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Devices of Dream-Like Precision: Tracing the Streets of Kyoto using Photogrammetry and Layered Drawing

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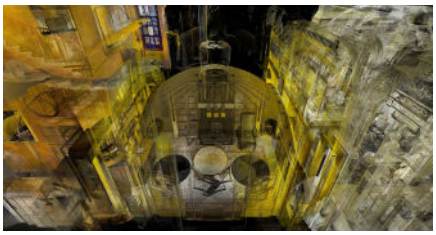
Forms of parallel projection drawing, described by such terms as axonometric and isometric, have long been understood to demonstrate precision, objectivity and scientific truth via their retention of properties of scale, geometry and dimension.[1] The embedded rationality of parallel projection was, however, challenged by 20th-century artists' fascination with this way of imagining space. They had been inspired by its ambiguous qualities, which had for many centuries in East Asia been used to capture a dreamlike world that was unbound, weightless and infinite.



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This paper will begin by examining claims made in relation to two technologies of representation – parallel projection and contemporary 3D scanning. 3D scanning is a way of digitising a subject through the production of a 3D 'point cloud' model by means of in-place survey. The type of survey conducted depends on the type of scan. LIDAR (Light Detection and Ranging) scanning relies on an instrument that emits lasers towards its surroundings to translate these dimensional data into a virtual model of its corresponding space. Alternatively, photogrammetry is a process of comparing multiple images of a subject, using the nature of parallax to reconstruct the space from data embedded within the images. To create a more detailed and 'complete' model, a systematic set of images that have been taken at regular intervals, circling and surrounding the site from a range of positions and angles, is needed. While the processes and instruments of scanning are very different, the results of LIDAR and photogrammetry are very similar – a point cloud model of the subject that is understood to be geometrically and objectively precise (Fig.1).

While an axonometric and a scan are unrelated in many ways – 3D scanning can (seemingly) only depict extant spaces whereas parallel projection has the potential to be propositional – both envision space as 'seen' from a disembodied eye with connotations of precision and accuracy. In this text, and through the design work presented with it, I aim to put pressure on the assumption of objectivity that attends such tools of representation, exploring the speculative possibilities latent in them. Using Kyoto as an example, I will move on to an examination of how such means of representation have been implemented in the depiction of the city. Referring to both the 17th-century *Rakuchu Rakugai zu* (*Scenes In and Around Kyoto*) screen paintings, which employ parallel projection, and the ongoing Virtual Kyoto project that integrates Geographic Information Systems (GIS) with virtual reality, I will outline the limits and opportunities of using such approaches to capture a city in its entirety.

Larger illustrations and captions on pp. 11–20

The paper will then focus on a drawing investigation, which moves between diverse modes of representation and forms of recording place. The piece, entitled 'Inside/Outside Kyoto', combines elements of in-person photogrammetry (a form of 3D scanning), remote virtual survey via Google Earth, hand-tracing via a lightbox, and Computer-Aided Design (CAD) drawing, to build a documentation of Kyoto using tools that have connotations of clinical objectivity. The project regards reproductions of images and drawings produced as sites in and of themselves, inviting subsequent tracings and re-inhabitations.

My analysis of this project will investigate acts of drawing that correlate graphic tracing by hand with human vision's ocular tracing of space. I will outline an alternative reading and application of photogrammetry, which conceives this technology of scanning as a means of tracing, rather than cloning, space. This interpretation highlights the capacity of the photogrammetric surveyor to reveal, highlight, omit or montage the subject through the layered and embodied process of producing a scan, as it relies on in-person inhabitation and movement. I argue that tracing is not merely a passive act of replication, but a creative re-telling, adaptation and revision of the original that has its own agency. By examining these questions through the lens of parallel projection, itself a form of representation tied to connotations of truth and disembodiment, I seek to build an alternative version of the portrait of Kyoto.

Architectural representations as instruments of truth

In the introduction to *Temple Island*, an exploration through architectural drawing of geometry, velocity and cones of vision, Michael Webb describes viewpoint in parallel projection as presuming an observer who 'is everywhere (almost) and nowhere'. He goes on to refer to Pascal's description of God as 'a sphere whose centre is everywhere and whose circumference is nowhere'.[2] In a sense, a form of representation that removes the viewer from the scene and conceptualises space in relation to a disembodied viewpoint is a description of parallel projection that could just as easily apply to 3D scanning. The capacity to command a representation of space in this way entails a notion of being 'everywhere and nowhere' and confers a God-like empowerment upon the spectator of a 3D scan, who has the power to manipulate what can be perceived within the virtual model.

The removal of the individual from representation, Massimo Scolari and others argue, omitted perspective bias and suggested mathematical truth, particularly as parallel projection correlated directly to the conventions of the plan and elevation. During the Renaissance, understanding of knowledge was tied to rational concerns over scale, measurement and dimension, instead of the illusion of the gaze.[3] However, while orthographic drawing such as plan and section offered such qualities, the representation of the third dimension within parallel projection meant that it wasn't just measurement and precision that made such representation useful, but its ability to reveal the whole from an omniscient viewpoint.

