

# Memory through Design: Supporting Cultural Identity for Immigrants through a Paper-Based Home Drafting Tool

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## ABSTRACT

Current research in HCI with immigrants predominantly focuses on their practical needs and little attention is given to their cultural identities. As such, we aim to understand how newcomers reflect their cultural values within domestic settings. We explore this by provoking memories immigrants associate with physical spaces inside their homes. Hence, we built “Our Home Sketcher”: a paper-based home drafting tool that allows novice users to design their homes by sketching and implicitly expressing their space, light, and privacy preferences. The collected drawings are then fed into a computer algorithm that produces 3D models of the sketched houses. This process of design acts as an artifact-driven storytelling for heritage sharing and rapport building within migrant communities. We engage 13 Middle Eastern newcomers in Canada with the tool and use Halbwachs’ [44] theory of collective memory to frame how home sketching provokes former experiences. Our findings show a strong longing for reclaiming the past, narrating space-related oral history, and designing beyond current limitations.

## Author Keywords

HCI; memory; culture; house design; 2D sketching; immigrants; ICTD.

## CSS Concepts

- Human-centered computing~User centered design
- Human-centered computing~Activity centered design

## INTRODUCTION

Cultural identity, a feeling of belonging to a group with common values [45], is immensely an important part of a person’s political self. This becomes even more important for people when they move to a new country to live in. When someone faces diaspora, they are usually placed in culturally dissimilar environments which make them feel isolated. As such, they tend to connect with their cultural heritage and, most likely, their cultural identities will emerge or even strengthen as a form of resilience [93]. Cultural identity encompasses familiar practices and social ties experienced on a daily basis [45]. This sense of belonging can make

newcomers feel less alienated with the foreign communities they are placed in and create strong in-group solidarity [13,56]. However, current research in HCI and related disciplines about immigrants mostly targets the newcomers’ immediate needs and emphasizes on functionality, especially in relation to the hosting communities (e.g. [17,18,34]), while little focus is given into how to support their cultural identities.

An important container of someone’s cultural identity is the domestic spaces they occupy. Several researchers have shown that vulnerable population groups (e.g. low-income families, displaced people) customize the design of their houses based on their memories, and despite limitations in available resources [79], to accommodate their needs, create “places” that provide an escape from their realities, generate a sense of home, and support people’s sense of identity and pride [5,69,79]. We can see through their placemaking their needs, memory reconstruction, and identity. Unfortunately, we do not have the ability to observe similar practices in North America because the vast majority of houses are standardized, the customization cost is only afforded by the elites, and regulations make it hard to perform even simple physical alterations [10,57]. Considering the hundreds of thousands of immigrants North America accepts annually[3], it is essential to have different home designs for the migrants to support their domestic needs and cultural identities. As such, we were motivated to pursue this research about cultural identity, home design, memory, and immigrants.

Houses are studied in non-immigrant HCI literature through the concept of placemaking: reinventing spaces to create new realities [76]. This is done using multiple agents such as augmented reality [61] and sensors [63,91]. However, work in this field focuses usually on a particular space in the house (e.g. the living room) and does not consider the relationship between the different spaces: how spaces are configured in relation to one another and the broader and deeper cultural dimensions that inform such compositions. Theorizing and conceptualizing a sense of place within domestic settings are inherently complex tasks since place is not only a lived reality in its physical sense, but also a “bricolage” of past places enshrined by one’s own experience, envisaged from stories by others, and “internalized” in the form of “memories, values, and emotions” [51]. As such, we need to have a deeper understanding of how memory advises placemaking. Subsequently, we turn into the process of “making” to comprehend such a complex relationship because “making” is a form of weaving in which the creator

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binds their own values into the texture of the artifact [50]. Unfortunately, less emphasis in HCI literature is given to how “making” can act as a memory reconstructing tool.

The objective of this paper is to explore what cultural identities immigrants associate with the physical layout of house structures. We do this by investigating the role house sketching can play to narrate memories and foster agency for the newcomers to catalyze reconciliations and forge bonds. As such, we developed a cultural probe called “*Our Home Sketcher*”: a low-cost paper-based workflow that guides non-designers and low-tech users to design their dream homes by sketching and expressing preferences and requirements in terms of space, light, and privacy. Image processing is then used to produce 3D digital models of the sketches to create a clear projection of the prospective homes. We engage 13 Middle Eastern newcomers in Toronto, Canada with this tool to design their homes. Through observations, interviews, and design analysis using Maurice Halbwachs’ [44] theory of collective memory, we reveal a set of cultural values attached to placemaking and propose HCI research directions.

The primary contribution of this paper to HCI and migration scholarship is introducing space design as an approach for reminiscing to understand the cultural needs associated with domestic places. In doing so, this paper (a) mends a gap in HCI discourse on immigrants which emphasizes functionality over the emotional aspects (e.g. social ties, trauma) central for long-term settlement by illuminating the relationship of immigrants to people and spaces in domestic settings, (b) advances research on HCI design with memory by presenting an augmented tool that supports spatial recall comprised of paper sketching (for simplicity) and 3D modeling (for visualization), and (c) offers an original insight into the domestic relations fostered by space configuration to build rapport, agency, and cohesion which reflect cultural identities of Middle Eastern newcomers.

