

Augmenting Kashgar

Serdar Aydın

School of Architecture
The Chinese University of Hong Kong
Hong Kong
serdar_aydin@hotmail.co.uk

Marc Aurel Schnabel

School of Architecture
Victoria University of Wellington
Wellington, New Zealand
m@aurel.pro

Abstract—This paper demonstrates a framework for a digital heritage research, *Augmenting Kashgar*, that facilitates the revitalizing of a historical architecture by using gamification, shape grammars and virtual reality. Examining current use of new media technologies, our methodology initially merges shape grammars, a generative modelling method, with gamification. It then extends the use of game elements into virtual reality in which the synthesizing of the old culture with a new one is the main accomplishment being sought. Firstly, gamification maps a community engagement plan while shape grammars serve for spatial analysis of the narrow alleys of Kashgar. Secondly, the gamified platform transitions from screen-based experience to immersive virtual reality interpretations.

Keywords—digital heritage; shape grammars; gamification; full-dome projection; Kashgar

I. INTRODUCTION

When the editors of the DMACH '08 conference pointed in the proceeding preface out the constraints and limitations which digital media experts should be aware of and examine them from different angles, they were placing themselves in parallel with Jean Baudrillard's criticism of contemporary art which is, in his own words, "moving ever closer to high definition, ... to the useless perfection of images" [1, 2]. Virtual/Augmented reality applications in digital heritage studies tend to aim at reaching the level of high definition standards, i.e. the realist perfection of images rather than the creative power of illusion. Despite remarkable new media technologies in digital heritage such as high-definition 3D scanning and 360 degree panoramic screens, reinvigorating cultural assets involves considering a variety of latent factors. On the one hand, as is put by [3], the interpretation of historic data needs to meet the degree of authenticity. On the other, community engagement through the extensive use of social media is one of the latest challenges for the creation of digital heritage. Addressing these two concerns in the context of Kashgar, this research links between two domains, virtual reality and computational architecture design. This paper examines current full-dome projections with two examples from the both fields to demonstrate attempts from each. The first is one of the VR applications of the LUXLAB Workshop 2013 [4] attended by the authors and the latter is from the Smartgeometry 2014 [5] with themselves being the organizers. Based on this linkage, we introduce our methodology that is gathers virtual, architectural as well as productive experiences of digital heritage making via community engagement.

II. KASHGAR

Kashgar is a historical city in the Xinjiang-Uyghur Autonomous Region, the westernmost part of China, through which the products of the Silk Road was once carried for centuries, with a unique architectural heritage [6]. It is an ending as well as a beginning between the Central Asia and China where the penetration of the North-Indian and Middle-Eastern impacts is inevitable due to Kashgar's location. Majority of people living in Kashgar are Uighurs, Turkic ethnic group, identifying themselves with the city as the capital of culture [7]. However urbanization and development, which is aggressively effective anywhere in China, have been threatening the authenticity of the old-town as well as a distinct culture (Fig 1) [8].



Fig. 1. Diagram that shows the scale of the demolition in the old-town Kashgar.

Due to large-scale urban projects, many of the mud-brick houses in Kashgar have recently been replaced with their concrete replicas. Let alone the disappearing architecture, the maze-like urban pattern that was shaped by narrow alleys is damaged with a new urban tissue with wider streets [9]. One may, at least, argue that Kashgar's cultural heritage property received recognition by preserving the style of architecture and keeping intact a small portion of the old-city. Nevertheless, like most culture heritage development plans in China, this strategy targets the lucrative tourism potential. What is mostly concerned in these plans is the interest of Han Nationality who

represents nearly ninety-two per cent of the population in China [10]. On one hand, such heritage plans in Kashgar should be primarily identified with by the indigenous people, namely Uighurs. On the other, heritage studies are recognized as more of a credit to the nation, ending up with museums where national proud and prestige are sought – in this case Chinese identity. Therefore it is hardly an easy task to contribute to the preservation of the distinct Kashgar heritage that is not only being artificialized but also commercialized and urbanized at present. Yet, this research dissolves the complexity by grasping only one ‘essence’, i.e. the architectural aspect of the maze-like narrow alleys. In doing so, a new methodology seeking community engagement at a global level is developed so that essential knowledge acquisition can be fostered via a solution to which the indigenous identity can be ascribed. Shortly, it consists of Virtual Reality, shape grammars and gamification.

