Digital Nomads: Space + Narrative Computing for the Village of Al Araqib

by

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ABSTRACT

For political reasons, the officially unrecognized Bedouin village of Al Araqib in Israeli’s Negev desert is prevented from building permanent structures. While the state of Israel does not issue demolition warrants for new illegal houses, it instead demolishes these houses without a warrant, under the auspices of a law that allows the police to destroy new illegal structures within 30 days of construction.

This situation has encouraged the people of Al Araqib to become familiar with different technologies. They use solar energy to provide electricity to the village, and smartphones to document and report demolitions. As an act of resistance as much as a practical measure, they repeatedly rebuild their houses, appropriating architecture as a political tool. This creates a situation where the Bedouin with their strong nomadic history, uses physical structures--the language and logic used by their oppressors--in the fight for their ancestral land.

Beyond supporting and recognizing the Bedouin people’s fight for justice, this design thesis asks to harness the conflux of physical architecture and digital technologies in an effort to create innovative
modes of communication that speak to the experiences of unrecognized populations, struggling for cultural survival. Specifically, through collaborative work by the people of Al Araqib, this thesis initiates a laboratory of tools and techniques that harness the spatial characteristics of the land and the social narrative of its people. Aiming to strengthen their ability to communicate more widely and more productively, the thesis proposes a platform that includes a set of digital and physical tools, such as digital design and fabrication, hackable devices, internet of things, architectural drawings, videos, sensors, GPS, automatization and GIS. Lastly, this thesis catalogues these diverse tools as part of a content management system and as a ‘cookbook’. It is composed of spatial information, automated and visualized to create a more persuasive narrative, and of journalistic strategies that introduce knowledge sharing and evidence of the reality of demolition and its impact on human lives.

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This research is based on collaborative work conducted with the people of the village of Al Araqib in the Negev Desert. I would like to thank the residents of the village, and especially Aziz and Sabah A-Turi, who were open minded, extremely thought provoking and welcoming. They were the perfect partners for this project.

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Overview and Vision

Hypothesis

Located in the northern border of Israel’s Negev desert, the Bedouin village of Al Araqib is a unique social and architectural phenomenon. Officially not recognized by the State of Israel, the village experiences the demolition of all its structures by police bulldozers every three weeks. Hours later, and as the sun sets, the people of the village begin to build their homes anew. By the next morning, the whole village had been reconstructed. This ‘ritual’ has been taking place for over ten years, through which the residents of Al Araqib have been fighting against constant demolitions, prompting many of the village’s residents, after the first demolition in 2010, to leave their jobs and dedicate their entire time and effort into running a non-violent action against state policy. Although the community members are familiar with various technologies and tools, these are mostly confined to their construction methods. A large portion of the community’s struggles however, lies in the efforts of the people of Al Araqib to adopt technologies and methods into their attempt to recruit and influence public opinion.

For the past two years, I have been working with the people of Al Araqib in order to suggest a design system that will support their protests against the demolitions. In this thesis, I argue that digital tools can be used by the community in order to form a more coherent narrative about the village and its people. The digital methods being used in this project create an interactive visual experience: one that engages a wider audience, gives the community more control over the distribution of their data and challenges the traditional static visual narrative of the village today.
The potential of this narrative design is to create sympathy for, and bring wide attention to, the political situation of Al Araqib and other unrecognized populations struggling for cultural survival.

Background

The Site

Al Araqib is one of 34 unrecognized Bedouin villages that are prevented from building permanent structures due to political reasons. Indeed, these villages are not marked on any official state maps, nor are they provided with any sort of infrastructure by the state, be it water, electricity or sewage. In spite of this, Around 100,000 people live in these villages, and human rights organizations estimate that by 2030, this number will increase to 235,000 people. It's important to note that while the Bedouins are a muslim minority in Israel, they are considered Israeli citizens. The Bedouin have been inhabiting the Negev land in the 19th century, much before the state of Israel was established in 1948. Although they lived in tents and tin shacks, some evidence, such as the existence of cemeteries, cultivated plots and old water wells, suggests that they have had a strong connection to this part of the desert for several generations.

In 1966, Israel ordered the Bedouins to relocate to government-built Bedouin towns in the driest and most barren areas of the desert. This was, and still is, a systematic government action

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2 Unlike the some parts of the Palestinian population under Israel's rule in the west bank, for instance.


intended to uproot the Bedouins from their lands. The Bedouin opposed these attempts to settle them in semi-urban towns which are counter to their traditional agricultural way of life, and approximately half of them refused. Over the past 15 years, the situation worsened with the rise of the Israeli right. After years of neglect and disregard, the State of Israel intensified its efforts to enforce illegal building activities within the Bedouin community. In a somewhat prosaic argument, the Israeli government’s claim that the bedouins do not own their land, allows it to consider every new structure built to be illegal, prompting the police to issue a demolition warrant for each and every one of these new structures.

Figure 1. A temporary house in the village of Al Araqib.

The case of the village Al Araqib, by no means solitary, is the most difficult. The decision of the Israeli government to evacuate Al Araqib, whether because of its symbolic stature or the fertile
nature of the desert land they inhibit, seems unequivocal and determined. The legal instrument used to perpetuate this situation is an indication of the state’s conviction: instead of issuing demolition warrants for new illegal houses, the state demolishes them without a warrant, under the auspices of a law that allows the police to destroy new illegal structures within 30 days of construction. Since 2010, and up to today, the police have demolished the village over 170 times, once every three weeks, leaving the residents without any permanent structures--if they were to leave, the state would plant forests on the land to prevent their return.

**Al araqib's Digital Identity**

As an act of resistance at least as much as a practical measure, the Bedouins repeatedly rebuild their houses, appropriating architecture as a political tool. This creates a situation where the Bedouins, with their strong nomadic history, employ physical structures in a battle for their ancestral land, using the language of their oppressors. Today, the people live in self-made shelters, built out of wooden poles they find on waste sites. Residents of Al Araqib have no physical space as we usually understand it. Since their village is demolished every three weeks, and since they have never actually had permanent dwellings, they sometimes have no physical connection to the ground. This is why it is important to think about the village in digital terms to create a digital existence for the village.

[^5]: Ibid
The bedouins are struggling to structure a narrative that supports their protest, and traditional narrative design methods fail to assist the community's needs. Maps, for example, are commonly used as a colonial means to exploit and claim territories, and in the case of Al Araqib, to argue that the villagers are nomads with no rights on that land. There is no evidence or representation of their existence in any official state map, nor is it possible to see their temporary structures in satellite images and street views, or navigation apps such as Waze and Google Maps; Videos and images, for instance, are subjective to the perspective of the photographer and the access she might have to power or events. In the case of Al Araqib, The people of the village try to document the demolitions with videos and photos, but due to the threat of being arrested, they do it from a distance that does not allow them to produce a coherent visual record. The only videos
taken from a closer perspective are the ones made by the police, who as representatives of state authority, employ the created visual record in the project of control. When it comes to long-established journalism, it is the common users’ interest that set the agenda. As a minority living far from the country’s financial and cultural centers, and does not always speak the Hebrew language well, it is hard for the Bedouins to publish their stories and narrative in mainstream news outlets. The common narrative delivered by such outlets often presents the Bedouin as poor, uneducated nomads, when in fact, many within the community have technological knowledge, and a large number of them hold university degrees.