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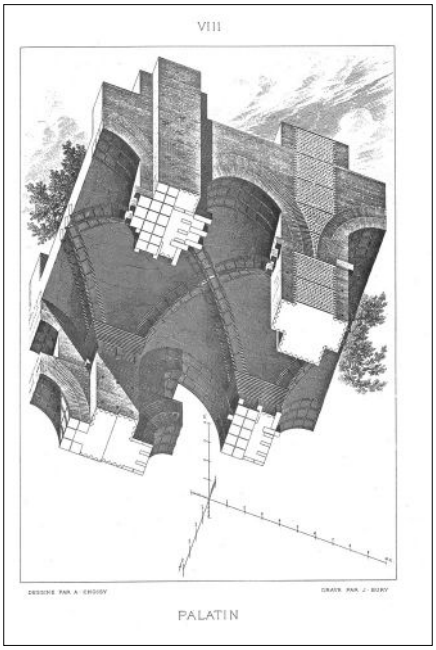
This fascination with precision has extended to contemporary understandings of 3D scanning (Fig.2). It is a tool that is understood and implemented on terms that are forensic in nature and start to redefine architectural drawing as more than just another 'representation of space'. Discussing their scans of heritage sites, the directors of the imaging company Scanlab suggest that their work may eventually replace live field investigations, for 'to observe or navigate a scan is to visit, or revisit, with uncanny, unnerving accuracy'.[4]

The nature of photogrammetry as a process of documentation transforms spaces and places into objects. As we must circumnavigate the subject in



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near-360 degrees, we point our cameras inwards towards it condensing its surface into a tangible, finite 'thing'. Any context that happens to slip into our scans is accidental, partial and fractured, a by-product of the angles of our photographs. This in turn relates to the forms of scanning – while, as already noted, the LIDAR shoots outwards from a singular point, like a sun emitting rays in all directions, photogrammetry is more akin to a planet in orbit, continually directed towards its gravitational anchor. The result is a scan of the object, unbound and weightless, floating free in the virtual non-place of our computer screens. This is a condition that, again, is linked to a particular cultural history of representation. Where perspective is formed and constructed in relation not only to the viewer and their eye, but to some sort of context – the vanishing point, the horizon, ground, and in turn, place – parallel projection is not only without a fixed point of view but renders spaces as groundless, with no vanishing point towards which lines might converge (Fig.3).

Contemporary and historical portraits of Kyoto

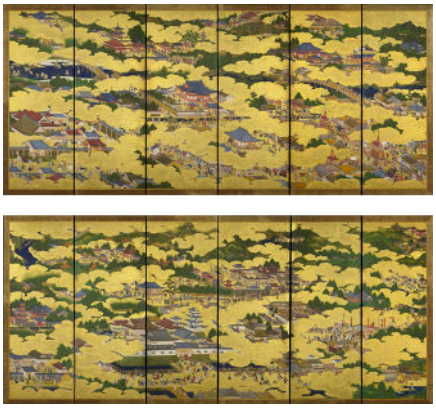
To understand the impact of reading architectural representation as an instrument of truth, I wish to explore how such systems have been employed in the representation of the city from a historical and contemporary perspective. Kyoto is, of course, far from the only city to be the subject of multiple portrayals across history, but its complex cultural context and symbolic relationship to Japan as a whole make it a useful case study through which to explore how the image of the city had a part in the construction of its own identity.

Perhaps as a response to the ever-growing influence of Google Earth, Keiji Yano, Professor at Ritsumeikan University in Kyoto, set up Virtual Kyoto to archive digitally the space of Kyoto across place and time. The objective, according to Yano, is to investigate 'historic Kyoto's past, present and even its future',[5] and the project attempts to do this through the use of advanced Geographic Information Systems (GIS) and virtual reality to 'reproduce Kyoto's distinctive street scenes on a computer'.[6] The idea of building a virtual Kyoto that encapsulates, as far as technology and precise data can allow, something that can resemble 'the real thing', is a natural extension of what Google Earth has alluded to – a mirror world.

Virtual Kyoto nevertheless seems aware of the potential trap of such ambitions in creating a static, lifeless cast of a city and has tried to address this by incorporating a temporal element, not just by retracing Kyoto's rich history but also turning our gaze to the future. While temporal mapping is by no means new, what makes Virtual Kyoto's ambition particular is the diverse range of source material that is incorporated into its database. While Google Earth's temporal archive includes what has been captured using consistent image-capture apparatuses, Virtual Kyoto is happy to delve into alternative sources: historical maps, old photographs, and even early modern paintings of the city. This ties into the ambition to archive not just the physical form of the city, but the evolving culture and consequential memories of place.