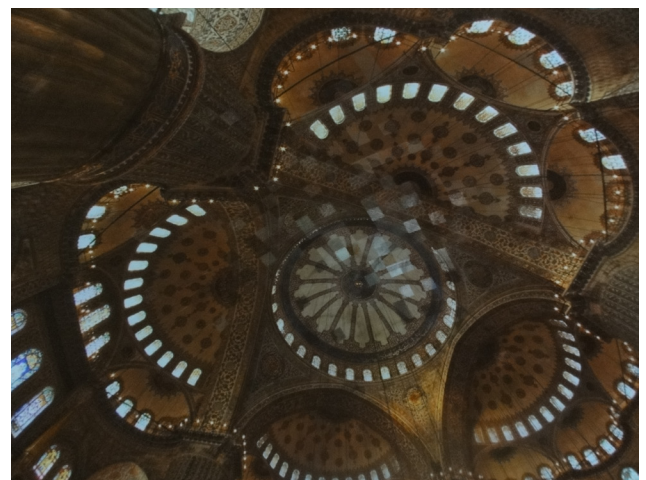
III. FORGET KASHGAR

In an interview, titled as ‘Forget Artaud’, with Sylvere Lotringer, Jean Baudrillard says that the French playwright and poet Antonin Artaud’s work “belongs to a secret place, a reserved domain and talking about that, exposing that to the light would amount to making one’s secret visible.” Explaining the way he followed in delivering his interpretation of Artaud’s work, Baudrillard stresses the futility in attempting to place Artaud in which he does not belong to [2]. Similarly, ‘Augmenting Kashgar’ does not contaminate the object’s reality by simulating a ‘hyperreal’ environment. In other words, it does not strive for emphasizing protagonist-antagonist relations between abundant possibilities. In fact replacing mud-brick houses with concrete replicas is also one of such possibilities, claiming a degree of abstraction for Kashgar heritage. In contrast to building its concrete replicas or instantly accessible digital images to which the idiosyncrasies of Kashgar are irreproducible, this project needs not to identify with Kashgar. Otherwise, it would be a delusion of believing that visualization of such culture is possible. Instead the enhancement and enrichment of heritage experience in this context is erected through revitalizing its one asset, architecture. Other dimensions disappear to leave room for interpretation to proceed to its own new ‘culture’ of the hustle and bustle that once characterized Kashgar. This is not an arbitrary decision but rather a determination firstly on going beyond its nostalgia deprived of meaning and depth, and secondly on avoiding misdirected use of the new technology. Then the question becomes as put by Stephen Greenblatt [11]:

What function of the imagination can erect absolute difference at the point of deepest resemblance?

Before bluntly stating that the answer is ‘game’ (Fig 4), we continue with two different uses of a VR technology, full-dome projection. One of the images on the homepage of this conference’s website shows two people lying on ground to watch an elaborate Kyoto ceiling projected by means of a hemispherical projection screen. The same VR application was a part of the LUXLAB 2013 Workshop [4], which was organized by the ALiVE (Applied Laboratory for Interactive

Visualization and Embodiment) [12]. During the workshop the application, *Look Up*, that virtualizes the domes in Istanbul was examined by the authors (Fig 2) [13]. Reflecting the dome of the Blue Mosque (Sultan Ahmed Camii) on the inner surface of an inflated planetarium would still be adequate to make perfect sense for a Turkish architect thanks to the pleasure of being attached to the context in relation to nationality, religion or at least the subject’s knowledge about the architecture. The reproduced version of the dome of the Blue Mosque seems to be craving for identifying with the real one. And the viewer is seduced to have the same emotion just as adult movies. The situation is a ‘hyperreality’ that, by acting out, *deconstructs the objects that deconstruct us in turn* [2]. There emerges controversy since the main objective of digital heritage is ‘enduring value’ [14]. This paper has no purpose of criticism towards the media art of the application, which would be another long discussion. However, *Look Up* may well be taken as an example of misdirected use of the new media technology



deprived of meaning with regards to digital heritage objectives.

Fig. 2. The dome of the Blue Mosque (Sultan Ahmet Camii, Istanbul) projected via the MediaDome shown in the LUXLAB Workshop, 2013.