Figure 3. A protest against demolitions in the village of Al Araqib.
It is not only that the digital age challenges many of the humanities disciplines norms and connects together many established disciplinaries, it also challenges the division between theoretical and practical methods and generates work in cross-media formats. This notion is critical for the understanding of how practical actions, computational artifacts and viable case studies can serve not only as a tool for distributing particular stories - but also as a scholarly method in the field of digital studies⁶.

In their book *Digital_Humanities*, Burdick, Drucker, Luenfeld, Presner and Schnapp point out that the printing press of the Renaissance and post-Renaissance allowed humanistic ideas to be widely circulated. Today, digital media circulates the same rich content but spreads it more widely and instantly. It was the Web which shifted the digital scholarship to networking, and not only processing, and “projects began to appear that harnessed the digital to create visualizations, geospatial representations, simulated spaces, and network analyses of complex systems”⁷.

Unlike the definite text of the pre-digital times, today we communicate with media which is much more diverse and extensible, that uses scalable databases, visualized information, virtual platforms, videos and interactive interfaces. This way, content, narratives and arguments are formed across different platforms. A Lot of times, we extensively use small screens to do so, like phones and tablets, which makes the visual materials much more crucial to the way we deliver ideas. This has to involve the use of sound, motion graphics, animation, screen capture, video and audio. “Digital design expresses concepts by means of the multitude of ways in which it

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⁶ Burdick A et al., Digital_Humanities. MIT Press. 2012
⁷ Ibid
layers media, structures information, and articulates navigational strategies. Though not every project requires a custom approach or platform, attention to the design of arguments is a fundamental feature of Digital Humanities research”.

And while the medium used in the past fits many of the old world social orders, it fails to provide solutions to new ideas such as the democratization of knowledge and to serve communities which lack access to power positions. Digital tools allow users to engage with a subject in a performative way, from different platforms -- especially when this knowledge is accessible anytime through your phone. While the old mediums are mostly static, reflecting one point of time, the digital mediums allow us to associate live data streams and interactive systems with real-time data, that can be displayed on maps, projection systems, and immersive 3D environments, “Processing embedded sensor input or engaging with feeds from social media challenges the very concept of the archive which has now come to encompass the realm of live, unfolding events”.

**Vision**

This thesis asks to support the effort of the Al Araqib community in reaching a wider audience, by harnessing both physical and digital tools to create innovative modes of communication. Such a system would assist the residents to visualize the multilayered space of their village and with

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8 Burdick A et al., Digital_Humanities. MIT Press. 2012.
10 Burdick A et al., Digital_Humanities. MIT Press. 2012.
that, communicate its story and shape a narrative around it. While mapping, documenting, photographing, writing and drawings have been used to shape narratives of places for centuries\textsuperscript{11}, this thesis suggests using sensors and other live data and computational tools in the production of an interactive story, one that continues to document the incremental changes of the village space. This also allows one to challenge the existing dichotomy between the digital and the physical, the built and the demolished, the past and the present, over time.

**Motivation**

In the past decade I have been working as a journalist in prominent media outlets in Israel. As a journalist, I engaged with the most burning issues in the political discourse, covering the Israeli-Palestinian conflict and the way minorities in Israel and Palestine are being treated. During that time, I learned the impact of a good story on public opinion and on decision making. The challenges in raising empathy with journalism is not only to find the story, but also to tell it in an intriguing way. For example, to mark 50 years of Israeli occupation in the West Bank, the weekly edition of *Time Out Tel Aviv* turned into *Time Out Ramallah* in October 2017. The idea was to feature writing by young Palestinian journalists who would expose Israeli readers to what is happening on the other side of the border – not only in terms of human rights, but also with regard to culture, nightlife and the everyday experiences of young people living in the territories. This challenging, politically-charged project indeed received a lot of attention both in Israel and

\textsuperscript{11} for example, the medieval first maps, TO (*terrarum orbis*), that set Jerusalem in the middle of the world, or The first maps visualizing the americas, transformed the narrative of a national union between heterogeneous groups into reality and supported the will to control, exploit and claim territories with maps. Caquard S. Cartography I: Mapping narrative cartography. Progress in Human Geography. 2013 Feb 1;37(1):135–44.
worldwide\textsuperscript{12}. Another interesting community partnership in journalism in Israel was for example \textit{The Refugee Voice}, a non profit newspaper for asylum seekers from Africa in Israel\textsuperscript{13}.

At MIT I was able to think about technology, and physical making, in that matter, and integrate it into this approach. During my time at MIT I had the opportunity to engage different kinds of making approaches, and to experience various technologies. During the last summer I led an MIT workshop in the Israeli desert, to engage the Bedouin community’s issues. In this workshop I met for the first time the people of Al Araqib and started to collaborate. Together with four other MIT students, and with the guidance of Prof. Larry Sass, we designed and built a temporary structure in the village, which became the first experiment out of many to integrate technological thinking and making into social activity and narrative design in the matter of Al Araqib\textsuperscript{14}.

Along with the summer workshop, I tried to expand my knowledge both in the matters of computer aided design and fabrication, technological thinking and critical broadcasting.

\textsuperscript{12} A project that I led and edited. 

\textsuperscript{13} A project I managed in 2012.

\textsuperscript{14} The project team members: Molly Mason, David Allen White, Hugh Ebdy, Yaara Yaacoby and Hila Sharabi.
Methodology

This project pursues to form a comprehensive visual narrative of a space, by using several different digital technologies and methods. Together, these tools will allow the village of Al Araqib to tell a more complex story of a space. This thesis also asks to harness the physical characteristics of the place, and give it a digital entity, all of this by using hackable cheap devices, and the internet of things, to collect data from the site and convert it to a digital-visual form.

The research is composed of two main parts. The first is the historical background of the Bedouin community in Israel and the political challenges they are facing. In particular, I study the situation in the village of Al Araqib, which gets demolished by the police every three weeks. Beside the historical background of the community and the village, this section also leans on interviews I conducted with the people of the village of Al Araqib and other people involved, to get a better understanding of the narrative they are choosing to form and their ways of political actions.

The second part of the thesis suggests new ways to design the visual narrative for the village in a way that gives the community control over the data and information distribution. This part of the research survey the use of visual materials such as drawings, models, maps, images and texts by designers in the past, in contrast to data driven maps, videos and 3D scanning that are used today to do the same thing, and offers the adaptation of some of these methods to fit the village needs.
and their attempts to form a far-reaching narrative, engage civic issues and function as a political tool.

To do so, I developed a set of tools and techniques, which construct a complete story, which also takes a political stand. The tools are:

1. **Demolition and Deconstruction Interactive Map**

   An interactive data-driven map that visualizes the village and the incremental changes it is facing due to the constant demolitions. The data for the map is being collected by the community with a simple user interface programmed to fit the village needs, but can be also collected by off the shelf tiny GPS (Global Positioning System) that can be hacked for this goal. The map is coded to visualize the shelters that were built in the village by date of construction, and present a moving act of the different village layouts, being ruled by the destructions.

2. **Live Stream Demolitions**

   A system of hackable cheap cameras, that can be produced easily by the community in less than 10 USD each, and are programmed to stream live videos from the village, broadcasting online the demolition from a very close perspective. The cameras are tiny, cheap, fit in the shelter structure, and can also be replaced in case they get ruined during the demolition. They are solar powered by compact off the shelf Amazon solar panels, that allow them to run constantly during day time. Communities without WiFi
infrastructures can connect the cameras to the internet using cellular data from their phones or from a Sim Card.