These paintings, entitled *Rakuchu Rakugai zu*, are picture-maps of the then capital city produced during the 17th century. It is particularly interesting that Virtual Kyoto refers to these paintings as sources, because one could describe such paintings as themselves aspiring to provide a holistic overview of Kyoto. Matthew McKelway points out that they were produced during a highly volatile period in history, when the capital was still recovering from the hugely destructive consequences of the Onin War, and as such the depiction of a thriving and culturally rich capital city was thereby simultaneously nostalgic and aspirational.[7] The fact that they have become used as reference points for an archive of Kyoto's past is

interesting, because they too were intended as archives, not of the city's geographical make-up but of its identity. They were used as political tools to perpetuate a selective version of Kyoto to rival warlords as a way of establishing authority. While they may be untrustworthy as archaeological records, they instead reveal more about how the city existed in the collective imagination. Virtual Kyoto therefore incorporates the hyper-precise forms of data such as GIS mapping, as well as the imagined and ambiguous depictions of the city in the Rakuchu paintings.



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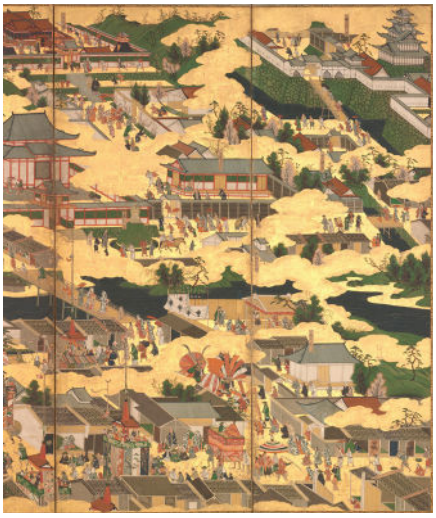

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Like all traditional Japanese *Yamato-e* painting from this era, the Kyoto paintings depict the city's iconic landmarks as well as the ubiquitous *machiya* townhouses using what appears to be parallel projection, peering through a maze of golden clouds that sprawls and interrupts our view of the city (Figs 4, 5). The use of parallel projection, which we have already established was an instrument of objective and mathematic rationality in a European context, was here being used to blend fact with fiction in a way that edited how the city was presented as a coherent whole. Kyoto's geography is adjusted in these paintings using the golden clouds, which move the viewer from one part of the city to another. Furthermore, specific and iconic buildings themselves are not represented with any degree of architectural accuracy, with distortions in scale and proportion. These are not defects or faults of the painting, but manipulations of the viewer's perception of the city by the artists – McKelway speaks of the 'artist's ability to modulate the degree of "truth" in the painted image'.[8]

This is partly because representations of buildings did not need to be accurate – they had more to do with how the space was imagined and remembered in the collective consciousness, rather than any notion of scale or dimension. Architecture was not reliant on drawing in this period but instead on an understanding of carpentry and craft. It is unlikely that artists even visited the sites to conjure their depictions; the portrayals of famous landmarks were instead based not on the actual buildings themselves, but on earlier paintings and images of such places. These iconic temples and palaces had been the subject of artistic works for centuries and the depiction of such places was popularised through fan paintings and reproductions[9] of famous scenes and characters. It could be argued that, in many ways, people in Japan were far more familiar with the images of buildings in Kyoto than through any experience of the actual structures themselves, as such paintings had built the identity of these places within collective culture.

Through the fusion of seemingly more precise and less precise information, Virtual Kyoto taps into a wider memory of Kyoto. It asserts that 'what people have in mind when they think of Kyoto is a grid-work of street lines with *kiyomachiya*, sprinkled with numerous shrines and temples, set against a backdrop of mountains',[10] suggesting that representations of the city feed off and feed into the urban imaginary. We are now used to being able to 'visit' distant lands via remote means and Yano suggests that, just from online tour guides, we can 'imagine strolling through temples and shrines or along the banks of the Kamo River'.[11] This sense of remote inhabitation of a city is essentially the aim of the Virtual Kyoto project – to activate the 'mind's eye' and create a 'digital diorama'[12] of, and perhaps for, the city. The means of representation – the nature of computer-generated 3D modelling, Virtual Reality and the backbone of GIS data – lend an air of concrete believability to the representation of Kyoto.

However, the means and apparatuses used to document the city in an apparently absolute way have their own flaws and drawbacks which can wrongfoot the viewer of such images. As Virtual Kyoto puts it:

> creating the most detailed virtual space would involve placing CAD data for each building in the city into the GIS along with indications of each building's scale. However, to do this for such a large volume of data would require a supercomputer.[13]

While Virtual Kyoto attempts to create a digital copy of the surfaces of an entire city, contemporary technology still cannot cope with the demands of such an ambition. What is provided instead is a virtual environment that has the semblance of totality, but only in clouds of resolution, rendering famous landmarks and key buildings in an accurate fashion using building plans, while modelling the more generic and repetitive parts of the city in less detail. This hierarchy of precision/importance is not too different from the approach taken by the artists of the *Rakuchu Rakugai zu* paintings, which were built through depictions of famous sites interspersed in a sea of *machiya* townhouses, greenery and golden clouds, lending the appearance of a complete image while shrouding vast swathes of the city.