We then organized the Smartgeometry 2014 event where, of its ten workshops, one, *Full-dome Projections*, was about exploring future urban scenarios within a planetarium dome (Fig 3) [15]. And its subheading was *Interfacing Ephemeral Urbanism*. A similar VR installation targets to highlight the temporality of urban conditions while users experience a new way of collaborative form-finding within 3D space. In contrary to *Look Up* where the screen is dominant on the viewer, *Full-dome Projections* approaches the user more objectively and allows for more active engagement due not to its quality but its subject matter. The dome is projected as if it is a screen of an urban designer who tests prototype design alternatives for future urban scenarios. What is missing in the *Full-dome Projections* though is a creative dialogue between self, place and its technology. The dome is employed in an artlessly direct way, thus malfunctioning for providing an immersive experience.

This paper has no intention to compare and deduce meanings by showing these two applications. But its purpose is to demonstrate how both fields apply identical techniques and how different approaches can be adopted more radically to the digital heritage of an urban entity, Kashgar. That is to ask how experts and new media artists can work together in order to eliminate conflicting interpretations.



Fig. 3. Installation of the *FullDome Projections* at the Smartgeometry 2014, The Chinese University of Hong Kong.

IV. USING GAMIFICATION FOR COMMUNITY ENGAGEMENT

With regards to digital heritage, the core component of this project is to enable interaction with the objects in question, which are the narrow alleys of Kashgar. The community is invited to contribute to the production of digital heritage making. Since the conditions mentioned in the second chapter do not allow a culture heritage plan dedicated to Kashgar people, a broader level of community engagement is sought via new media technologies. Therefore the community engagement in this project transcends the local borders, facilitating the synthesis of old and new cultures. Subsuming the fundamentals of an old architecture entirely in a game, the methodology is focused on the contemporary demand for personalization and social sharing. And the social motive of this game is revitalizing Kashgar.

We introduced gamification to architecture domain in earlier works [16-18]. But to understand what makes gamification distinct from the idea of game is essential. Gamification was initially the application of basic game design elements, such as points, badges and leaderboards, to increase user engagement in websites. With the pervasive use of social media, the potentials has grown into a business model for gamification [19]. A protein folding research has been initiated via a design game, *Foldit*, with a target to identify new proteins that could help prevent and treat important diseases by crowdsourcing the research through a puzzle game [20]. Because of the abundance of possible protein chains, *Foldit* uses the power of collective intelligence instead of exhausting computationally expensive algorithms. Likewise, the ‘Augmenting Kashgar Project’ aims at convincing the public of contributing to the accomplishment of a digital heritage research which investigates the grammar that is embedded in the morphology of Kashgar’s narrow alleys. The method of this investigation is called ‘Shape Grammars’, invented by [21].

The gamified platform allows community engagement by revitalizing the shape grammar of Kashgar without simulating it but creating anew.

V. CONTENT GENERATION THROUGH SHAPE GRAMMARS

The houses in Kashgar’s old town invariably have a courtyard regardless of the householder’s social or financial status. Accessed via narrow lanes, the courtyard typology whereby vertical and horizontal allocation of different functions is organized displays variation based on affordability. As a religious condition, which is prevalent in other Islamic historical cities, the balance between privacy and sister/brotherhood defines visual and spatial permeability in the old town via courtyards and lanes. As a consequence the old city is a product of interwoven arrangements, whereas strong social relationship is fundamental for its agglomeration that grows from the mosque as a de facto standard. Another of most important factors in the growth of architectural composition is water. Water spaces are associated with flora-rich courtyards that correspond to the environmental conditions of Kashgar’s arid climate [22]. Encoded with these essentials, Kashgar’s urban pattern has a distinct architectural style that is to be addressed by means of shape grammars in this research.

Shape grammars have been developed over the course of the last four decades, primarily within architectural and urban design [23-25]. These works are limited to computational power and heavy algorithms in order to deal with creativity. Despite rigorous works in shape grammars, the architectural practice has regarded its creative power with contempt due to lack of practical tools. Reference [26] brings together shape grammars and content generation in game design. The challenges in content generation can be summed as follow; easy creation, large-scale production, realistic modelling and low cost. Except realistic modelling which is about resemblance to reality, three concerns are what the framework of this research addresses. And shape grammars have direct influence on the content generation, whereas the scale and cost are resolved by gamification techniques.