## RELATED WORK

### Immigrants, House Design, and Placemaking in HCI

Current research in HCI about immigrants aims to understand the challenges newcomers face and design computational supports accordingly. Topics discussed with newcomers include health and wellbeing [17,18], youth role in family integration [34], collaboration with the host communities [4,30], and information access [23,49,78]. Unfortunately, most work focuses on how newcomers can communicate better with their hosting communities while less emphasis is given into understanding the role of cultural identity in their lives. Supporting cultural heritage is important for migrants who are left with pre-relocation identities that will likely emerge or even strengthen after they face diaspora as a form of resilience [93]. Cultural identity reconstruction is mostly apparent inside their houses through domestic objects’ arrangement and practices [39,92,97]. Our paper is motivated by the argument Sabie et al. [79] and Nabil et al. [69] present visually and empirically, within the HCI context, that displaced populace in camps build, paint, and decorate their public and private spaces to reflect their

cultural identity. We extend their work by making an accessible tool that allows non-designers to sketch and visualize their aspirations and memories in physical spaces.

In a more general context, HCI research has been interested in enhancing people’s experiences with their homes. This is done through multiple channels such as identifying people’s routines and organization strategies within domestic settings (e.g. [84,86]) and deploying house technologies (e.g. [54,72]). Desjardins et al. [26] go deeper and define 7 genres of HCI research on the home and conclude on the importance of first-person research to investigate how the concept of “home” can be radically different based on events happening in a space, space arrangement, and occupants’ background. These studies lay out the different practices people use to reconfigure the spaces around them - mainly through object placement - to fit their family’s needs and activities. However, there is a less explored angle which delves more deeply and intimately into the spatial configuration of past homes, the type of living activities they afforded, the stories entwined with such physical environments, and the rich and complicated relationship between past and current habitats.

One way to understand this interweaving web of space, home, and people is to look at it through the process of placemaking. Dourish [28] notes that space configuration creates alternative realities “*in which spaces, their extents, their boundaries, and their capacities become legible, understandable, practical, and navigable*”. Placemaking is a fundamental aspect of embodied experience and a variant on the ways in which spatial perception is seen through a cultural/social lens [16]. Technology has helped to amplify this practice by creating new tools for experiencing spaces such as augmented reality (AR) [61], moving structures [91], and sound sensors [63]. House design is studied at a much lesser capacity in HCI. For example, Luhtala et al. [62] develop a prototype that utilizes AR to help novices in choosing appropriate design layouts during the house planning process. Desjardins and Wakkary [25] reflect on the process of converting a van into a camper to see how people reinvent the environments they live in. While these and similar research are making notable advances in connecting HCI with house design, they mostly use artifact probes to understand the psychology of homes and focus less on how house domestic spaces are related to one another. We address this gap and use space production as a probe to understand the complex network of past and current social, material, and mental relations interlacing within domestic physical setting.

### Collective Memory and Reconstructing Remembrance

In order to explore the interlacing web between space design and past events, we turn to theories of cohesion, memory, and place. When an individual experiences a major life transition change, such as migrating, it impacts their wellbeing, even when appraised as improvement, leaving them grappling to consolidate what they experience internally and externally with what they once knew or were accustomed to. These reverberations transcend to the society

level, necessitating a cohesion that Hickman et al. [46] define as “*the ability within the individuals and groups living in a place to manage the inequalities, differentiations and tensions intervening within and between them in terms that they perceive as positive and successful*”. Psychology discourses posit reminiscence as an important process in regulating individual development throughout when they in constant mobility. This stems from a need of maintenance continuity, or preservation of one’s life circumstances (external) and sense of identity (internal) because both are essential to functioning and wellbeing [6]. *Collective memory* is important for the process of migrant’s cohesion. Halbwachs [44] defines *collective memory* as a reminiscence that narrates previous events and experiences by the virtue of being part of a group (e.g. family, society) they identify by. In the context of limbo, such as becoming a newcomer, Schwartz argues [82] that people turn to collective memory because it does not merely reflect past experiences as it also has an orientational function and is both a mirror and a lamp, “a model of and a model for society” to find resilience [33].

Collective memory comprises of three dimensions aligned with culture’s 3-dimensional framework: *social memory* (people), *material memory* (artifact), and *mental memory* (cognition) [32]. The *social memory* dimension explores how people formulate social identities through relating to past social ties and practices and reflect on the multiplicity of meanings individuals attach to shared experiences and the intense struggles that take place within groups over what to remember and what to forget [37]. The *material memory* dimension investigates how history can be contained in objects: mediums that conserve social memories of the past and produce multiple narratives for the present around various themes (e.g. consumption and creativity) [36]. The *mental* dimension contributes to how the other two dimensions are shaped. When groups reproduce constructions of the past and give them material form, they invest them with the “psychological charge” of their particular beliefs and desires (e.g. communal values and national glorification) [68]. As we can see, unlike autobiographical memory which is private and local [80], collective memory, while still recognizes the personal dimension, also offers a communal component that is vital to the migrant community. This framing of collective memory allows us to understand the different aspects in which offering newcomers the opportunity to design a house trigger past events and encounters associated with physical spaces.

A place plays an important role in immigrants’ lives. While a place, by the virtue of its existence, is a material memory probe, it is also crucial for the other two dimensions of collective memory due to our physical, sensual, and emotional responses with the site itself, events that occur there, and with people in that particular space [90]. Halbwachs [44] argues that spatial images play an important role in collective memory because individuals and place each receive an “imprint” of one another as detail in a place has a meaning only visible to certain people. It is the stabilizing

persistence of place as a container of experiences that contributes powerfully to its intrinsic memorability [67]. As such, in the context of transnational communities, transforming habitats to reflect cultural identities (e.g. Little India and China Town) is an externalization of the desire to restore a sense of place and relive past experiences in the present [97]. This reenactment manifests primarily through architectural features, signs, calligraphy, textiles, color schemes, gardening, language use, and even flags [39,92]. Given this rich body of theoretical work that links memory with place and recall, we turn into HCI literature on memory.