The parts of the city rendered in less detail – the *machiya* townhouses – also seem to be the object of Virtual Kyoto's fascination. Although these were once a symbol of 'typical' Kyoto – the ubiquitous generic language of houses that lined the grids of the city – as Virtual Kyoto points out, 'their distinctive façades are disappearing day by day'.[14] Virtual Kyoto has worked very hard to index and map out the extant *machiya* houses in the city, even categorising them into separate typologies based on their physical properties. But their appearance in the virtual interface is based on a generic model that is used in all instances, with texture mapping providing the appearance of individuality.

While Virtual Kyoto has amassed an impressive collection of images and 3D models, the representation of Kyoto in such a platform does not correspond or relate to how we experience or imagine the city, despite its semblance of authenticity. Rather than embracing the inevitable impossibility of trying to capture the whole, as the artists of the *Rakuchu* paintings seemed to, Virtual Kyoto has relied heavily on contemporary technology to bridge the gap between representation and reality.

What interests me here is the possibility that the representational devices of precision and accuracy might be freed from the obligation to map the physical reality of the city and instead open on to abstract and irrational imaginations of space, which may have more in common with how we envision or how we may dream of these places. Architectural drawing has the capacity to provoke the imagination, creating in one's mind an entirely new and alternative place that may have connections to the real, but is fundamentally separate in nature.

Tracing/scanning

Perhaps the way in which the act of 3D scanning is understood is limiting how we interpret the resultant images and representations. What if, instead of reading such scans as copies of real places, demonstrative of objective truth, we instead understand them as acts of tracing – in which the agency of the draughtsperson or instrument is retained? Tracing is in itself a form of drawing that has its own connotations of truth and accuracy, but may also involve diversions.

In *Victims*, John Hejduk likened the act of tracing to 'touching the surfaces of the face in order to understand a sense of volume, depth and penetrations'.[15] This way of thinking of the act of tracing could be applied to the process of 3D scanning. Whether it is LIDAR or photogrammetry, both systems of scanning are means of engaging with the surface or the skin of the environment to ascertain a sense of its spatial capacity. Michael Young

suggests that 3D scanning 'is not only trying hard to see as many qualities of environmental surfaces as possible, it is also trying to give them spatial depth, in a way it is trying to touch reality'.[16] This 'layering' upon the original, be it a drawing or a building, in order to re-enact its marks, lines, or points, is an aspect of tracing as a drawing technique that is just as much about discovery as it is about copying.

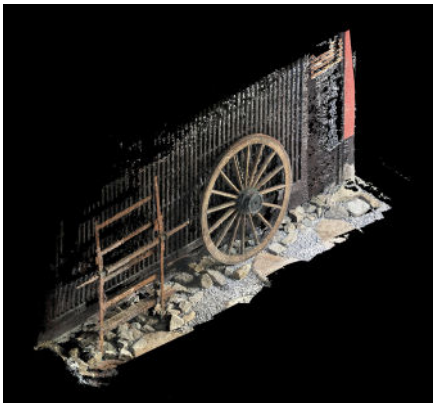
The act of tracing is the production of a copy of an original that might be understood more as generative than passive. Ray Lucas asserts that tracing is a form of knowledge production, in that such processes are not instantaneous replications but ask the draughtsperson to re-enact the embodied process of drawing, and, in doing so, this reveals and produces something that may share many properties with the original but is also different from it. Lucas writes that: 'The original is grounds for invention rather than something to be blindly reproduced.'[17] Similarly, Thomas Pearce has suggested that 3D scanning be viewed as 'endowed with its own creative agency, performing and creating rather than merely representing phenomena…. The scanner is thus turned into a productive agent, a creative complicit.'[18] While Pearce is referring to edge noise readings of 'ghost points' within LIDAR scanning, my own interest in the scanner as a 'creative complicit' is not about the minutiae of detail, resolution and tolerance, but more in understanding authorship in the act of scanning. Photogrammetry is an entirely different form of 3D scanning and requires negotiation between a person, the subject, and the digital apparatus.

In other words, while a LIDAR scanner is a somewhat autonomous technology that, once set up in effective positions, sweeps its rays across the scene – every surface that it touches being captured and the rest lying in shadow – photogrammetry instead asks the user to be the equipment, manually documenting the subject from multiple angles, moving and adjusting their position to ensure all has been captured with enough overlap. At each stage of the process of photogrammetry, decisions are made that reduce the capacity of the scanning process, shifting from producing an entire replica to creating a curated and singular perception. It is a conversation between these processes, from the act of photographing to the translation into a point cloud and finally to the extracted image/view/animation selected by the draughtsperson on a computer. This builds up as a series of layers, insinuating this notion of tracing, retracing and fixing things into something that can be represented.