3. Houses Lab

An experiment I did in the village of Al Araqib, exploring the way physical materials can be used as story elements, and not only as an actual housing solution. The idea is to create a social and digital platform for designers to design and build temporary experimental shelters for the community, by using digital fabrication and computer aided design methods. The files for the shelters are available on-line, in a sharing knowledge platform I designed, enabling designers and communities to reproduce the shelters over and over again, and by that, appropriating architecture as a political tool. The platform allows designers to share their shelters designs and outcomes, and act as a publishing tool for experimental digital design techniques. Hopefully, it can be used by designers, architects and artists who are politically involved and would like to use design to make a social impact.

4. The Al Araqib Cookbook (Buildtube)

A website designated for knowledge sharing and DIY instructions for different construction solutions, that can help communities with similar problems around the world improve their housing situation. The platform includes an option to share videos, drawings, links and also a Q & A chat system. It is also designed to include 3D models
and 3D scannings of shelters and buildings details such as connectors, solar panels and textile elements.

All of these tools are designed to form an extensive narrative around the story of Al Araqib and its community, but likewise can be conceived as a prototype that one may use to tell other stories, visualize it and interact with others to provoke empathy.

Figure 4. the digital platform for the village of Al Araqib, available at: www.diyaraqib.com

**Intended Audience**

Although the digital platform telling the story of Al Araqib and visualizing it is directed to the public in Israel, the system and the methods developed in this thesis can serve designers and
storytellers such as journalists, in order to create a visual narrative of a place. Since the platform aspires to be communicative, it is crucial that it will be used to create a narrative which is accessible to a wide audience. The digital systems used in this thesis can also benefit archivers and historians, who would like to design a digital archive from a specific point of view - and visualize a space and an historical story in a digital interactive form, and scholars researching the digital humanities field.

**Intended Contribution**

This thesis aims to contribute to the research in the field of digital humanities\(^\text{15}\). It deals with subjects of design activism, digital journalism, narrative design and spatial research.. While the Humanities discusses concepts such as value, narratology, interpretation, subjective judgment and verifiable truth, it is the digital capabilities that have challenged the scholars to amplify many of those premises, and make them operative in computational environments\(^\text{16}\).

The thesis examines different digital methods that can be used to design a narrative of a place and produce an image of it, and by that to provoke empathy and lead to a social or political change. The tools were developed to collect spatial data, use it as an “input”, and form a visualization of the data in a way that reflects a certain stance. The uniqueness of this research is in the manners in which different tools from different scopes - some of them digital and some of them physical - are being used together to form a story, and the collaboration with a community to do that. It aspires to hack off-the-shelf affordable devices and interfaces, and use them for this

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\(^{15}\) Burdick A et al., Digital_Humanities. MIT Press. 2012

\(^{16}\) Ibid
purpose, in such a way that weakened communities will be able to operate. The research suggests
the assimilation of physical artifacts, DIY (Do It Yourself) methods and digital interfaces that
can serve communities that struggle to tell their story, control their data collection and own the
narrative. The methods being introduced here could further contribute to the democratization of
knowledge sharing and the distribution of facts and stories by people that are usually being
silenced.
Part One

The Most Temporary Village in the World
The Most Temporary Village in the World

In this part of the thesis I present the historical and social background of the Bedouin community in the Israeli desert, their political issues and the state policy regarding them. In particular, I explore the situation in the unrecognized village Al Araqib, north to the city of Beer Sheva. This village became the symbol of the Bedouin community's struggle against the states’ decision to uproot them from their lands and relocate them to one of the seven states’ built Bedouin towns. This section also leans on interviews I conducted with the residents of Al Araqib, humans rights activists who work with the community and jurists who consult and represent the community in their legal battle.

The Bedouin Community in the Israeli Desert

The Bedouin community in the southern area of Israel inhabited the region much before the state was established in 1948. Although it is customary to think of the Bedouin as nomadic, they settled into more permanent villages in the Negev desert in Israel as early as the nineteenth century as evidenced by their marks on the land: cultivated lands for agriculture and livestock, a system of wells, and cemeteries with tombstones that predate the formation of Israel17.

In 1966, after almost twenty years of military regime followed by the establishment of Israel and the 48 war, Israel formulated a new policy in regards to the Bedouins in the Negev desert, and ordered to settle them in one of seven new Bedouin towns in the Siyyag area, the less fertile area of the Negev (the towns are: Kuseife, Ar'ara BaNegev, Segev Shalom, Tel Sheva, Hura and

Lakiya), surrounded by the Jewish towns Beer Sheva, Arad, Dimona and Yeruham\textsuperscript{18}. This was, and still is, a systematic government action intended to uproot the Bedouins from their lands at the northern edge of the Negev and concentrate them in specially designated towns, most of which are located in the driest and most barren desert areas.

Figure 5. Bedouin in their tent in Galilee. Color photos taken in the late 19th century (about 1890) by the French photographer Bonfils. Credit: The Israeli National Photos Collection.

\textsuperscript{18} Swirski S, Hasson Y. Invisible Citizens: Israel Government Policy Toward the Negev Bedouin. Adva Center; 2006. Available from: 
https://www.academia.edu/28809288/INVISIBLE_CITIZENS_Israel_Government_Policy_Toward_the_Negev_Bedouin?email_work_card=title
The Bedouin oppose the attempts to dispossess them from their lands and settle them in semi-urban towns counter to their traditional agricultural way of life. The villages are currently home for 108,000 people, a number human rights organizations anticipate will grow to 235,000 by the year 2030\textsuperscript{19}. 34 out of 46 of the villages are still unrecognized by the state, which means they are not marked on any official state maps, nor are they provided with any sort of infrastructure by the state, be it water, electricity or sewage.

At the beginning of the previous decade, and after years of neglect and disregard, the State of Israel intensified its efforts to enforce illegal building activities within the Bedouin community residing in the Negev desert. In fact, Israeli authorities issue a demolition warrant for each additional building that Bedouins construct without a permit. In 2017 for example, 2,200 Bedouins’ houses and shelters were demolished by the police\(^{29}\). According to Weizman and Sheikh, the destruction of houses in the unrecognized villages is the latest chapter in a saga which they call *the battle for the Negev*. As stated by them, the State of Israel intends to worsen

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\(^{29}\) Ben Zikri A. "An increase in the demolitions of buildings in Bedouin villages; The number has doubled within a year". Haaretz; March 26, 2018. 
https://www.haaretz.co.il/news/law/premium-1.5939855
the living conditions of the Bedouins to such a degree that eventually they will have no choice but to move to towns that do provide municipal services and basic infrastructure.

But the conflict between the Bedouin community and the state of Israel is not all about legal claims and property ownership, it has a strong relation to the land itself and to the special meaning earth holds in the Bedouin’s culture and social order. For decades the Bedouin have planned and developed their villages according to their traditional norms and tribal divisions. Although international committees see this community as indigenous population, the state of Israel fails to acknowledge the Bedouin villages and their connection to the land, and in doing so prevents these communities from developing and getting their most basic planning rights, evolved from their unique status as indigenous population. On the other side of the barricade is the Israeli government, which -- by human rights organization -- seeks to settle jewish communities of the same lands. An example is the Israeli government decision from 2013 to evacuate the unrecognized village Umm Al-Hiran and build the jewish village Hiran on the same land instead.