### Memory and the Process of Making

There exists a considerable body of work in HCI that explores how digital technology can effectively collect memories and support reminiscence. This is done through various mediums such as sound (e.g. [22,70,73]), photos (e.g. [59,65,88]), and sensors (e.g. [11,38,71]). Most relevant to our work is how reminiscence relates to emotions. For example, Sosik et al. [81] explain how users reflect on their friendship on Facebook by encouraging free recall of events and emotions using mental imagery through collective memory. Bruun et al. [19] show that cued-recall of emotions does not suffer from the memory bias as free-recall. However, HCI focuses on activating reminiscence when a contact with a sentimental object happens while little attention is given to consider other practices to evoke past experiences. *Memory through design* is an important approach for reminiscing. This is because the process of “making” inherently stimulates memories of persons, places, relationships, events, activities, and other objects [41], and moves the maker closer to their true “self” by enabling them to tell something about themselves and their lives through the things they create. [74,99]. Also, such an approach is more fruitful than simply interacting with an object if we want to retrieve not intuitive links (e.g. connect physical spaces with past experiences) because the process of making entails us to comprehend the final product in an ongoing generative motion that is temporal, spontaneous, and harmonious [50].

Few HCI scholars have commented on how the process of making can act as a *memento*. For example, in one of Bennett et al. [12] creative storytelling sessions for the elderly, each participant produced wax tablets representing significant symbols of place drawn from the participants’ personal memories. Marshall et al. [64] assert that the process of creative making can support both hedonic and eudemonic facets of wellbeing because creative design makings are ways in which participants and their relationships and memories could be told and held. Though this body of work is limited, it does touch upon the importance of “making” for recalling past events. We are inspired by the work of Lynne Howarth’s [48] “*Indigenous approach*” which utilizes surrogates that give voice to artifacts and their makers, encompassing references to people, places, relationships, events, techniques, and places. In this project, we follow the “morphogenetic approach” which enacts making as a contingent process of growth, to facilitate reflective and constructive design [50].

In the next section, we detail how the tool we developed accomplishes these notions.

### “OUR HOME SKETCHER” SYSTEM DESIGN

In order to create an effective tool for reminiscing in connection with placemaking, we sought to provide a simple interface such that users do not spend much time learning it, offer a template to reflect on past and current encounters, and provide entertainment. Based on this framing and on the collective and professional knowledge about house design the first two authors have as they were trained in Architectural Design, we developed an accessible spatial design tool called “*Our Home Sketcher*”: a paper-based kit that guides users to design and sketch houses purely with paper, pencils, stickers, and tangible stencils. Image processing is then used to turn the sketches into 3D models for clear visual representation. As such, our participants are augmented by technology during a small portion of the study, to perform tasks beyond human-capabilities and provide entertainment, in order to facilitate non-disturbed memory reflection through the simple interface (i.e. the paper).

There exist several free interactive digital platforms which allow users to utilize the mouse or their fingers to draw floor plans of homes on the screen and automatically generate 3D visualization of them such as Homestyler [102], planner5D [100], and RoomSketcher [101]. However, we opted for developing our own paper-based design tool because paper is an established medium to mediate an elicitation dialogue in the drafting sessions among researchers and vulnerable population group (e.g. elderly, migrants) since a paper-based interface is accessible and permits a level of engagement and collaboration that can be hard to provide with digital interfaces [60]. This is particularly important when working with immigrants who usually find it hard to communicate their ideas due to language barriers [1] and cultural constraints stemming from the fear of being misunderstood [29]. Moreover, based on a comprehensive study with design students by Pan et al. [75], while sketching on computers enables working on more details and is more time-efficient, it does not allow much room for imagination and creativity as paper sketching does. Hence, many augmented sketching tools (e.g. PaperSketch [96], BricoSketch [89]) are based on how paper drafting makes creators focus on the design issues. There are some systems which convert professional hand sketches to digital plans and 3D models such as the work of Ruwanthika et al. [77] and Sketchplan [83]. Our system similarly affords users the opportunity to inform and manipulate the design, but through tangible paper stencils and annotations that are suitable for the novices.

#### The Sketching Tool

The interface for our tool is a 16-page kit that has (Figure 1): instructions on how to use the tool, a short pre-design survey to help the user to know some target things to achieve in the design (such as how many bedrooms and bathrooms), a sketch vocabulary and annotations sheet to explain the different drawing conventions they can use, and 6 sample design templates where each sample has a detailed plan view

with furniture, a sketch of the design using the provided kit, and a 3D model of it. With the design kit come sketching grid sheets (at 1:50 scale), a black pen, a pencil, an eraser, a pencil sharpener, a ruler with scaled annotations (aligned with grid paper scale), colored paper cutouts, colored construction papers, furniture cutouts, a pair of scissors, and a glue stick.



Figure 1: Pages from the design kit and the provided stencils

To use the tool, the user starts by going through the design kit and answering the questions in the pre-design preference survey. For design inspiration, they can refer to the house templates provided or look for ones online. On the grid paper, the user utilizes a pencil to draw an outline (in plan top-view) of their dream house (the tool only supports one level currently), along with the different types of doors and windows. The width of the openings can be of any size based on the length of the colored cutouts. We provided pre-cut pieces but a user can cut a custom length from the provided colorful sheets. However, we opted for specific openings' heights based on the paper's color (Figure 1) in order to not confuse the user with too many options and to make it easier for the algorithm to create the 3D model. Users can label each room and use the furniture cutouts to help them imagine how the different spaces can be arranged. After they finish, they draw the final version on a new grid paper by 1) using the black pen provided to draw the walls, and 2) placing the colored paper cutouts provided or the ones they created close to the walls they want the openings to appear at. They can use the glue to stick the cutouts on if they believe this is their final design. A photo is then taken of the final sketch which is run into a computer program to generate a 3D model of the sketch using OpenCV library [103] in Python to recognize the different colors in the sketch and ObjectARX [104] to draw solid objects in AutoCAD. A user can zoom in/out, pan, and orbit around the model to see their design in detail and renderings can be produced of the different views.