Inside/Outside Kyoto – a drawing study

Inside/Outside Kyoto is a design investigation that posits an alternate reading and positioning of photogrammetry as not simply a scan of the built environment, but instead as a tracing of it. The work seeks to produce a contemporary urban portrait of Kyoto, drawing upon the imagery and language of the 17th-century *Rakuchu Rakugai zu* paintings as well Virtual Kyoto's oscillation between the forensic and the mythological. As in the paintings, parallel projection is used to create seamless aerial depictions of the city's urban fabric, playing with the relationship between maps and pictures. In my exploration of the city, I seek to disrupt the assumptions of truth and accuracy that are associated with parallel projection and extend this scrutiny to a contemporary device of precision – 3D scanning. The use of photogrammetry up close, and *in situ*, as well as far away and remote using Google Earth, aims to play with the connotations of embodied and disembodied forms of subjectivity provoked by such representations.

I conducted these drawing studies during multiple field visits to Kyoto in 2018 and 2019. Fieldwork conducted on-site involved the documentation of hundreds of buildings, architectural elements, street furniture and urban fragments through systematic photography for the purposes



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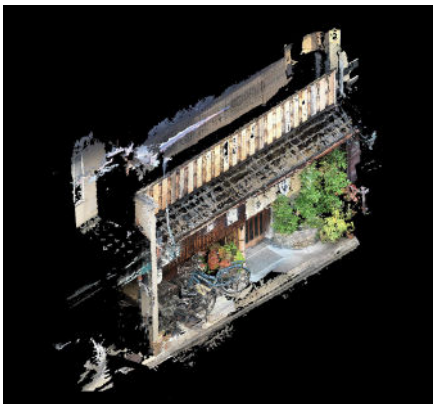

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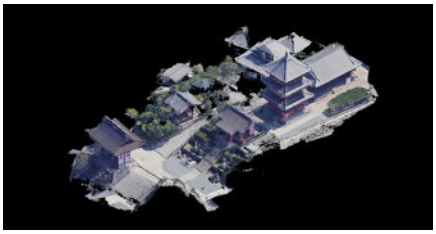
of photogrammetry modelling. The sites were selected during a series of walks through the urban grid, enacted systematically. Rather than focus only on the famous sites that are located on the city's periphery (stemming from an historic separation of the religious quarters from the city proper),[19] my studies tended to seek out the everyday assemblage of the *machiya* building typology in the inner city. While these are ordinary houses, restaurants and shops, in many ways their coherent architectural language is as much a signifier of the city's identity as famous landmarks and sites. Although this historic typology is becoming more rare today, the city still can be recognised through the scatterings of lattice shutters of the street houses and arched *inuyarai* barriers. In this way, during my walks through the streets, I constantly looked for such moments and opportunities to document this persistent although intermittent architectural vocabulary.

These initial surveys of the city led to a series of point cloud models, of varying scales and resolutions, of fragments of temples, shrines and *machiya* houses, as well as street furniture and parts of building façades. The subjects of my scans are mostly architectural elements, but the nature of photogrammetry means that surrounding pot plants, bicycles, lanterns and restaurant menus are included equally in my survey of fragments of the 'real' Kyoto. These sets of subjects blend architectural elements with that of 'entourage' – which Young explains as 'how all the stuff of the world – trees, furniture, vases, cars, lamps, rocks, animals, and people – is represented in an architectural image'.[20] While Google Earth tries its best to erase 'background noise' such as cars from its 3D models, my attitude is to include these elements of architectural clutter within the city portrait. The omnipresence of vending machines and air-conditioning units forms as much the urban grain of Kyoto as the iconic shrines, gardens and temples. The *Rakuchu* paintings were very aware of the importance of the 'stuff of the world', and it is no accident that the thousands of unique individual characters that occupy the space of the paintings tell us as much about the city as the portrayals of mansions and castles. It is this focus that is also missing from Virtual Kyoto, whose 3D models of generic housing typologies lack detail in the haphazard signs of inhabitation that usually surround the houses.

In addition to first-hand documentation of architectural 'moments' on my field trip, subsequent imagery acquired remotely, using Google Earth, was extracted to depict buildings and places of a different kind. The use of Google Earth feeds into a discussion on the levels of resolution in the urban image as well as the blurring of 'site' and 'subject' in my design investigation. In the scans produced from my own first-hand survey of parts of the city, the resultant models are highly detailed, bespoke and for the most part representative of everyday nameless fragments of townhouses and shop façades (Figs 6–9). In contrast, the models produced from the Google Earth images are a result of a double process of photogrammetry, where the subject being surveyed is not the site itself but a modelled representation of it, also produced through photogrammetry. These models are far less detailed and were produced from a disembodied and remote form of survey. The models are not just lacking in resolution but are loose approximations of the sites, built from simplified, generic and repetitive models that are made to seem like reality (Fig.10).

