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Digital applications of ancient Armenian stone carving for rural housing in Shikahogh.

Background and rationale

The proposed research will attempt to create a digital-analogue hybridized design solution for a rural development, therefore it entails a research by design or an action research with the intention of innovation. The aim of the thesis is to investigate into the possibilities of bringing together the long established stone masonry tradition in Armenia, the Shikahogh village in Syunik province in Armenia and the modern digital applications. Hence the challenge is to utilize the ancient carving techniques on the platform of the digital applications whilst addressing the real needs of the villagers.

These three areas have various degrees of available research materials:

The information about the ancient stone carving methods is extremely limited, few written manuscripts and instruction manuals have survived from around 5th Century BC. However the modern interpretations of the techniques are used in the country currently, as well as the physical manifestations of these methods in forms of the manmade caves and Khachkars (traditional carved stones) which will provide basis for the studies.

The development site Shikahogh is vastly under-researched, the information is scarce, especially around the various recent activities of controversial nature (the mining site, the new built road and the one in the pipeline, etc.). Therefore the source of information at this stage has been drawn upon a number of Armenian press releases, governmental and national statistics websites. The major part of the site specific issues will be clarified during the fieldwork.

The digital application aspect in form of the computational design and the digital fabrication is a relatively recent phenomena in architectural design but there is a wider spectrum of theoretical framework accessible. Having said that, the digital design area is in constant flux, therefore the ongoing new discoveries with the fresh technological advancements will be integrated into the research simultaneously.

Research questions

Can the ancient stone carving technique be translated into a digital medium?

This is the dominant question that the research will address, by attempting to utilize the stone masonry methods on the platform of the modern architectural design software packages, in particular 3Ds Studio Max.

Here it can be hypothesised that the physical experience of the stone carving, the tactile dialogue between the creator and the object is translated into the computational design software. When this solely material aspect of the physical crafting is absorbed within the digital realm, it will result in more enriched and grounded, more controlled and realistic design process. The Shikahogh village will help with the exploration of the stone carving techniques through studies of the prehistoric Karahunj landmark with early samples of stone masonry, as well as the stone carved caves and the Khachkars of the later medieval era.

How can this concept of analogue-digital stone carving be used to address the needs of the rural Shikahogh?

The Shikahogh village is the real world framework, it is the experimental ground, where the prototypes of any architectural assemblages will be tested and installed.

In this setup the digital application becomes the facilitator and the tool in creation of an architectural structure. A unique piece of software or a fabrication process might be developed to utilize the crafting methods and to address particular impediments of Shikahogh community. For example, there is a gold mining project initiated in 2012 in Shikahogh village and the by-product of this industry is the enormous amounts of the stone that are being extracted. Here an innovative design approach could be to compose a piece of software that deals with the logistics of the re-cycling of these stones in the community by addressing the housing issues. This is only one example, used to illustrate one of the many possible routes. There are number of potential inputs and outputs incorporated with this design process, where much overlap will occur, therefore the above areas are merely provisional, soft distinctions.

Research framework

The methodology will shape as a stream of the three different flows corresponding to the elements of the stone technique, the site and the digital tool.

-The ancient crafting technique-

This comprises of studies into the origins of the stones and the tools and techniques exploited by the stone masons.

Armenia is a land of predominantly volcanic origin, igneous rocks and it is notoriously earthquake prone. Currently there are seven volcanos on the territory of the land, each surrounded by mythical stories. To understand the stone implies an understanding of where does it come from and why the stone masonry evolved in the country the way it did. To unveil the roots of the stone, the studies will be conducted in Karahunj landmark and Garni Gorge within the vicinity of Shikahogh village and the careful documentations will be collected in video, photo and other relevant formats during the fieldwork. The access will be gained to

Matenadaran (a repository institute of ancient manuscripts in capital city Yerevan) to explore the early manuals of stone masons from 5th century BC and copies of these scripts will be made where possible. Armenians are archaic mountain cave dwellers, masons, who established the stone masonry techniques by carving into the fabric of the mountains. There are still some traditional Khachkar workshops existing in the country where these methods are being practiced and the knowledge is passed from master to disciple. Therefore interviews and any empirical master classes with these stone artists will provide much insight into the essence and the journey of the technique, the quarrying methods and the tools. In the same time a small workshop will be organised to introduce the stone masons to the digital sculpting software packages like Z-Brush and 3Ds Max, to simulate an interesting dialogue and to collect their feedback on this new methods of their analogue counterparts. A visit will be paid to the National Arts Museum of Armenia to study the small selection of the preserved tools (chisels, hammers, sharp pens and other custom made metal and stone apparatuses) used in creation of the manmade caves of Geghard monastery and medieval city Ani.

-The Shikahogh development-

There is a fair amount of background knowledge in historic, socio political and demographic notions required to recognise the particular issues of the Shikahogh community.

Syunik province, which is where Shikahogh is located, has a strategic importance for the country's economy, it is the only link with Iran. Since 1991 the borders between Turkey and Azerbaijan have been concealed, thus making communication with Iran of vital importance for Armenia, which relies heavily on its imports of energy, in particular natural gas and other commodities. Currently, there are several projects taking place around Shikahogh and the Shikahogh national preserve, which are seen as controversial as there seems to be a disagreement between the environmentalist, the government and the foreign investors. These ventures are the explorative mining project initiated by a German corporation, which started last year, but some environmentalist oppose it arguing that there is a bigger potential for eco-tourism in the area. Also there is the huge railroad project in the pipeline which will be passing through the Shikahogh and linking 3 countries Georgia, Armenia and Iran.