#### METHODS

The first two authors were trained in Architectural Design and are of Middle Eastern background. They have worked on multiple projects for developing houses and public spaces in refugee camps. The first author has been active as a volunteer interpreter for newcomers in the Greater Toronto Area (GTA) in Canada over the past few years. We received approval for all study procedures from our university's ethics review board before conducting the work. To recruit

participants, we used “snowball sampling” [42] where we asked a number of newcomers we knew to participate and recommend other newcomers. Using their testimonials, we recruited more participants. We stopped at a theoretical saturation, i.e. when no new additional data were found that developed our findings [40]. All participants except one have no design experience. Table 1 illustrates their characteristics.

Gender	Male: 7    Female: 6
Age	Min: 18    Max: 45    Avg: 31
Country of Origins	Syria: 5    Turkey: 4    Iraq: 2 Iran: 1    Bangladesh: 1
Came to Canada	2016/2017:6    2018:5    2019:2
Migration Status	Permanent resident:10    Student:3
Highest Education	Ph.D.: 1    Master: 2    Bachelor: 5 High school: 1    Middle school: 4
Occupation	Graduate student/Researcher: 4 Trade employee: 2    Housewife: 2 Doctor: 2    Builder: 1 High schooler: 1    Driver: 1
Living Status	Married: 9    Single: 4

**Table 1. Summary of the participants' demographics**

Cultural probes are widely used in HCI research with immigrants (e.g. LEGO blocks [35], dialogue cards [52], postcards [95]) to provoke users, inspire ideas, and facilitate further interaction and creativity [43]. We used the tool we developed “*Our Home Sketcher*” as a cultural probe to trigger memory associated with placemaking through design. All studies (except 2) were conducted in groups of 2-5 people where participants in one group knew each other through family or work. Each study lasted 2-3 hours and conducted either on the university campus or at the newcomers’ homes, all in the GTA (Figure 2). One author moderated all the user studies alone. Each study was divided into two parts. During the first part (which took 60% of the time), the participants were educated about the tool and directed to go through the design kit and start designing a house they want. We left it for each participant to choose their house specifications (e.g. number of rooms). The final sketches were digitally processed during this phase to generate the 3D models which were shown to our participants and we used the mouse to rotate around it. We emailed the participants renderings of their 3D models after the study. During the second part of the study, the participants were interviewed and asked about their experience in using the tool, the decisions that informed their designs, and their thoughts on the generated 3D models. Each participant was compensated with CAD 20 in cash.

We used three methods to collect data: observations, semi-structured interviews, and participants' final designs. During the first part of the study, we observed participants while they used the tool and took notes and photos to assist how the users interacted with the tool and their design process. We refrained from asking questions about their sketches during this stage to avoid any influence in their designs. Semi-structured interviews with the participants were conducted during the second part of the study to get information about

the usability of the tool and the design choices. Interviews were audio-recorded and transcribed by one of the authors before analysis. The participants’ draft sketches and final designs were kept for space configuration analysis later.



**Figure 2: The design sessions**

We used different methods for data analysis. The produced house layouts were analyzed by commenting on the designs for contextual insights and understanding the underlying meanings of space distribution. Through our analysis, we were trying to place related themes (e.g. rooms arrangement) to the three components of collective memory. For the interviews, we did qualitative analysis using a text analysis software [105]. We began with a comprehensive reading of the transcripts during which we identified sub-codes based on collective memory dimensions. Our initial pass through the data resulted in roughly 20 codes (e.g. past social configuration, current space problems, personal aspirations). We then iteratively refined and discussed the codes to ensure that they were representative of the data. Related codes were clustered into high-level themes. Our findings sub-categories represent themes with the largest number of sub-domains.

## FINDINGS

Each participant produced one home design. Eleven of our participants created houses to be located specifically in Canada while the other two said that the designs could be placed anywhere in the world. Our analysis uses these house designs to link between placemaking and the 3 dimensions of Halbwachs’s collective memory: social, material, and mental. We map the produced houses’ layouts, not only in terms of the individual design preferences but also in terms of how inclinations are interconnected. We first establish the social memory represented in the designs. Then, we link between the implemented layouts and the materiality of spaces our participants have experienced. Lastly, we discuss the mental stands that were provoked by the design process.

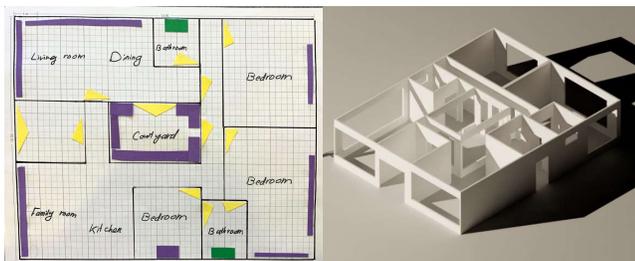
### Social Memory

Social memory is concerned with communal pieces of memory about social norms and cultural values of a group (e.g. family, friends, and community) which is significantly associated with the group's identity [32,37]. Such a framing can be seen clearly in the design decisions of our participants. We noticed two major themes in this memory: one related to pre-immigration cultural practices that are embedded in our newcomers’ values; and a second one associated with domestic social practices peculiar to their families.

