, the traditional and the modern (both cultural and material), conventional woodworking techniques and digital fabrication and now the small single action to the larger and more complex puzzle.

In order to consolidate these, I focussed purely on the sliding motion of joining pieces that has been so engaging to viewers and created small self contained puzzles made with the 3D printer (Figure 7). The main influence for these come from traditional Japanese carpentry techniques[5] that have evolved over hundreds of years and require a high level of skill with hand tools to achieve in wood. This joinery style has an emphasis on mechanical strength in the absence of glue, nails or other hardware as a part of an architectural tradition that relies heavily on wood as the structural material in buildings. My work as also been inspired by the animations posted by *The Joinery* on Twitter.[6] This account posts animations on a loop of various Japanese joinery techniques with parts seamlessly coming together to form the joint. These animations

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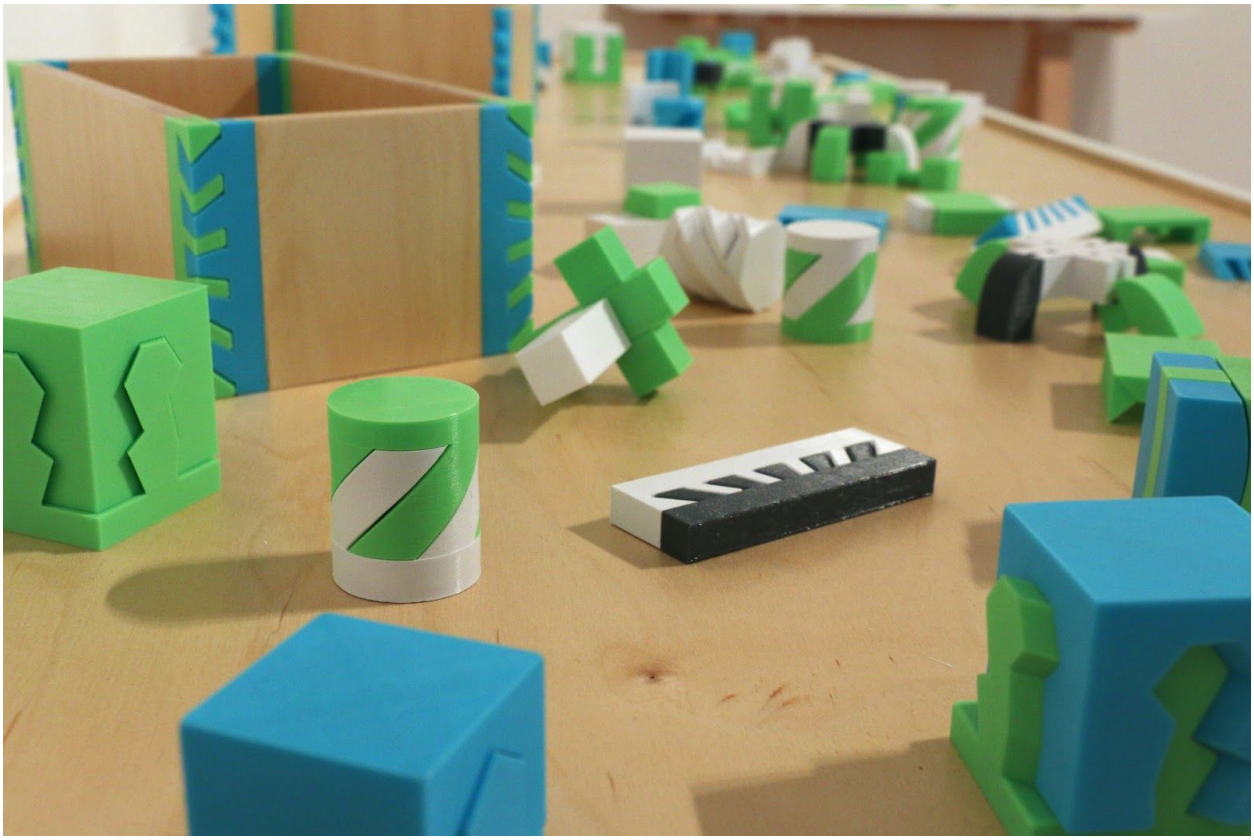
[4] Moran, Dermot. *Introduction to Phenomenology*. London: Routledge, 2000. Print.
[5] Seike, Kiyoshi. *The Art of Japanese Joinery*. New York: Weatherhill/Tankosha, 1978. Print.
[6] Joinery, The. "The Joinery (@TheJoinery_jp)." *Twitter*. Twitter, 12 Jan. 2017. Web. 15 Feb. 2017. <https://twitter.com/thejoinery_jp>.