In a way, this might be compared to the painters of the *Rakuchu Rakugai zu*, who based their depictions of iconic sites not from first-hand observation but from already established depictions of the buildings in famous paintings. The subject isn't the actual city, but how the city exists in the collective and touristic consciousness. When we see such images



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of Google Earth, we are led to imagine Kyoto in ways with which we are familiar – and it is more the semblance of precision rather than the reality of it that leads us to believe in its imagery.

In Virtual Kyoto, the subjects of greater precision were landmarks with a more iconic status, modelled with greater accuracy using floor plans and drawings, whereas in my study, it is the everyday and generic that receives this detailed level of scrutiny. Famous sites such as Kiyomizudera, the Meiji Shrine, Nijo Castle and Toji Tower have been included in my remote survey in a much lower level of resolution, rendering these sites as a generic backdrop to the more human-scale entourage of urban sprawl. This reversal in some way positions these townhouses, street furniture and evenvending machines as the protagonists of the study.

The drawing investigation sought to bring the individual point cloud scans together into a collective ensemble. The objective was to break down the understanding of these elements from being scans of objects to being traces of places through the reconfiguration of the models within the representational plane. To do so, the models were positioned to form a sense of coherence and consistency with other models.

The transformation of the 3D virtual point cloud into a singular isometric viewpoint, rendered into a file, is the translation of the model into an image. In this case, the idea of drawing-as-image is particularly interesting given the qualities of parallel projection. Any typical drawing is constructed with the act of producing a line on a surface, but parallel projection is fundamentally bound to lines as the framework of the drawing's logic. Here, however, we have a form of parallel projection that contains no lines but points. Instead, it is the computer that is repackaging the point cloud within the framework of parallel projection, obeying its laws and shifting the viewer's relationship to the subject under a similar logic. The lines of projection are, however, not concrete as in drawing – they are phantom lines that may be traced out and revealed but are not in themselves embedded within the image. The representation thus has more in common with a pointillist painting than a form of architectural drawing, even if the language of such drawing systems is shared.

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My drawing process seeks to unearth the oneiric dimension of photogrammetry – its ability to conjure dreams and 'remembrances' of spaces. In this, my techniques yoke the analytical to the speculative whereby systematic and rigorous data collection is toyed with, manipulated and distorted in a way that interacts with memories and imaginations of place. Drawing is therefore an act of curation, positioning supposedly objective and precise information (the photogrammetric models) in a way that builds a new Kyoto in and of itself. As this process is sequential – I tamper with the models only once they have been produced after the fact – it is a layered approach, one where each drawing or image is treated as the site from which the next tracing starts. By moving between digital collage, hand-drawn tracing and occupations of the space of the drawing via CAD software, the process builds a layered series of tracings of the city within the logic of parallel projection (Fig.11).

This produces a conversation between the digital manipulation of the flattened point cloud and the act of tracing – not simply to redraw, but to rewrite, embellish and extend. The apparatus that allows for this, the ability of multiple scans to 'speak' to one another, is the use of parallel projection, which means elements of each view can be extracted and repositioned, rotated, multiplied and combined with a different space without destroying the visual logic of the whole. The act of collaging the original scans echoes Lucas's suggestion that 'tracing can also be a form

of compositing, allowing elements to be gathered together from a variety of sources and placed into an overall composition; pieces contributing to a whole'.[21]

This process binds disparate conditions of buildings together through a shared 'common' language, weaving together repetitive elements within these spaces. Integrating these separate scans into a common scene and navigating the transition through drawing transforms them from being 'objects' into being 'places' that have proximities and relationships with other entities. The revised spaces of Kyoto are further inhabited by people, giving an effect of the solidification and anchorage of spaces that are free-floating and inherently abstract. These figures represent an embodied engagement with the city that was required by the act of documentation and is typically removed from representations such as Google Earth. The spaces of the *Rakuchu* paintings are compelling because they are inhabited, as the city is treated as a living body and its inhabitants contribute to its urban identity.

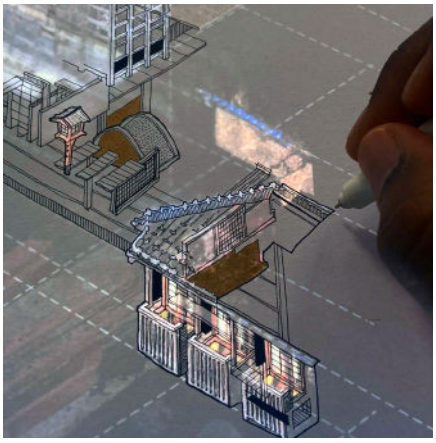
Even though these adjacencies and relationships are entirely invented and, in some sense, arbitrary, the imagery of the scans and the format of the isometric lend an aura of seamless believability. This is akin to how the artists of the *Rakuchu* paintings would distort the make-up of Kyoto, moving from one part of the city to another using golden clouds that shift our gaze without interrupting the visual coherence of the overall image. These artists knew that you did not have to show every part of it to be able to depict the city as a whole, and instead used strategies of representation and composition to do so. In my drawing, the golden cloud is replaced by the black void in which the buildings float freely, like a form of exploded viewpoint. This representational device that peels walls, floors, façades and roofs from the building in a way similar to the Japanese technique of *fukinuki yatai* ('blown-off roof') allows the viewer to peer into spaces that would otherwise have been concealed. In my study this device is used to hold elements together rather than pull them apart.