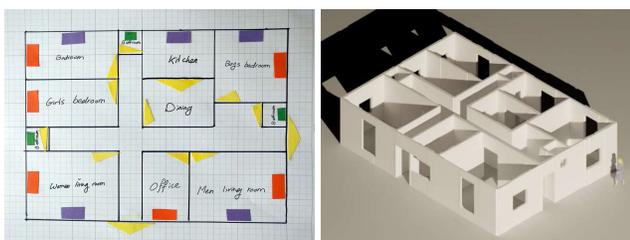
### Cultural Values

Many personal values are rooted in cultural customs such as

privacy standards and social obligations [31,66]. In all of our participants' designs, we saw the presence of some cultural values not present in North America such as dedicating rooms for parents in the house because 3 generations would be living in one house (the grandparents, parents, and children) and creating ventilation corridors. The most noticeable difference between the designs of our participants and current local house designs is the clear physical divide between what is public (e.g. guest room) and what is private (e.g. bedrooms) in the house. As all of our participants come from Middle Eastern cultures, the vast majority separated their houses into a public and a private sector. The division is visible through clustering the bedrooms away from the living room, dedicating entrances (one for the family and one for the guest), and assigning rooms for the guests (e.g. a separate bathroom). For example, in Figure 3, the participant created a main entrance to the left which divides the house into 1) the public sector at the top with the formal living/dining and the guest bathroom, which has limited access to the rest of the house, and 2) the private sector to the bottom and right of the house which has an open flow for the family. The separation is taken even further with our participants who are from rural areas where they separate the male and female sectors. For example, in Figure 4, the participant created a door to the right that offers access to the men living room and the boys' bedroom while the master bedroom, girls' bedroom, and the women living room are pushed all the way to the left with a separate entrance.



**Figure 3: A courtyard core with a division between private and public sections (P13, female, doctor, 20s)**



**Figure 4: A clear separation between male and female (P6, female, housewife, 20s)**

In general, our female participants provided more insights and detailed sketches and spent more time on the design process compared to men. They would measure every single dimension, draw multiple versions, and produce neat final sketches. This is because women from oriental cultures have a stronger attachment to domestic settings as certain day-to-day operations (such as hosting gatherings, cleaning, and

cooking) have a strong correlation with their sense of importance through spatial activates [98]. Moreover, home design describes a women's identity as it is an expression of family and personal relationships, of personalization, and of refuge [2]. Our male participants were engaged with the design process too, but their focus was targeted towards maximizing space usage and finishing the design within the shortest amount of time possible.

#### Social Relations

A house for our participants is not only a place to spend the night in, but it is also a locus for domestic social gathering, exchanging expertise, holding events (such as engagement parties), and much more. It is for the whole extended family, neighbors, and friends. We noticed that there was a strong longing for people who no longer live with them. Our participants kept referring to their family members (such as parents and siblings) who still lived back home. They would either refer to their family members' preferences or implement design features that support interaction with these members. The most noticeable relation that our newcomers kept referring to was maternal; mothers were discussed in all the sessions in one way or another. This is due to the degree of authority mothers have on their children in eastern cultures where women are still strongly attached to domestic settings [53]. One of our participants explains:

*"Mom! I've missed my mom so bad. I was thinking of her. Part of the reason my mom and I so close is that we spend so much time together. Until I got married, I've lived with my mum for my whole life. My father passed away 4 years ago, and ever since then my mom and I have become very close. Since we've spent most of time at home, I feel what a house means to mom and daughter. We were having conversations at the kitchen while she was cooking and I was telling her about my day, and drinking our coffees at our balcony facing our big garden. I really wanted to have these spaces in my house and invited mom here to share those moments again and again."* (P2, female, graduate student, 30s)

Besides referring to a particular person, most of our newcomers put a lot of value in the time spent with the family as a whole. This was reflected through the emphasis on kitchen layout in all of the produced designs. The kitchen would have large windows and mostly is not separated from the rest of the house. It is common in eastern cultures for the kitchen to have a limited number of windows and be in an isolated room so if someone is cooking they are not able to communicate with people seated in the living/family room. This was a source of annoyance to our participants as they stressed on the importance of food in their cultures for family gatherings. Hence, the designs we see reflect the need for connecting the kitchen with the rest of the house:

*"Here is the kitchen. I do not want any wall inside ... I can cook here. There is going to be window here so when I cook I can watch outside ... There is going to be like a dining table and also cooking table something"*

like that like a divider between the kitchen and the living room ... Here is the living room so when somebody cooks something here they shouldn't be a different room. They can stay in touch or talk or you can watch movie from here when you prepare something." (P11, male, marketing employee, 20s)

In summary, our participants contemplated on the cultural values they experienced and reflected, through spaces configuration sketching, on the ones they wanted to be presented in their homes - mainly privacy, maternal connection, and unobstructed communication.

### Material Memory

Unlike the previous dimension of memory which is tied to social norms, this memory is concerned with how "objects" speak with us [36]. The major artifact in a house is the actual physical space in it. Our participants reflected - through the designs - on the physical settings of previous and current houses they experienced. We noticed influences from cultural building conventions, the houses they lived in before immigrating, and the placed they are settled in now.

### Physical Cultural Features

Several of the designs draw from traditional houses from the participants' home countries even though none of our newcomers had lived in such traditional configurations. The most notable one which one of our participants drew plainly (Figure 3) is the courtyard. A courtyard offers privacy and seclusion as you can be outside but away from strangers' eyes. Moreover, it presents a central focal point; an open middle space for gathering where all rooms have access to it [7]. This concept of a central space can be seen in 7 of our 13 designs (e.g. Figure 5). Our participants would create middle empty space where all the room open into. This concept is not dominant in the North American housing market as it is not space-efficient given lot restrictions [57].