Within this framework, the designer of the content provides the rules of the game while the community engagement solves possible variations. Instead of employing algorithms and claiming selected ‘Kashgar’ reproductions, each individual creates her/his self-heritage as well as assists a research that is focused on deciphering the architecture of Kashgar. In doing so, the game also turns into a tool that delivers knowledge about Kashgar heritage.

VI. DISCUSSION & CONCLUSION

Due to technology- and content-transfers between different fields are frequent. As a result, emergent technologies have been transforming both virtual reality and architecture fields. Subsequently this has an impact on the convergence of these two fields in regard to digital heritage. However, the addition of other indispensable dimensions, such as history and culture, also generated some degrees of complication. We respond to this situation by mapping out methodology through gamification techniques. In doing so, we blend seamless past-present-future relations by evolving from a real tangible assets,

then transforming them through a transformation from 'inside', meaning from local stakeholders, and finally reenact a further evolved local culture (Fig 4).

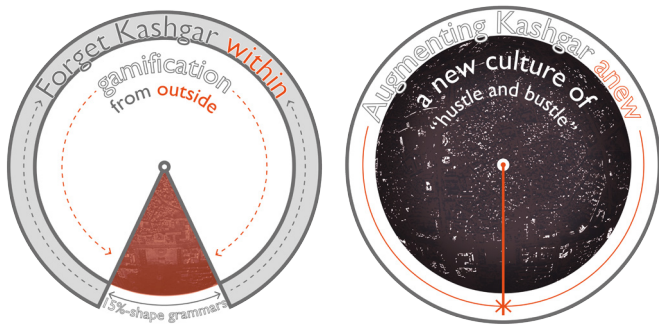


Fig. 4. (Left) Gamified platform replaces Kashgar heritage through its shape grammar analysis of the narrow-alleys and spatial organization at the city level. (Right) Gamification closes the loop back with a new culture of the hustle and bustle that once characterised Kashgar. But this time, its an intangible culture that serves for a new kind of digital heritage objective.

Kashgar's revitalization has already been a controversial issue because of the demand for urban development. This has caused current conversation plans prepared by local and central authorities end up with lucrative tourism models. Kashgar may grow into a different authenticity. The current situation does not allow for a flexible and evolving interpretation of Kashgar's heritage allowing Uyghur people to identify themselves with. Therefore, our *Augmented Kashgar Project* goes beyond a heritage visualization limited to a prescribed interpretation and definition. By prompting a social motive, collective intelligence and participation the project builds upon geometrical data that are generated by stakeholders via game methodologies. They form the basis for the next level of our project development that uses virtual reality visualizations to allow an interactive engagement with the heritage. Finally, Kashgar's people can experience the research outcomes through a full-dome projection, in which we use the reaction of the local people to the interpretation of their culture to further develop the system.

ACKNOWLEDGMENT

'Augmenting Kashgar Project' is partly supported by the Design Research Society Student Bursary.

REFERENCES

- [1] J. Al-Qawasmi, S. F. El-Hakim, and M. Chiuini, *Digital Media and Its Applications in Cultural Heritage*: CSAAR Press, 2008.
- [2] J. Baudrillard and S. Lotringer, *The conspiracy of art : manifestos, interviews, essays*. New York: Semiotext(e), 2005.
- [3] J. Affleck and K. Thomas, "Reinterpreting Virtual Heritage," in *CAADRIA 2005*, New Delhi (India), 2005, pp. 169-178.
- [4] LUXLAB. (2013, September 20, 2013). *LUXLAB Scanning Workshop*. Available: <http://3cdi.um.edu.my/centres-staff-hong-kong-city-university/>
- [5] Smartgeometry. (2014, July 20, 2014). *The sg2014 Workshop: Urban Compaction*. Available: http://smartgeometry.org/index.php?option=com_content&view=article&id=249&Itemid=201