The inhabitation of the montage through CAD line drawing seeks to re-write the spaces and their assumed spatiality. The linework interrogates the digital scans, adding a speculative layer of tracing that is bound to the language of the original scans but is at the same time independent. By masking out parts of walls, roofs and doors, this layer of drawing peels away the surface that the 3D scans map, allowing spatial elements to pierce through these thresholds.

Lucas suggests that, in tracing, '[l]ines can be selected and given permanence through repetition, others are abandoned, corrected, altered',[22] and this mode of selecting, highlighting and deleting mimics the ways in which our eyes trace the spaces we inhabit – darting along their edges and shifting elements in and out of focus. In this way the drawing process, through its layered approach of shifting between modes of tracing, is a form of dreaming of the city. Such dreams are both tied to a bodily inhabitation of the place but also charged with distortion in the flickering of our eyes (or cameras) and the capacity of memory and recollection to be simultaneously lossy and fruitful.

Conclusion

The drawing process described here is a series of tracings upon tracings, engaging with the surface of the spaces it traverses while creating new ones. This act therefore produces a convergence between an analytic and creative process of representing place. From an embodied act of photographing space to the digital process of manipulating the resultant image, the inhabitation of this space through hand and computerised



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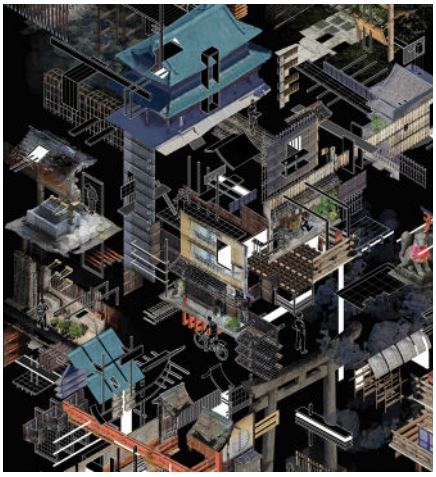
drawing creates sequential tracings of Kyoto that are anchored to, yet divorced from, the real place. This process also oscillates between embodied and disembodied means of drawing, between the connection to the fabric of the city and the means of hand and digital drawing. The documentation of Kyoto through photogrammetry scans starts from a position of accuracy and objectivity, capturing the city through analytical survey. The initial studies produce a digital replica of the city but only through virtual data manifest in the point cloud. It is in the act of manipulating this data to form viewpoints, representations and drawings that the information is curated, controlled and edited to form a selective and specific image of the real. Despite the instrumental character of parallel projection, the transformation of the point cloud into isometric is the moment at which the analytical survey becomes a creative and speculative exercise. This initial curatorial organisation of the city is furthered through a series of traced layers and a modal shift that uses drawing as an act of cumulative and performative memory.



13—

In this sense, the drawing study comprised three separate stages and forms of tracing. The first layer involved the act of producing photogrammetry scans of many sites of the city through an embodied process of re-tracing the spaces of each site and documenting them through photography. Secondly, a digital manipulation of the point cloud, using Photoshop and parallel projection, was used to stitch together the disparate fragments of the city into a seamless, though fictitious, whole. The final act of tracing is the most direct, in that the montage itself was re-inhabited, initially through hand drawing (Fig.12) and then through computerised drawing, to bring forth entirely new spaces that co-exist and overlap with the originals (Fig.13). In this way, *Inside/Outside Kyoto* is intended to reorient the representational devices that we tend to accept as providing an objective and precise depiction of our built environment.