21 Shmueli D F, Khamaisi R. Bedouin Communities in the Negev, Models for Planning the Unplanned. Journal of the American Planning Association, Vol. 77, No. 2; Spring 2011
The unrecognized villages in the Negev are not far apart from each other, and the culture of the various tribes is similar - still, each village has its own problems of recognition and frequency of demolitions. For example, the village of Al Sirra benefits from political representation and therefore getting demolition warrants less frequently. Thus, they can build more permanent structures, out of concrete, and set more permanent infrastructures such as water systems, solar energy and WiFi they installed themselves.

And indeed, The residents of the unrecognized villages take advantage of technology in order to overcome the multitude of obstacles that they face. Their status as unrecognized denies them access to State run electricity and water grids. Instead most of the unrecognized villages are solar powered, and residents install and maintain the necessary panels themselves. The Bedouins regularly recycle their water, and use it for the irrigation of the villages. Some of the unrecognized villages managed to install the internet themselves, by using antennas from the nearby Bedouin towns. This is technology functioning, not as a luxury but as a necessity.

Under these circumstances, the Bedouin in Israel have acquainted themselves with various tools and techniques and developed building methods that enable them to build temporary dwellings which are both inexpensive and make use of available materials. More than just a building technology, architecture becomes their opportunity to struggle repeatedly with the states decision to dispossess them of their lands. Bedouin in the unrecognized villages are illegally building their villages. They use inexpensive materials they find on construction waste sites. Through their insistence on continuing to build despite the persecution by the authorities, the Bedouins are
actually resisting attempts to restrict their rights to their land with the help of physical objects. As an act of resistance at least as much as a practical measure, they repeatedly rebuild their houses, appropriating architecture as a political tool. This creates a situation where the Bedouins, with their strong nomadic history, employ physical structures to fight for their ancestral land, using the language of their oppressors.

The Bedouins in the Negev sometimes ignore the repeated demolitions of their homes, and build dwellings that testify to the development of the villages. They provide planning solutions for the expanding families, design extensions for their homes and build tin shacks for their goats. Occasionally, they build outside the boundaries of land on which they claim ownership to
improve their status in negotiations with the state on their plots borders. Buildings techniques of the Bedouins in the Negev, however, consist mainly of iron welding, and simple constructions, creating support for basic materials at the community's disposal, in most cases tin shacks, plywood, fabrics and plaster. These structures, however temporary, are cheap and replaceable; a necessity in a reality in which every structure can be demolished at any time.

Several initiatives have been launched in recent years aimed at empowering the population through advancement and technology. Because permanent buildings are not a viable option, some initiatives did not find a permanent home. For example, women from the town of Lakiya have set up a mobile library in a car, which travels among the unrecognized villages and allows children to borrow books and read on-line materials. Another interesting initiative is a photography workshop for women in which they document their lives and thus disseminate the situation of the unrecognized villages. Among the initiatives for Bedouin women can also be found a cooperative that allows women to work from home and embroider traditional patterns. The products are later sold in Lakiya. This allows women to make a living without dispute the traditional norms.

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25 Liddell G. Library on Wheels: Delivering literacy to Israel's unrecognised villages. Middle East Eye; 12 October 2016. [https://www.middleeasteye.net/features/library-wheels-delivering-literacy-israels-unrecognised-villages](https://www.middleeasteye.net/features/library-wheels-delivering-literacy-israels-unrecognised-villages)

The Village of Al Araqib

The village of Al Araqib has become the symbol of the unrecognized villages struggle in the state policy. Al Araqib is located north of the city of Beer Sheva, on one of the most fertile lands of the Negev. The proximity to Beer Sheva makes the land a possible site for the development of the city, increasing the state’s incentive to evacuate the villagers. Since 2010 and up to March 2020, the police have demolished the village over 170 times, leaving the residents without almost any permanent structures.

The state no longer issues demolition warrants for Al Araqib, taking advantage of a law that states that a new building can be demolished without a warrant thirty days after its construction. Instead, bulldozers revisit the village every three weeks to demolish any new standing structures. The residents of the village say that before 2010, 573 people lived in the village and not one was unemployed. The frequent demolitions in the past decade - once every three weeks - have made the life in the village intolerable, and only a few families currently remain living there at risk of arrest. Within this last year, the village leader, Sheikh Sayyah Abu Mdeighim al-Turi, served eight months in jail for trespassing.

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27 By the count the residents are running.
28 Ministry of Finance: national planning law enforcement Unit and construction. Administrative demolition order, 2017. [https://www.gov.il/BlobFolder/generalpage/files_manager_instructions_unit/he/3.3_Guidance_for_an_administrative_demolition_order_0.pdf](https://www.gov.il/BlobFolder/generalpage/files_manager_instructions_unit/he/3.3_Guidance_for_an_administrative_demolition_order_0.pdf)
However, the risk of leaving the land exceeds the risk of staying. If they leave, the state will exploit their absence to plant forests on the land, thus preventing their return\(^\text{30}\). In the past decade, residents have been fighting a lengthy legal battle to prove their ownership of the land even before the state was founded. It is a legal battle that uses the physical landscape and architecture as evidence. The interpretation of landscape becomes a fight for narrative and architecture becomes means of resistance and negotiation.

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The residents have been tracking the demolishing since 2010, documenting them with their smartphones, taking videos and photos and distributing it to human rights organizations and other community members. They believe that by doing so, they will be able to provoke empathy and influence their judicial proceeding.\(^{31}\)

Residents of Al Araqib live in shelters they build themselves every three weeks. The temporary shelters are made out of wooden poles gathered from the waste of construction sites, and put together using nails. The structures are forced to the ground using small steel rods, and the structure is covered with a tarp purchased in the nearest town of Rahat. Before 2010, construction in the village was made out of tin. After the court approved a warrant in 2013 saying they can be arrested for building new structures, and because of the frequency of the demolitions, the community builds the houses in the middle of the night out of wooden poles. It can take about an hour for a fast group and up to three for a slow group to construct a shelter. They argue that no one in the village is considered more expert than the others, so that everyone must be familiar with the process. Al Araqib is completely solar powered by solar panels they hide between the graves in the nearby cemetery so the police will not confiscate it. The residents get their water from an old water well, which collects underground water.

Every two weeks, residents of Al Araqib are preparing for the arrival of police bulldozers to destroy the tents. They place guards at the intersection near the village, alerting residents when the bulldozers are on the way. Residents rush to dismantle the piece of textile that surrounds the

\(^{31}\) By a conversation I conducted with Aziz A-Turi from the village of Al Araqib; August 2019.
tent - the shelter’s most expensive building material - and hide it in one of the cars. Because they have a 10-minute warning from the time the bulldozers appear at the intersection until they reach the village, residents leave the wood structure and flee for fear of being arrested. Everything left becomes trash rubble.
Part Two

The Digital Village
The Digital Village - Computing a Story

Space + Narrative Computing - Background

First, it is important to discuss the importance of space, place and the notion of it in the actions of narrative design and narratology.

In order to shape a narrative or tell a story, the use of space can have a symbolic meaning, or can serve as an emotional object, a form of orientation and even as the medium itself. In their book *Narrating Space / Spatializing Narrative*, Ryan, Foote and Azaryahu argue that a place can function as an object of representation, or from the other hand, as the environment in which narrative is formed.\(^32\)

In the past, space was not as important as time in the narrative shaping process.\(^33\) But the significance of space and its context as a medium was accelerating with what is called the “spatial turn” in the history of science, noted by Fredric Jameson and others in the 1990’s, when scholars, historians and philosophers debated the notions of place and space.\(^34\) Among that, is the characterization and use of cognitive maps.\(^35\) The consideration of "spatial turn” of place as social practice, and of placing as a process for movement of ideas over space and time, may help

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33 Ibid
to strengthen connections between geography and history.\textsuperscript{36} They emphasised the connection between space and identity and between place and meaning, and suggested that place identity became a matter of identity politics and differential access to power.