perfectly capture the moment of unity that I have become so fascinated with while showing the viewer how these complex forms are assembled in a straightforward way. I have come to think of my joinery objects as a physical extension of these animations, as some are direct copies of the Japanese joints in 3D printed form while others experiment with structures that would not have been possible in wood. In this sense, they are an exploration of the directions these traditional forms can go within the context of modern fabrication techniques.

Figure 7. *Joinery Toys*



As an homage to what these joints were originally developed for, I developed furniture pieces that incorporate the 3D printed joints as a method of maintaining the sliding assembly and disassembly cycle on a larger scale. The small joint pieces are displayed on this furniture as an

example of the joints in a functional context. Each furniture piece is adjustable in nature, with tables made of sawhorses and surfaces as well as a modular shelving system. There is a degree of flexibility in each design that allows the user to learn the joint system and envision different applications of those objects according to different needs. For example, one of the sawhorses used in the larger *Arrow Sawhorse Table* (Figure 8) could also be used as the sawhorse to make *Arrow Console Table* (Figure 9) simply by switching the tabletop. There is the potential for customization as the dimensions and angles of the sawhorse design can be modified or interchanged according to the purpose of the stand or table.

Figure 8. *Arrow Sawhorse Table*

Figure 9. *Arrow Console Table*

To take this concept a step further, I have implemented an augmented reality environment to demonstrate how the existing furniture was assembled accompanied by some larger screen walls to open up other possible designs with similar systems. The augmented reality headset allows the viewer to observe these structures around them at a realistic scale while the parts of the structure are assembled around them to illustrate how everything fits together. By borrowing from *The Joinery*'s mesmerising animations and implementing them as large scale animations, I bridge the gap between the tactile satisfaction of interacting with the small joints and the learning curve involved in the larger complex structures. The viewer can interact in a tactile way with a toy version (Figure 10) of the joint used in the *Interchanging Dovetail Shelves* (Figure 11) to understand how those connect, then see that same system at a larger scale in the augmented

reality animations of the screens and crates (Figure 12 & 13). Thus this showcase covers multiple levels of understanding these connections, as the audience engages with the pieces on a physical level with the interactive toys, on a visual level from seeing the finished furniture pieces in the show and on an intellectual level by watching how the pieces get put together in the animations.