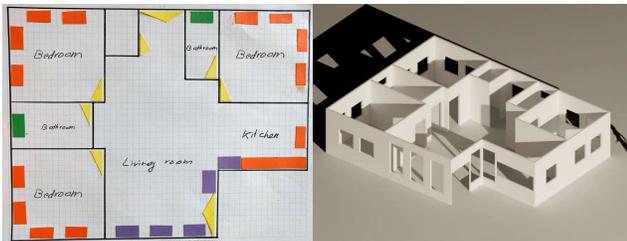


Figure 5: A central core design (P8, male, researcher, 30s)

The division between public and private sections of the house is evident in modern houses in eastern countries. Some of our newcomers note that the house would be surrounded by a fence and the living room and the kitchen would face the front yard (e.g. Figures 3 and 6). There would be two doors: one for the guests that goes into the living room while the one opens into the kitchen for domestic activities. The kitchen is placed in the front so people cooking can see who is knocking on the front fence door and the grocery can be carried right into the pantry. We do not see such a design in typical North American houses as the kitchen is usually pushed to the back, next to the family room, to face the

backyard which is considered the family space.

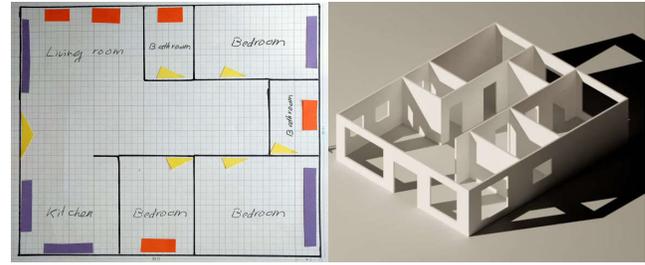


Figure 6: The kitchen and the living room face the front yard (P12, male, doctor, 20s)

Another cultural aspect of house design that some of our participants like is the "un-cubism", i.e. houses with multiple edges. Such dynamic designs remove dullness and add uniqueness to the façade. With mass housing production, houses in North America tend to - more or less - have a box-like shape, look similar to each other, and lack privacy from neighbors [20]. One of our newcomers explains (Figure 7):

"One thing I always disliked about modern houses, at least houses that are built massively to accommodate more people rather than being a nice place to live, was that these houses are just cubes but my ideal house would have lots of edges like the windows are coming out/going up as you can see my design is like I do not like the cube style... I also think that there are these things [bay windows] that are somewhat historical or cultural in Iran as well like very historic like you have 8 edges or 6 edges it is kind of inspired by my own culture." (P1, female, graduate student, 20s)

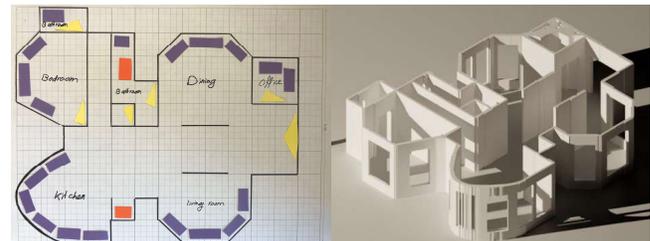


Figure 7: Faceted walls (P1, female, graduate student, 20s)

### Pre-Immigration Homes

The configurations of houses our participants lived in before immigrating informed their design choices. All of our participants considered their former houses as departing points for their aspired designs. They would consider what they liked and what they did not like about their previous homes. For example, 11 of our participants enjoyed their previous houses' layouts such as the relationship between the living room, bedrooms, and balcony/garden. About half of our participants indicated that their previous homes were larger and afforded more open spaces. However, the other half noted on how the low number of bedrooms and bathrooms forced them to share their personal spaces with other family members leading to lack of privacy. In response to that, the vast majority created more bedrooms and bathrooms than what they had originally and added extra

spaces that act as an office or a multipurpose room.

Separating the kitchen from the rest of the house in pre-migration houses was frowned upon by our newcomers because this configuration did not allow for communication between who is cooking and the rest of the family as illustrated in the previous section. Hence, 9 of our immigrants created open concept kitchens. 10 participants noted that aesthetic was not a huge part of house design culture in their home countries as the economic state was forcing people to be as efficient with space as possible (even with large lots) and creating open concept was a waste of resources. One of our immigrants said:

*“We are coming from Istanbul ... there the houses are always like the design should cover as many people as possible. Non-aesthetic or taste. So, I tried to keep balance like both aesthetic a bit and also as much space as possible... Now in recent years there is a trend towards minimalism so less is more so less furniture may be less room whatever we need we should have them.”* (P10, male, marketing employee, 30s)

#### Current Spaces

The struggles our participants face with their current small places of residence impacted the resulted designs greatly. Our newcomers pointed out how the lack of space resulted in functionality limitations such as no space for a laundry machine or a table for studying. Due to space limitations, multifunctionality is a must. For example, the dining table acts as a study desk and a food server. Hence, when someone is studying and it is time for dinner, all the books and papers must be cleared to make room for the food. This multi-usage led our newcomers to feel that they are temporary in this space. Hence, most of our participants made sure to dedicate rooms for offices and other side chores in their designs.

The kitchen seems to hold a special place in our newcomers' lives. All of them complained about the small sizes of their kitchen that limit movement and the lack of natural light in it. Three even noted that they had to share the kitchen sometimes with multiple other residents which caused inconvenient such as time restrictions. Hence, most of our participants created spacious kitchens with large windows and made it open to the living room as this will allow for direct communication with the rest of the house, makes the house looks larger, and, luckily, is the norm in North American houses. However, 7 participants pointed out that the kitchen should not be totally open to the rest of the house in order to stop the smell of cooking from spreading everywhere. Compared to traditional cooking in the west, oriental cooking is heavy on spices and require elaborative steps that would produce a fair amount of fume and scent [9].