Designers, storytellers and philosophers suggested numerous approaches to visualize a space in creative, mixed-media, ways, much before it was possible to broadcast live videos, use sensors and GPS technology to collect live data and visualize interactive experiences. Comic books and graphic novels suggest the use of both text and drawings to form a story which has notions of time and space; videos, maps and architectural drawings that also graphics and texts are offering interpretation or analysis of the visual artifacts. All of this laid the groundwork for the contemporary approach to narrative spatial design.

An early example is Charles and Ray Eames’s short film *Power of Ten* (1977), made with the help of Philip Morisson as a narrator.\textsuperscript{37} In this film, the creators integrate visual contents with infographic elements and clear voice-over to generate a narrative which gives a sense of spaces through scales. They represent time through dimensions, and the way humans perceive time in relation to space. They move from an image of a couple having a picnic in the park, to the outer-space scale in which the universe seems as dust. “This lonely scene, the galaxies like dust, is what most of space looks like. This emptiness is normal. The richness of our own


\textsuperscript{37} Movie available at: https://aeon.co/videos/the-classic-1977-film-that-put-the-vastness-of-the-universe-into-perspective
neighborhood is the exception” - the narrator explains. Then, the image moves back to the most small scale: the DNA and molecules in the hand of the man from the picnic scene.

Figure 10. Charles and Ray Eames’s short film *Power of Ten* (1977).

In recent years, researchers have drawn increasing attention to the “situated” position of narrator and audience in both time and space, and how narratives formation is bound to a specific place,
its historical moments, its social and political complexity and how human actions and habitation shapes a place which is distinctive and unique. For instance, John Doe notes that “There is a close relationship between place and the concept of sense of place, the latter referring to the affective, emotive bonds and attachments people develop or experience in particular places and environments on a variety of scales, from the microscale of the home (or even room), to the neighborhood, city, state, or nation. Writing and narratives are often influential in shaping people’s sense of place and a means by which authors express their own or their characters’ attachments to place… sense of place is related to the process of place making, through which individuals as well as social groups shape the environment and invest space with meanings”.

pace, it is argued, becomes a fundamental part of the act of narrative construction.

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Maps and the Cartography of Demolition

Past

Narratives and agendas were always planted into maps, which tell stories and “inviting readers to journey through imaginary and pleasurable worlds”\(^{39}\). They were used not only to characterize a space in a given moment, but also in the formation of a narrative and taking a stand. Every map told a story, cartography was used to set new facts and state land ownership. It was never objective, or a determined evidence. The medieval first maps, TO (*terrarum orbis*), for example, set Jerusalem in the middle of the world\(^{40}\); The first maps visualizing the americas, transformed the narrative of a national union between heterogeneous groups into reality and supported the will to control, exploit and claim territories with maps\(^{41}\).

Figure 11. The Hereford Map of the World (Mappa Mundi), 1300. Jerusalem at center, east toward the top, Europe at bottom left and Africa on the right.

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Besides navigation and orientation, maps have the potential to tell stories, as was introduced by Robert MacFarlane in his concept of “story maps”. In humanities, maps range from historical mapping to memory maps, conceptual mapping and community based mapping. Digital-cultural mapping, or “Spatial Humanities” is a sub-field in the digital humanities research suggesting geographic analysis, digital mapping platforms, and interpretive historical practices come together to form richly textured, multidimensional investigations of place.

Designers and computer scientists are trying to develop new kinds of mapping systems in order to promote community mapping and storytelling through maps. Ushahidi is an online free maps platform that allows communities to report violence and disasters, visualize and publish it through maps and with data that can be collected from social media. The company was founded after the Kenya post-election violence in 2008 in order to “help people raise their voice and those who serve then to listen and respond better”. They believe that marginalized communities can communicate their needs more easily using the maps, and by that bringing global attention to their problems and help organizations and governments to respond to these needs more effectively. Mapbox is an open source platform founded in 2010 to prompt the democratization of mapping and to allow users to create and publish their own maps. The company offers numerous example codes to use for visualizing the map and adding infographic elements.

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44 The platform available at: https://www.ushahidi.com/
by that to enrich the maps as tools for narrative design. These maps become an interactive site for creating, representing and navigating knowledge. Examples like political mapping of stories by illegal migrants crossing borders suggests that “mapping emotions” is a way to politically engage communities and individuals in their processes of reclaiming some control over the places that they inhabit.46

**Al Araqib Mapping Challenges**

Al Araqib residents know the challenges cartography and traditional mapping are arising. For decades, the planning and expansion of the villages were based on a tribal organization, and families used to discuss and agree on the “plot divisions”.47 The state's attempts to rearrange the unrecognized villages were often violent, using traditional mapping and grid approach to plan the unplanned. In Lakiya town, the government, for example, asked to plan a road on land that was linked to a specific family, as agreed by the whole village for generations. NGOs like Bimkom (Planners for Planning Rights) are trying to mediate between the bedouin and the state, and map the land with the community for the planning authorities, but most of the times the state dismiss the new maps suggested48.

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45 The platform available at: [https://www.mapbox.com/](https://www.mapbox.com/)
47 Shmueli D F, Khamaisi R. Bedouin Communities in the Negev, Models for Planning the Unplanned. Journal of the American Planning Association, Vol. 77, No. 2; Spring 2011
48 Greenspan I. Mediating Bedouin Futures: The roles of advocacy NGOs in land and planning conflicts between the State of Israel and the Negev Bedouins. Faculty of Environmental Studies York University, Toronto, Ontario, Canada; March 2005.
Maps and satellite images are also used by the state to dispute the Bedouin’s land ownership claims. After the 1948 war, Israel concentrated the bedouins of the Negev in one area, the Sayag. When the residents asked to go back to the locations they inhabited before the war, they were asked to prove their ownership on the land before the war. This started a lengthy legal battle in court, including historical maps and images taken from airplanes and satellites. Since their tents are temporary, it is hard to identify houses and buildings in the images and maps, but cultivated plots, old cemeteries and water wells suggested their presence there before 1948.49 a project done in 2015 by Forensic Architecture and the people of Al Araqib analysed aerial photographs from 1945 and compared them with a contemporary ground level archaeological survey, as well as with contemporary aerial images taken from cameras suspended from kites.50 In the past few years, the residents of Al Araqib are using these evidence in court, trying to prove their ownership on the land.

But the people of Al Araqib are also facing obstacles in more digital geo-spatial tools. In Google Earth satellite images, it is not possible to search for the village, which does not appear on Google records. It is also hard to identify houses and buildings in these images, because of the constant demolitions and reconstruction. In navigation apps such as Waze and Google map, it is impossible to find the location of the village. Besides the discomfort that this situation creates, it is also used by the state to tell the narrative it is trying to ground: that the village does not exist, and that its residents are nomads that do not own the land.

Figure 12. Al Araqib at it showed on GoogleEarth now (up) and in 2010 (down).
In order to form the spatial narrative of Al Araqib, I designed interactive community-driven maps with the community. The maps are not static and do not always reflect an accurate physical reality. Instead, they function as a representation of desirable condition, one that skips the time frame of the demolitions, in which there are no structures at the village at all. “Within a dynamic, ever changing environment, new data sets can be overlaid, new annotations can be added, and, perhaps most importantly, missing voices can be returned to specific locations and create a site specific meaning”.