Figure 10. *Joinery Toys* Dovetail Close-Up

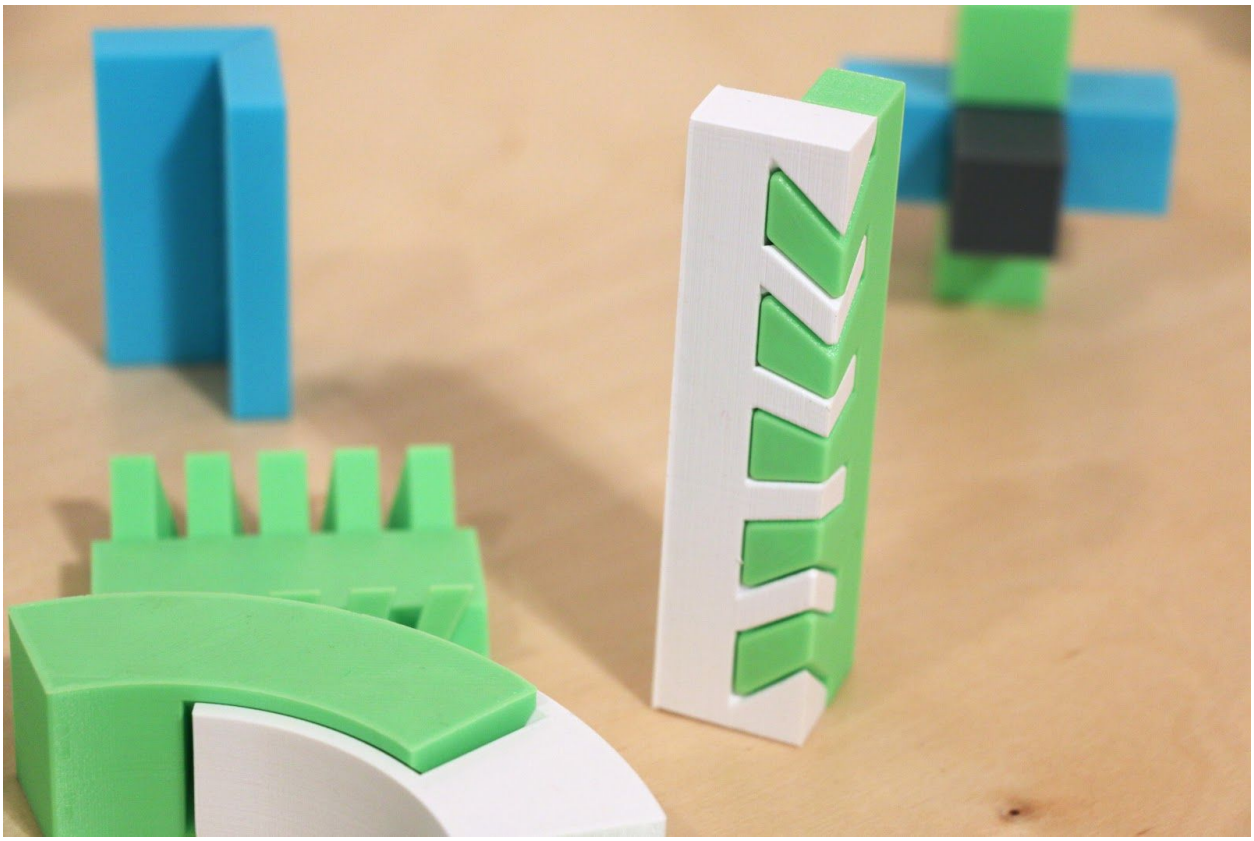


Figure 11. *Interchanging Dovetail Shelves*

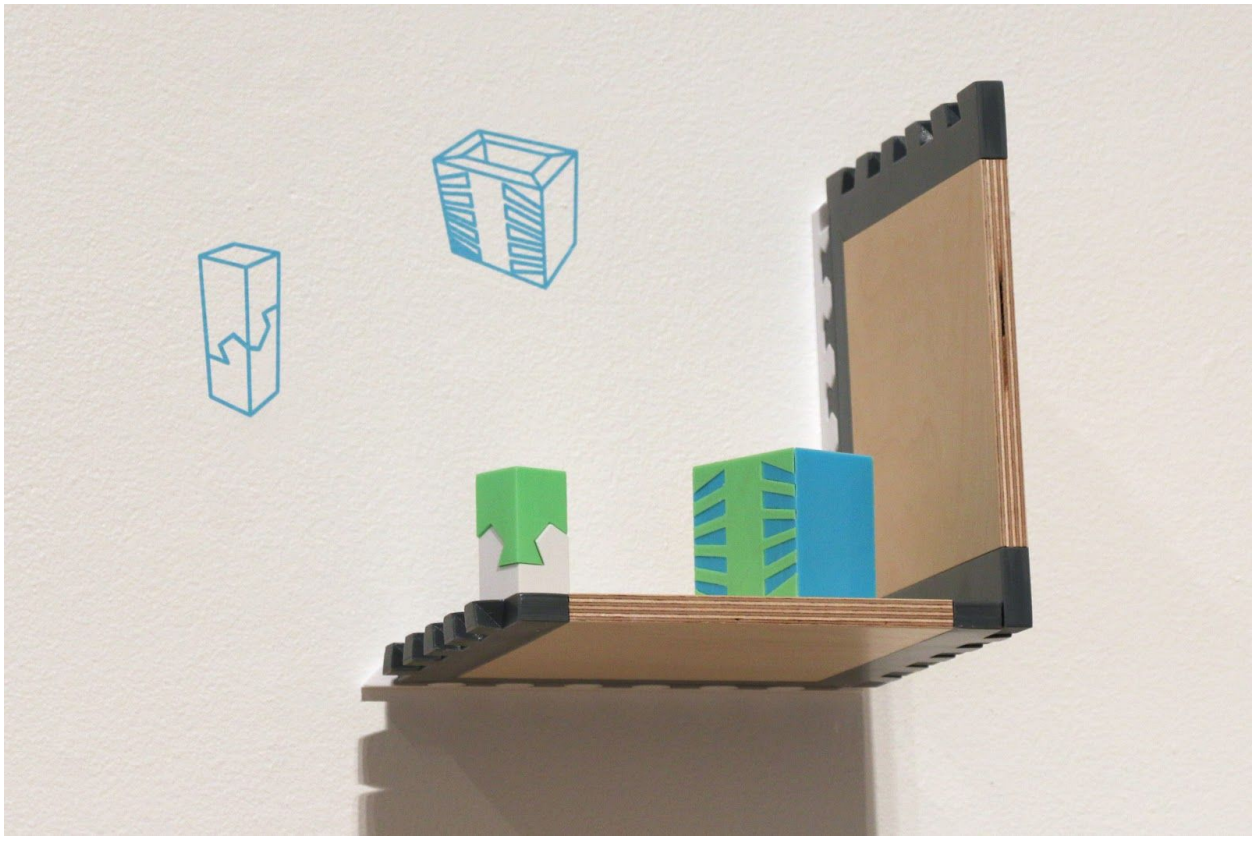


Figure 12. *Augmented Reality Furniture Animations*

Figure 13. Viewer using the Hololens to see the Furniture Animations

Looking ahead, there are multiple directions that this project could go in future iterations. One element for further consideration is an expansion of the sawhorses to a variety of stand systems for tables, stools and benches that play on the puzzle assembly of removable joints connected to wood. The joints could continue to be plastic pieces or expand into metals or other materials, an exploration that can also be applied to the handheld joinery toys in order to push them from a simple toy to a high design object. Another aspect to research is how the joinery could be scaled up and modified into different objects that could maintain the movement of the joints for functionality or simply reference the aesthetic of the joinery and be more of a sculptural object. A helpful tool for exploring these possibilities is the computer modeling, visualization and 3D prototyping workflow I have developed throughout my thesis experience and delving into augmented reality in its more accessible forms as I move forward in my work.

In a world that is rapidly transforming through emerging technologies, it can be difficult to consolidate modern developments with the comfort of nostalgia. While we push to move towards digital culture, crowdsourcing and ‘the cutting edge’, we maintain the propensity for traditions of the past as individuals, which influences both the objects we create and the products we purchase, even as our lifestyles evolve. The amount of time spent building a functional object is still a source of pride despite the knowledge that a machine can do it more efficiently and we are struck with the nostalgia for toys when presented with a small puzzle, no matter how it was produced. The time it takes to learn these systems as well as the physical contact involved with the assembly and disassembly cycle makes the user emotionally invested in the objects, creating a sense of value that is usually missing from a mass produced object. My research seeks to capture the tactile satisfaction of solving physical puzzles with the excitement of exploring new technologies by reimagining traditional carpentry techniques in a digital context. As is common with modern techniques, the possibilities are endless but I present a few scratches at the surface in the form of puzzle-like joint examples to learn the physical systems combined with demonstrative animations to give the viewer a glimpse of how the small object they are playing with could be applied in different contexts.