- [6] S. F. Starr, *Lost enlightenment : Central Asia's golden age from the Arab conquest to Tamerlane*.
- [7] G. Michell, M. Vicziany, T. Y. Hu, and J. Gollings, *Kashgar : oasis city on China's Old Silk Road*, 1st Frances Lincoln ed. London: Frances Lincoln, 2008.
- [8] S. Aydin, T. T. Lo, and M. A. Schnabel, "Gamification of Shape Grammars - Collaborative and Participatory Mass-Housing Design for Kashgar Old Town," in *Fusion - The 32nd eCAADe Conference*, Newcastle upon Tyne, England, UK, 2014, pp. 603-612.
- [9] J. Summers. (2014, November 15, 2014). *Kashgar's Controversial Facelift | A "New" Old City*. Available: <http://travelcathay.com/2014/11/11/kashgar-controversial-facelift/>
- [10] T. Kvan, Y. E. Kalay, University of Hong Kong. Faculty of Architecture., and University of California Berkeley. Center for New Media., *New Heritage Conference 2006*. Hong Kong: Faculty of Architecture, The University of Hong Kong, 2006.
- [11] R. Osborne, *Studies in ancient Greek and Roman society*. Cambridge, UK ; New York, NY, USA: Cambridge University Press, 2004.
- [12] ALiVE. (2014, November 22, 2014). *Applied Laboratory for Interactive Visualization and Embodiment* Available: <http://alive.scm.cityu.edu.hk/>
- [13] B. Lintermann, J. Shaw, and S. Kenderdine. (2005-2010, November 15, 2014). *LOOK UP*. Available: <http://alive.scm.cityu.edu.hk/projects/related/look-up/>
- [14] UNESCO. (2014, November 15, 2014). *Concept of Digital Heritage*. Available: <http://www.unesco.org/new/en/communication-and-information/access-to-knowledge/preservation-of-documentary-heritage/digital-heritage/concept-of-digital-heritage/>
- [15] N. Melenbrink, N. King, J. Grinham, and A. Haas. (2014, November 15, 2014). *Full dome Projections: Interfacing Ephemeral Urbanism*. Available: http://smartgeometry.org/index.php?option=com_content&view=article&id=261&Itemid=201
- [16] S. Aydin and M. A. Schnabel, "A Survey on the Visual Communication Skills of BIM Tools," in *19th CAADRIA 2014*, Kyoto, 2014, pp.337-346.
- [17] M. A. Schnabel, T. T. Lo, and S. Aydin, "Gamification and Rule Based Design Strategies in Architecture Education," presented at the DesignEd Asia Conference 2014, Hong Kong, 2014.
- [18] T. T. Lo, S. Aydin, and M. A. Schnabel, "Collaborative Design with Quasi-Grammars," in *the 19th International Conference on Computer-Aided Architectural Design Research in Asia*, Kyoto, 2014, pp.941-942.
- [19] G. Zichermann and J. Linder, *The gamification revolution : how leaders leverage game mechanics to crush the competition*.
- [20] Foldit. (2014, November 15, 2014). *Foldit: Solve Puzzles for Science*. Available: <http://fold.it/portal/>
- [21] G. Stiny and J. Gips, "Shape Grammars and the Generative Specification of Painting and Sculpture," in *Proceedings of IFIP Congress 1971*.
- [22] M. Florenzano, M.-F. Courel, and F. De Domenico, "Digitally Conserving an Endangered Built Heritage in Kashgar, an Oasis City of the Taklimakan," in *1st WATARID International Conference on Water, Ecosystems and Sustainable Development in Arid and Semi-Arid Areas, WATARID 2006*, Urumqi; China, 2010.
- [23] J. Halatsch, A. Kunze, and G. Schmitt, "Using Shape Grammars for Master Planning," in *Design Computing and Cognition '08*, J. Gero and A. Goel, Eds., ed: Springer Netherlands, 2008, pp. 655-673.
- [24] Y. I. H. Parish, P. M. #252, and Iler, "Procedural modeling of cities," presented at the Proceedings of the 28th annual conference on Computer graphics and interactive techniques, 2001.
- [25] J. Duarte, J. Beirão, N. Montenegro, and J. Gil, "City Induction: A Model for Formulating, Generating, and Evaluating Urban Designs," in *Digital Urban Modeling and Simulation*. vol. 242, S. Arisona, G. Aschwanden, J. Halatsch, and P. Wonka, Eds., ed: Springer Berlin Heidelberg, 2012, pp. 73-98.
- [26] P. B. Silva and A. Coelho, "Procedural modeling of urban environments for digital games development," Proceedings of the 7th International Conference on Advances in Computer Entertainment Technology, Taipei, Taiwan, 2010.