Figure 13. The interactive map platform showing the different village layouts and the superposition of them.

**Al Araqib’s Community Map**

The interactive map of Al Araqib is based on a Mapbox platform and visualized with JavaScript code. The residents use the online free platform of Ushahidi as their interface to mark

52 The interactive map available at: [https://www.diyaraqib.com/](https://www.diyaraqib.com/)
the houses that they built after each and every demolition. Now, not only do they count the number of times their village got demolished, but they are also able to give it a visual sense. Every time they rebuild the village, the residents can start mapping their houses using their cell phones by logging in to the system. First, they are required to create a new event for the time in which the village was rebuilt. To mark a new house on the map, they need to point to its location on their screen, name the house, the date of building and rather the structure is public or residential. They can edit the sections anytime and change the information they want to fill.

Figure 14. Ushahidi interface for Al Araqib.

The information collected with the Ushahidi map can be later exported to a CSV file and uploaded to the Mapbox studio platform as a data set. In order to create a map, the Al Araqib Mapbox map is programmed to filter the structures location by date of construction. Every time a new CSV file is uploaded to the system by the residents, the map is automatically updated. Then,
I used GL JavaScript library to design the interactive map that plays automatically the timeline of the demolition. Users can choose to see different layouts of the village by time, or decide to layer the layouts one upon the other.

Another interactive representation of the map embedded in the village website is a before and after simulation, that can be updated easily by the community. The tool was made using another open source technology, created by Knight Lab from Northwestern University, Illinois, that aims to “push journalism into new spaces”. The interactive image shows the empty village as it looks like in Google Earth platform, and the way it would have looked if the satellite was collecting and superpositioning the structures that were built over the years in the village.

53 The platform available at: [https://knightlab.northwestern.edu/](https://knightlab.northwestern.edu/)
Figure 16. Superposition of the different village layouts in the interactive map.

Figure 17. Before and after simulation at the digital platform.
Figure 18, Figure 19. The interactive map section on the digital platform. The users are welcome to scroll around and compare the incremental changes at the village.
Figure 20. The interactive map on the digital platform. Videos and images documenting the demolitions were associated with specific houses.
Images, Videos and the Documentation of the Absent Past

In drawings and images, the narrator captures a moment in time from a certain perspective, sometimes real and sometimes fictional, serving an agenda which is sometimes revealed and most of the time hidden.

A series of posters drawn by Franz Krausz in 1936 and published by the Tourist Development Association of Palestine, presented the “land of milk and honey” as a romantic derivatives of European-colonial thought next to merely countering more manifest forms of oppression and exploitation. In the posters Krausz painted oranges and agricultural industrial plots, small Kibbutz houses, some old ruins from old times and the old city of Jerusalem, promoting tourism and immigration, leaving aside the representation of the local indigenous community. Today, the Palestinians are the one who use these posters, provoking empathy to the name Palestine for a place and a nation which are totally invalidated by the Israeli government.

Another example is the New Yorker’s cover from 1976, View of the World from 9th Avenue by Saul Steinberg, which presents the view from Manhattan on the rest of the world, suggesting that Manhattan as the center of the world, just like Jerusalem was presented in the TO maps of the medieval times.

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54 Jaafar A. The Ongoing Struggle for Representation in the ‘Land of Milk and Honey’; 2013.
Al Araqib Images and Videos Challenges

The people of Al Araqib understand the importance in documenting, filming and distributing their village story. But so does the Israeli police. The policemen arrive at the village and arrest the residents who stay near their homes for the reason of trespassing. From fear of being arrested, the residents flee to the nearby graveyard, and take videos of the demolitions from there. Since their filming position is miles away, the videos are not coherent and the residents record explanations in their voices that guide the audience. Then they share the videos through social media, but since the image is unclear, it is hard for them to provoke empathy and the videos do not get to a wide audience.
The images and videos that do get to the wide audience are the ones presenting the bedouins as nomads. It is a mixture of romantic orientalist images of the bedouin tents as a touristic “authentic” experience, to a set of images showing the bedouins as a poor community living in shaky tin structures. The narrative, indeed, is formed by the narrator's perspective and its access to power in the case of Al Araqib.

Figure 22. Google images search results for “Bedouins in Israel” in Hebrew. The bedouins are mostly presented as “authentic” nomads for tourism reasons.

**Al araqib's Community Cameras**

To better design the images and videos that are distributed by the community, I designed a set of tiny solar powered cameras that are inexpensive and can be made easily by the community in less than 10USD. The cameras are designed to fit the structures in a discrete way, and to work during daylight without electricity to document the village from a perspective the residents choose. The cameras are programmed to livestream directly to a server.
Figure 23, Figure 24. Solar powered cameras designed for this research. The cameras are cheap and can be demolished with the structures. The solar panels allow them to work constantly during day time.
The Camera is made with an ESP32-cam board that can be purchased on Amazon. The ESP32 can be connected to a board I designed and that its production instructions are pubshared in the community online platform, but it can also be made with an Arduino Uno or a Breadboard. The camera is powered with a Lipo Battery that can be charged by the solar panel or by a mini usb connection. As for the internet, it can be connected to a WiFi network, hotspot connection or a local sim card.

DEMOLITIONS ARCHIVE
Take a look at all the previous demolitions in Al Araqib

Figure 25. Demolitions streaming archive on the digital platform.
Placing the cameras on the village structure can create a visual which is a primary mode of engagement. For the first time, the videos produced by Al Araqib will document a close look on the demolitions, from a location they choose. By letting the camera be bulldozed with the structure, it will be possible to design a narrative of the violent act of demolitions. The livestream of the events produces an indirect relationship with the audience, allowing people to watch the sudden unexpected situation without a mediator.

Figure 26. Tiny solar powered cameras kit. The community members can assemble and program the cameras by themselves.
Building the Medium: Home Lab

Past
Architects and designers have been interested in the ways temporary architecture can serve as a political tool, and imagined the future of nomadic architecture culture. Design, in their hands, was not only a solution to problems or for a functional, but poetic representation of the society needs now and in the future. Cushicle and Suitaloon (1966) by Michael Webb from Archigram seeked to act against the canon of conventional architecture, and make an adaptive architecture that could somehow change shape to accommodate the emergent needs and desires of its users. In that case, it included wearable inflatables that functioned as a temporary space for one person.

In that case, it included wearable inflatables that functioned as a temporary space for one person. Inflatocookbook by Ant Farm (1970 and 1973) was a graphic experiment manual for DIY inflatables, that encouraged its readers to use readily available items such as recycled fans to build an experimental inflatable temporary architecture.

The New Babylon by the dutch artist Constant (1956), was a project sought to achieve a creative interpretation of the everyday surroundings, by a vast series of maps, models, sketches, and paintings to give shape to a utopian scheme for a new mode of dwelling and a new mode of society.