As we can see, our newcomers reflected on the physical spaces they have experienced or seen before and choose the aspects they wanted to be part of their home designs. They mapped multifunctional objects and spaces with temporary states and noted on the importance of aesthetics and uniqueness in walls configuration.

#### Mental memory and Design Process Feedback

The mental dimension in collective memory reveals the cognitive beliefs and desires of a person when they recall social or material memories [68]. In this section, we discuss our participants' reactions to the process of reminiscence through design. The drafting sessions elicited mixed mental states. In the beginning, the users were taken back a bit because of what we asked them to design. House design is something that the majority will never be asked to do, whether at a research study or in real-life. After around 15 minutes, the drafting process became smoother. While the actual process of design was entertaining and fostered storytelling, our participants were constantly mindful of the shortcomings of their current statuses.

#### Enjoyment and Sharing Happy Stories

All of our participants expressed their enjoyment during the design process, sometimes even without us asking, by saying that the sessions were “fun”, “entertaining”, “amazing”, and “relaxing”. This is because they were designing homes which, though is typically an unconventional practice to perform, was still very familiar to them as they experience houses daily. Remembering their past lives and imaging their future - in terms of where the family is going to live and how it will grow – were a source of excitement. Moreover, 8 participants explicitly indicated that the papers, stencils, and stickers reminded them of when they were kids doing school projects. In a matter of fact, three of our newcomers' kids were very eager to take part in the study when they saw their parents participating. We gave them the chance to try the tool. However, as our ethic protocol targeted only adults, the children were not considered participants. Two of our participants noted that because their drawing skills were not very good, it was hard to imagine how spaces would look like and they felt anxious during some parts of the drafting session. However, the straightforward instructions and the simple annotations provided put them at ease. Lastly, our newcomers were thrilled to see a 3D visualization of their sketches almost immediately and without extensive effort from their side. All of them noted that indoor and outdoor details (e.g. wall papers, garden) were needed to make the digital models more appealing and could create a deep attachment between the digital visualization and the user who created the sketches. In general, the playfulness and simplicity aspects of the tool contributed to the sessions being relaxing and productive. As such, our immigrants let their guards down and expressed what they wanted.

The study provoked conversations between our participants with other participants and with the mediating author about their experiences with spaces especially joyful talks about family and friends, either in their home countries or in Canada. For example, in one session, two participants exchanged different laundry practices among family members and how the “sun” was their “dryer machine”. In another, a participant narrated how the house he lived in was “half-a-house” because his grandmother divided her large home into two to help her daughter and make a small income. During one session, 3

participants (a husband, his wife, and his brother) shared their stories about how the husband and the brother built by their own hands the husband's and the wife's house in their rural neighborhood. They went into detail to explain how they tore the bathroom walls multiple times because they wanted to fit a bathtub, a sink, and a toilet in a 2m X 2m area. Every time they made a change, something else went wrong such the bathtub did not fit or the door opened into the sink so they had to tear and rebuild.

### Distress

The design sessions were both motivating and depressing for our migrants. It was a joyful experience to let their creatively creep through and remember their families but when they started comparing it to their realities, they felt distressed. Some discussions turned into eulogies of past events such as continuous mobility, temporality, and loss of home:

*“Honesty, this is bittersweet. You know how [P7] talked about the story of our house and how we built and tore walls ourselves, this is very emotional because we stayed in the house for 10 months and then we left due to war. But this is generally a happy activity but yeh, you remember your old house, the kids, the dream house.”* (P5, male, driver, 30s)

Many of our participants, especially men, kept referring to the high cost of housing, land, and customization in Canada, the local house design constraints, and how people take advantage of newcomers when it comes to renting even though we did not refer to any of these topics in our design instructions nor in the interview questions. This was creating a disheartening sensation for our participants:

*“To be real, who builds their homes from scratch here? Very few... We do not have many options here... we are changing from this apartment to another one, it is the same even though it is in another city. The designs are typical... Everything is laid out one next to the other like train carriages. We visit our friends' houses and they have exactly the same layout even though they are at different cities.”* (P13, male, doctor, 30s)

### Control

Finding affordable houses and stable homes which meet the inhabitants' needs, aesthetics, and preferences are crucial to our participants. It is about having agency over domestic settings [58]. The design process offered our participants the autonomy to choose what to recall, how past experiences can influence the designs, and the cultural values they want to sense again. For example, all participants envisioned their homes to be close to an open space like a park or a lake and left no external wall without a window, particularly large ones to have direct interaction with nature and allow light to penetrate inside. This can be a direct response to the frequent gloomy days Canada witnesses during the winter and how buildings are usually very close to each other. However, we relate it to control. Control over who they choose to look inside their homes by having the option to choose whether to put the blinds up or down as most participants had to keep

their curtains down to keep privacy from close neighbors. As such, the drafting session allowed our immigrants to imagine their futures about something they experience every day and wish to have control over as they have lost it due to mobility [21]. As one of our participants tells:

*“This piece of paper [the sketch] is not just a piece of paper, it atones my choices, preferences, cultural elements inside. This can be kind of a cultural brokerage in a new city”* (P2, female, graduate student)

To summarize, as people become mobile, they lose control over their lives even the domestic ones. Immigrants associate emotive aspects of memory with physical spaces as they wish to regain a sense of agency over their lives again.

### DISCUSSION

As our findings illustrate, the participants expressed a strong longing for the past and an attempt to reclaim it as the house sketches were imbued with their collective memories. Our newcomers recalled events, places, and personas which in turn guided the design process. Through drawing, our participants: presented their cultural values (social memory), narrated space-related oral history (material memory), and designed beyond current limitations (mental memory). It was a dialectic process that was reflective, constructive, and empowering. Our findings are based on our context. It is possible that newcomers from different backgrounds and/or at different locations may have dissimilar experiences. Nevertheless, the results we report can be representative of how immigrants reflect their cultural identities through space configuration and point us to important HCI implications that can advance research in this field.