The Shikahogh fieldwork will be coordinated with the DAP (Develop Armenia Project), which is a part of a bigger governmental undertaking Luys, the aim of which is to provide young scholars and entrepreneurs with an incentive and a platform to acquire specific education and skills and to later implement the knowledge and expertise in the advancement of the country. DAP had sponsored the Masters studies at the Bartlett School of Architecture, where the initial concept of this current research was shaped. On this basis, a relationship was established with the DAP to participate in their ongoing rural development workshops and to draw upon their resources where applicable (TBC).

-The digital applications-

The role of the digital application element will shape alongside the research development of the stone masonry techniques and pinpointing the Shikahogh site specific requirements and perhaps after the initial fieldwork, there will be more clarity about where exactly the digital tool comes in play. As it has been previously mentioned, the stone carving methods will be explored on the platforms of the digital medium and the analogue stone masonry workshop in Armenia will create a feedback loop in pursuing this idea.

As previously stated, the digital medium can be used as a tool to directly embed the carving methodologies into the architectural design software and/or present a development for creation, simulation and implementation of innovative architectural solutions. The fieldwork and the further research into the crafting technique and the site, will shed much light on pin-pointing the feasible hypothesis to be exercised within the limited framework of this research.

Plan of work & time schedule

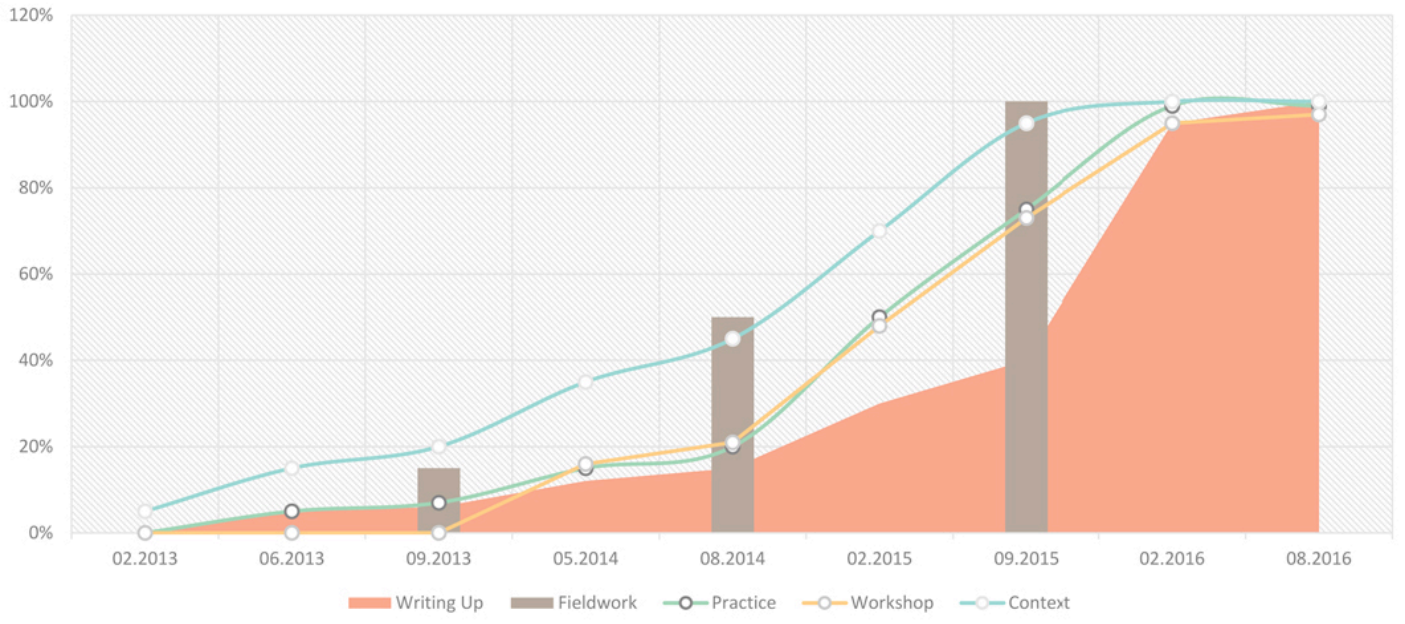
Below is the initial strategy that I have adopted.



Here I have identified the three main areas:

- The target, which is the rural development of Shikahogh.
- The context, which is the theoretical substance of the research as well as the socio-material context as a data source.
- The practice, which is where the transition and transfer between the theoretical and the practical implementations occur. Practice employs two vehicles for its realization, and those are:
 1. The workshop- where the initial prototypes and tests will materialize
 2. And the fieldwork which is the link between the concept and the site and it is the experimental ground for sampling and built.

PhD Timeline



Practice	Workshop	Fieldwork	Writing-up	Context	Date
0%	0%	0%	0%	5%	02.2013
5%	0%	0%	5%	15%	06.2013
7%	0%	15%	6%	20%	09.2013
15%	16%	0%	12%	35%	05.2014
20%	21%	50%	15%	45%	08.2014
50%	48%	0%	30%	70%	02.2015
75%	73%	100%	40%	95%	09.2015
99%	95%	0%	95%	100%	02.2016
99%	97%	0%	100%	100%	08.2016

Above is the illustration of the potential timeline for the next 3 years, in accordance with the key milestones outlined by DRDP, which is also the performance valuation graph. Here I have incorporated the elements from the project strategy, and additionally the on-going writing up component is shaping throughout as well.

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