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Present

Nevertheless, contemporary architects and designers around the world are seeking innovative design of temporary, recycled, inexpensive and fabricated structures. Examples include the IKEA prefabricated, lightweight BoKlok house;\textsuperscript{58} Shigeru Ban’s Paper Log House;\textsuperscript{59} the Instant House by Marcel Botha and Lawrence D. Sass\textsuperscript{60}; U-dome by World Shelters;\textsuperscript{61} and Origami-inspired deployable shelters;\textsuperscript{62} In some cases the structure was supposed to be built in a

\textsuperscript{61} World Shelters. Available from: http://worldshelters.org/shelters
factory or a FabLab to be assembled on-site. In other cases, the building process is executed by the future residents, as in the case of the Sandbag shelters by Natar Khalili, that was adopted and implemented by the UNHCR.63

Al araqib’s Architectural Challenges

The people of Al Araqib appropriated architecture as a political tool. They keep rebuilding their houses after each and every demolition, in what they call “a cat and a mouse game” between them and the police. They argue that sometimes it is more comfortable to live in their cars or just sleep outside. Many of them use their cars as the more “permanent” place of their house. They locate the improvised kitchen inside the car, so if they would have to run away in the middle of cooking, they could do it without losing their valuables. But even though it’s easier to not build a shelter at all -- especially in the summer -- they still make the effort to construct a structure that functions not only as a housing solution, but also as a protest artifact.

But even the most temporary structures are hard to deploy in Al Araqib, as the next experiment proved, and utopian architecture can create the wrong impression that the solution to the bedouin situation is a temporary house, and not a permanent planning political new policy. Therefore, the making of architecture in that sense is to use it as a media that can be published and distributed - and not just as a housing solution or just as an utopian experiment.

Figure 28. Temporary house inside a car at the village of Al Araqib. Sometimes it is easier for the community to live in their cars rather than building a temporary structure.

**Al araqib's Home Lab**

The Home Lab project for Al Araqib seeks to be on the spectrum between the utopian experimental temporary architecture of the 1960’s and 1970’s, to the disasters, social, human-rights shelters of today. It uses the need for shelters and temporary structures in the village, to prompt experimental architecture that will grab attention. The Houses lab will be a digital platform to share experiments in digital temporary architecture. It will call designers, architects and artists to suggest designs that can be built in the desert but can also be demolished. Unlike the structures themselves, that are only very temporary, the files for the design and production of the structures will be shared in the platform online, and will be immortal.
In the summer of 2019 I initiated a workshop for MIT students with the people of Al Araqib in order to design and build one structure like this. Given that we intended to design with the community, we entered the Negev unsure of what kind of structure we would eventually build, what principles would be necessary, and what tools we would need. We brought with us a portable Shapeoko CNC router, recognizing the flexibility in the machine’s ability to be reprogrammed with different tools for manufacturing and building on site. Working with residents of Al Araqib, we designed a structure which would follow design principles the residents of Al Araqib were already using, use local materials, and respond to the unique situation of their village.

Figure 29. The “10 minutes house” designed and built in collaboration with the people of Al Araqib.
An initial step in the design phase consisted of an analysis of the existing structures built in Al Araqib for the harsh climate conditions. The residents build their structures on a North to South axis so the corners will break the wind. They also make it possible for the textile to be folded in all directions, so during the day the wind can go through the shelter for ventilation. As for the winter, the residents use their experience and knowledge about the water drifting to locate their shelters in a better location. Although summer and winter structures and materials are the same, in the winter the tents roof is built more like a pyramid, and is covered with a plastic tarp.

Given these constraints, we decided to use a system of ungulate scissor mechanisms\(^{64}\) because these systems use self-similar two dimensional units to create three dimensional structures, can be transformed between two stable states, and allow single movements to result in the transformation of many elements at once rather than sequential steps of assembly traditionally used in building.

\(^{64}\) Scissor mechanisms are a type of ternary bar linkage system where each unit attaches to three other pieces through a rotational pin connection. When these connections occur within a straight line, the rotation of a single unit results in all the units rotating and the structure expanding in a linear motion. If the middle connection is moved out of line with the end connections (but kept equidistant from each point), the resultant angular unit will produce a structure that expands with a constant curvature.
Figure 30. The “10 minutes house” opened and closed positions. After one side of the structure is placed inside the foundation, the structure only needs two people to open and close the tent. Placing, opening and reinforcing the tent took less than 10 minutes, while closing the tent took less than eight.
Figure 31. The final structure integrating textile into the transformable mechanism meant all materials could be stored and saved. The custom footings and all structural components can be assembled from flat wood stock. The tarp folds up to allow ventilation.

The design for Al Araqib consists of two arcs created by angulated scissor mechanisms that are attached to three perpendicular sets of linear scissor mechanisms, allowing the structure to open three dimensionally. The arch shape followed the formal conditions used by the Bedouin to deal with rainfall in winter and allowed the height of the structure to be tall enough for occupation with a minimal number of units. Using Rhino and Grasshopper, the unit geometry was optimized to fit as many pieces as possible within a 45” x 24” bed. The final structure used 66 bar linkages with specific angles of the connectors and the exact location of the pins are only possible through
digital design and fabrication. The design used as many self similar units as possible to reduce sorting during the initial assembly.

Figure 32. The foldable structure can be cut from three wooden sheets. The file is kept with the residents and can be downloaded online so even if the building is demolished, it can be quickly rebuilt.

After cutting with the CNC router, manual assembling of the tent is easy and quick, and only two people are needed to assemble the shelter. The membrane that wraps the tent is made of several different textile pieces, which connect to the skeleton with ropes - so no special or complicated fabrication is required for textiles, and each piece found in the area can fit into the tent. Thus, the entire structure, 4x5 meters size and 2.1 meters tall, can be folded into a particularly compact shape by a few simple operations in less than 10 minutes. We designed foundations that are cheap and easy to assemble. On one side of the structure, the foundations are inserted into the ground to be particularly stable. Then the legs of the structure on this side fit in so that it is easy to take them out quickly when one wants to fold the structure. On the other side of the tent, the
foundations are connected to the legs by a hinged mechanism, allowing them to be opened to the final position without moving the elements.

Few days after its construction, the police arrived to demolish the structure, together with the other houses in the village. The residents documented the demolition, and shared it with other villages and NGOs. 10 month later, we published our joint work in the International Journal of Architectural Computing.

Figure 33. The foundation mechanism details allow the residents to leave behind a part of the foundation for quick demolition.
The 10 minutes house experiment had some limits. First, it was inspired by the current solution of building temporary quick tents out of wooden poles, and dismantling them as fast as possible when the police arrive. This situation makes daily life in the village unbearable, as the people need to be alerted to the police arrival all the time, and their houses should be able to be disassembled with only a 10 minutes warning. That was another weak point of the experiment: when the police surprised the village residents, only few days after the previous demolition in the village, the residents were not prepared, did not place guards in the nearby junction - and therefore did not had the 10 minutes warning to take apart the structure, and it was quickly demolished by the police. This experiment also relies on the assumption that the residents have access to a cnc machine, which is most of the time a problematic statement.

Still, the call for designers to rethink architectural solutions as part of the HomeLab might provoke interesting and useful approaches - for temporary housing solutions in general, and for the situation in Al Araqib in particular. The unique political situation at Al Araqib makes it possible to actually build and experiment the uses of such houses, and develop new concepts for collaborative design frameworks.
Figure 34. The two types of foundations were sleeve anchors and hinges. The sleeve allows for a quick release while the hinge allowed for a more controlled closing motion.

Figure 35. The demolished structure in Al Araqib, a few days after its construction.
JOIN US TO DESIGN A BETTER FUTURE

Do you want to imagine the future of temporary housing, inspire others, and help Al Araqib? Write to us today to join the build-design-demolish program.

designbuilddemolish@al-araqib.com

Figure 36. Call for designers at the digital platform.