### Designing with Memory

There is a growing body of work in HCI (e.g. [14,27,55,94]) that explores the possibilities of richer and more complex relationships between humans and everyday objects (e.g. mobile phone and spaces) beyond function and design. This “post-humanistic” connection is important to understand why we value objects beyond their monetary values. Such a bond is mediated through memory [87]. Hence, it is important to think carefully about the types of cultural probes that can allow us to frame an alternative account of knowledge production. Unfortunately, most current research in HCI with immigrants do not take such an approach. Our work joins this conversation about rapport with objects used daily through memory but within the migrant community. Our home sketching tool acted as a cultural probe and offered our immigrants the agency to reclaim their relationships with physical spaces that were lost or weakened due to mobility. We recommend that the HCI community consider the role memory can play when leading research with migrants.

The drafting process we implemented helped participants to not only draw from the past but reflect on their present state as well. In other words, the past and the present exist in one design sheet. This is similar to *conflated narrative*: a form of Buddhist art consisting of drawings or sculptures to portray a long series of events that stretches multiple loci and lacks a

chronological order [24]. It is the process of “flattening” experiences of the 3-dimensional world into 2D sketching that pushes personal meaningful events with high emotional intensity to become visible for the organization of reminiscence [15]. As such, a paper-based sketching tool makes more sense compared to a 3D prototype in our context because paper invokes memory more due to it being native to humans. Moreover, unlike instant recalls through interviews or interacting with static probes [19], the paper sketching sessions offered our newcomers the time to reflect on their current and past lives as they erased and re-drew things of what they wanted (or not) to experience and refined the output. Hence, future HCI research with migrants should consider the memorial values embodied in the “making” process and aim to design with it.

### Broader Lessons for HCI

A critical challenge in doing migrant research is that it can be hard to get detailed information from immigrants for various reasons such as language, privacy, and fear [85]. The home sketching process allowed us to dive deeper and understand some immigrants’ preferences in domestic placemaking that could not have been possible using other methods. For example, our findings tell us how our Middle Eastern participants imagine privacy in terms of space configuration and how multipurpose spaces and multifunctional objects are synonyms for temporary status. We achieved this because the newcomers were designing something very familiar to them and experience daily so they did not have to overthink. Moreover, the tool allowed our participants to deliver their preferences in terms of how spaces are configured in relation to one another without the need for extensive verbal communication. If we only allowed oral or written descriptions, a participant may emphasize a notation that the researcher could interpret differently. By asking users to sketch outlines of how they imagine spaces are linked together, the designer can understand the underlying dimensions of placemaking. As such, the process of design can be a method for gaining deeper knowledge about immigrants. Similar approaches have previously been used in HCI with immigrants (e.g. [18,23,34]). However, the majority focus on drawing imagined technologies or thinking diagrams which can make participants uncomfortable if they are not good with conceptualizing [8]. By augmenting familiar concepts (e.g. sketching, house) with technology (e.g. visualization), we can successfully provide a middle ground to foster creativity and support fast feedback.

Our study asserts how standardized architecture in North America is far from accommodating the needs of immigrants from eastern culture. Current house layouts lack privacy to separate the guest section from the family sector and cannot foster large social gatherings. Dourish [28] notes that our sense of place is produced and experienced from “within” by the virtue of interacting with other people and objects rather than imposed from outside. Considering there is a lack of research in HCI about house design for immigrants, researchers can work with architects to design tools that can

foster clearer communication between the immigrants and the designers. Moreover, while the size of dwellings is a constraint, there are some architects who have shown how different space configurations can fit efficiently within small areas (e.g. [47]). HCI can help as it can propose interventions that depend on existing restrictions and take what is existing to its maximum limits.

Considering the global mass migration dynamics and based on our findings and related work, we believe that it is crucial to focus not only on functionality but also on empowering people through acknowledging their cultural values and memory-reservoir. The social and physical contexts of highlighted past and current experiences have great importance in the building of the self and wellbeing [13]. If we want to have a pluralistic society, we need to allow people to live with their cultural principles. Hence, more research in HCI should aim to understand newcomers’ cultural identity.

### Limitations and Future Work

The number and background of our participants were limited. It is possible that with more users and demographic variety we may produce new findings and interlacing relations we cannot deduce currently. Moreover, because our tool is limited to the wall structures and does not include detailed interior or exterior features (e.g. levels, gardens), we might be missing some interesting linkage between indoor and outdoor spaces. Future work can provide more detailed characteristics of home design (e.g. landscaping, neighbors’ relations) to deliver a deeper understanding of homemaking. Furthermore, as a few of our participants felt uncomfortable in drawing on paper because they were not confident in their artistic skills, future research may want to utilize a digital drawing tablet so sketching straight lines would be easier. By doing so, we are keeping the “playfulness” of hand sketching but giving participants more rigorous annotations.

### CONCLUSION

We addressed the gap in HCI research with immigrants and recognized the newcomers’ cultural identities in domestic settings. We developed a paper-based cultural probe to help migrants sketch their dream homes to provoke their memories in domestic spaces. As we engaged 13 newcomers with this tool, our findings, framed by Halbwachs’ [44] collective memory, reveal how standardized architecture is far from accommodating and the importance of memory in supporting and reshaping cultural identities. Our tool was successful in making our migrants express what they wanted clearly without the need for extensive verbal communication due to the tool familiar interface and simplicity. Future work in HCI with immigrants should consider the value of cultural identity and memory and aim to design for it.

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