FACTS ON THE CLOUD

THE 10 MINUTES HOUSE

House for disassembly was a collaborative research project by MIT with the collaboration of Al Araqib, initiated in the summer of 2019. The research goal was

Figure 37. Case study House No 1, “the 10 minutes house”, at the digital platform.
The design for Al Araqib consists of two arcs created by angulated scissor mechanisms that are attached to three perpendicular sets of linear scissor mechanisms, allowing the structure to open three-dimensionally. The arch shape followed the formal conditions used by the Bedouin to deal with rainfall in winter and allowed the height of the structure to be tall enough for occupation with a minimal number of units. Using Rhino and Grasshopper, the unit geometry was optimized to fit as many pieces as possible within a 45" x 24" bed. The final structure used 44 bar linkages with specific angles of the connectors and the exact location of the pins are only possible through digital design and fabrication. The design used as many self-center units as possible to reduce

Figure 37. Case study House No 1, “the 10 minutes house”, at the digital platform.

Figure 38. Case study House No 1, “the 10 minutes house”, at the digital platform.
Few days after its construction, the police arrived to demolish the structure, together with the other houses in the village. The residents documented the demolition and shared it with other villages and NGOs.

Figure 38. Case study House No 1, “the 10 minutes house”, at the digital platform.
The Al Araqib Cookbook

Past

The DIY (do-it-yourself) manuals were throughout the 20 and 21st centuries an important method to educate and share knowledge not only for practical construction methods and technology, but also philosophical and cultural ethos.

One of the most well-known of the DIY manuals is Stewart Brand’s *Whole Earth Catalog* (1968). The catalog included a vast range of products and information on topics as varied as education, religion, child-rearing, architecture, and building construction in order to promote a holistic and self-sustaining lifestyle. The art and architecture collective *Ant Farm* also produced their own manual for DIY inflatables—the *Inflatocookbook* (1970 and 1973), which encouraged its readers to use readily available items such as recycled fans in order to construct structures and products.

**Al araqib's Sharing Knowledge Platform**

Al Araqib people are very familiar with the DIY culture, as they built their homes and infrastructures by themselves. When I asked them how they knew. For example, to install solar panels to give power to the whole village, they answered: “we just watched videos on youtube”. Just like the DIY manuals of the 1970’s, to the knowledge of the DIY techniques has a specific audience, and they can share their solutions for cheap temporary structures, solar power

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66 Ibid
installation solutions to self sustainable infrastructures with the other beouin villages in the area.
For this cause I created a designated section in the website of the community to upload videos and share sketches, instructions and ideas.

This section also includes the cookbook for these research tools - detailed instructions on how to produce the tiny cameras, ways to program the interactive map, the files to reproduce the temporary structures etc.

Figure 39. The digital sharing knowledge platform for Al Araqib - “how to assemble solar panels”.
Figure 40. The digital sharing knowledge platform for Al Araqib - “how to get clean water out of a water well”.

Figure 41. The digital sharing knowledge platform for Al Araqib - “how to produce a solar powered camera”.

TINY CAMERAS
Livestream demolitions with solar-powered DIY camera. Download files:
- box.3dm
- box3.std
- app.yaml
- streaming.ino
- untitled.sch
Figure 42. The digital sharing knowledge platform for Al Araqib - file uploads.
Conclusion

My initial hypothesis was that by using computing and digital tools, it is possible to form a more coherent, and in-control, narrative, and by that, helping communities that their voice is silenced to better tell their stories. To prove so, I developed a set of tools and techniques that visualize the information and characteristics of the village of Al Araqib and its people. The tools were developed in collaboration with the residents, which gave them the power to design their own narrative. The platform that was developed in this thesis allows one to navigate through the village narrative, and get a whole and more comprehensive story.

The interactive approach and the participation of both the storytellers (the village residents) and the users, creates bigger engagement, one which is active and not passive, and by that can generate a deeper understanding of the story and the people behind it.

In this research I analysed the ways traditional tools such as maps and drawings, that are usually being used to visualize a narrative of a space, cannot suit the village needs. By adjusting digital tools and hacking devices to collect and represent information from the site, I created a more suitable set of techniques for the village.

Future Work

Even Though the platform and the tools that were being used in this research were designed for Al Araqib’s story, the methods can be used to design narrative of other communities, with the
people’s participation. The research brings up the possibility of adjusting existing technologies to fit people’s needs. All the tools that were being used to design the village narrative were simple - off-the-shelf - techniques that are simple to adjust. Although these tools aren’t meant to be used for narrative design, the implementation of them in a defined space, in purpose to design a narrative, gave them a new role in the field of the digital humanities and the scholarly of narrative design. By overlaying physical objects and digital means, I highlighted the new ways space can be represented in the current DIY environment. The future work for this research can be divided into two aspects:

1. **Al Araqib’s platform and its impact:** the user management system that was created with the residents can be developed to a more public system, that will include other unrecognized villages and their spatial stories. The success of this platform is much dependent on its ability to engage a large audience, to get more exposure and by that, to create more impact. Therefore, including more villages, as well as NGOs and other organizations working with the community, can evoke much bigger attention to the platform and the use of digital tools by a community that is much considered as low-tech.

2. **Templates and system development:** Another development I would like to explore is the way these tools can work as a system that can be used by different communities around the world. The development of a generic system that offers tools and templates that can be adjusted to design a narrative is a novel tool that would serve a very wide
range of organizations and communities. The system developed should be easy to use, and in DIY approach, so anyone could adjust and change it to their needs.


Ben Zikri A. “An increase in the demolitions of buildings in Bedouin villages; The number has doubled within a year”. Haaretz; March 26, 2018. https://www.haaretz.co.il/news/law/.premium-1.5939855


Burdick A et al., Digital_Humanities. MIT Press. 2012


Greenspan I. Mediating Bedouin Futures: The roles of advocacy NGOs in land and planning conflicts between the State of Israel and the Negev Bedouins. Faculty of Environmental Studies York University, Toronto, Ontario, Canada; March 2005.


Jaafar A. The Ongoing Struggle for Representation in the 'Land of Milk and Honey'; 2013.


Liddell G. Library on Wheels: Delivering literacy to Israel's unrecognised villages. Middle East Eye; 12 October 2016. https://www.middleeasteye.net/features/library-wheels-delivering-literacy-israelas-unrecognised-villages

Ministry of Finance: national planning law enforcement Unit and construction. Administrative demolition order, 2017. [https://www.gov.il/BlobFolder/generalpage/files_manager_instructions_unit/he/3.3_Guidance_for_an_administrative_demolition_order_0.pdf](https://www.gov.il/BlobFolder/generalpage/files_manager_instructions_unit/he/3.3_Guidance_for_an_administrative_demolition_order_0.pdf)


Seidler S, Buso N. “The government approved the demolition of a Bedouin village and the establishment of a religious settlement in its place”. Haaretz; November 10, 2013. [https://www.haaretz.co.il/news/education/1.2161474](https://www.haaretz.co.il/news/education/1.2161474)

Shmueli D F, Khamaisi R. Bedouin Communities in the Negev, Models for Planning the Unplanned. Journal of the American Planning Association, Vol. 77, No. 2; Spring 2011


Stern Y. Government privatized Negev planning - Organizations say the goal is the Judaism of the region. Haaretz; September 11, 2005. [https://www.haaretz.co.il/misc/1.1043085](https://www.haaretz.co.il/misc/1.1043085)