1 Yve-Alain Bois, 'Metamorphosis of axonometry', *Daidalos: Berlin Architectural Journal*, 1 (1981), 40–58 (50).
2 Michael Webb, *Temple Island: A Study*, Mega 5 (London: Architectural Association, 1987), 1.
3 Massimo Scolari, *Oblique Drawing: A History of Anti-Perspective* (Cambridge, MA, and London: MIT Press, 2012), 17.
4 M. Shaw and W. Trossell, 'Digital doppelgängers: future scanscapes', *Architectural Design*, 84 (2014), 20–29 (25).
5 Keiji Yano, Tomoki Nakaya and Yueuru Isoda, eds, *Virtual Kyoto: Exploring the Past, Present and Future of Kyoto*, trans. Minae Savas (Kyoto: Nakanashiya Publishing, 2007), 2.
6 *Ibid*., 3.
7 Matthew P. McKelway, *Capitalscapes: Folding Screens and Political Imagination in Late Medieval Kyoto* (Honolulu: University of Hawaii Press, 2006), 2.
8 *Ibid*., 5.
9 *Ibid*., 33.
10 Yano *et al*., *op. cit*., 7.
11 *Ibid*., 3.
12 *Ibid*.
13 *Ibid*., 26.
14 *Ibid*., 12.
15 John Hejduk, *Victims*, Text 1 (London: Architectural Association Publications, 1986), 7.
16 Michael Young, *Reality Modeled After Images: Architecture and Aesthetics after the Digital Image* (New York: Routledge, 2021), 50.
17 Ray Lucas, 'The discipline of tracing in architectural drawing', in *The Materiality of Writing: A Trace Making Perspective*, eds C. Johannessen & T. Van Leeuwen, Routledge Studies in Multimodality (New York: Routledge, 2017), 116–37 (117).
18 Thomas Pearce, 'Orchestrating the edge: towards a noisy point cloud onto epistemology', *Design Ecologies*, 4: 1+2 (2014), 142–70 (147).
19 Matthew Stavros, *Kyoto: An Urban History of Japan's Premodern Capital* (Honolulu: University of Hawaii Press, 2016), xxi.
20 Young, *op.cit*., 69.
21 Lucas, *op. cit*., 124.
22 *Ibid*.

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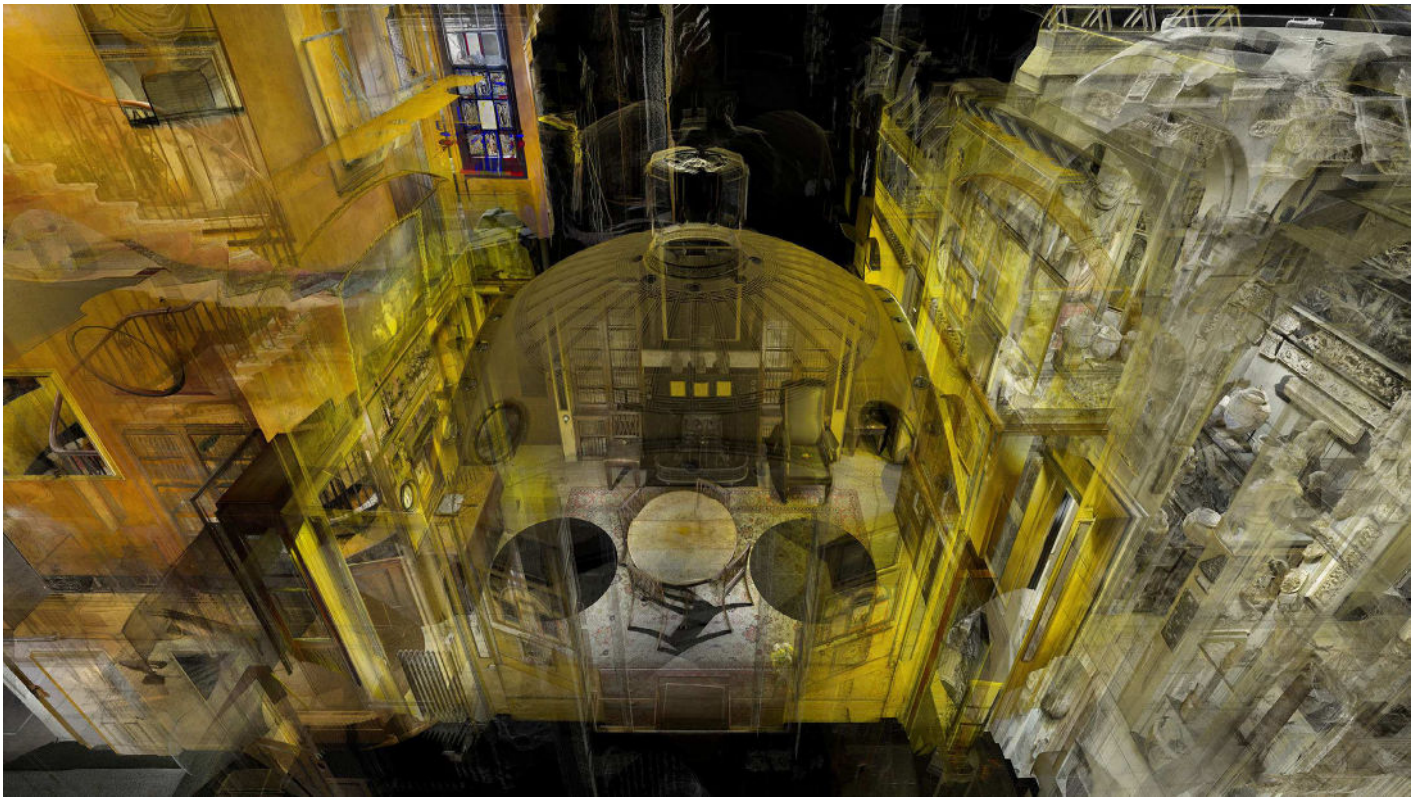
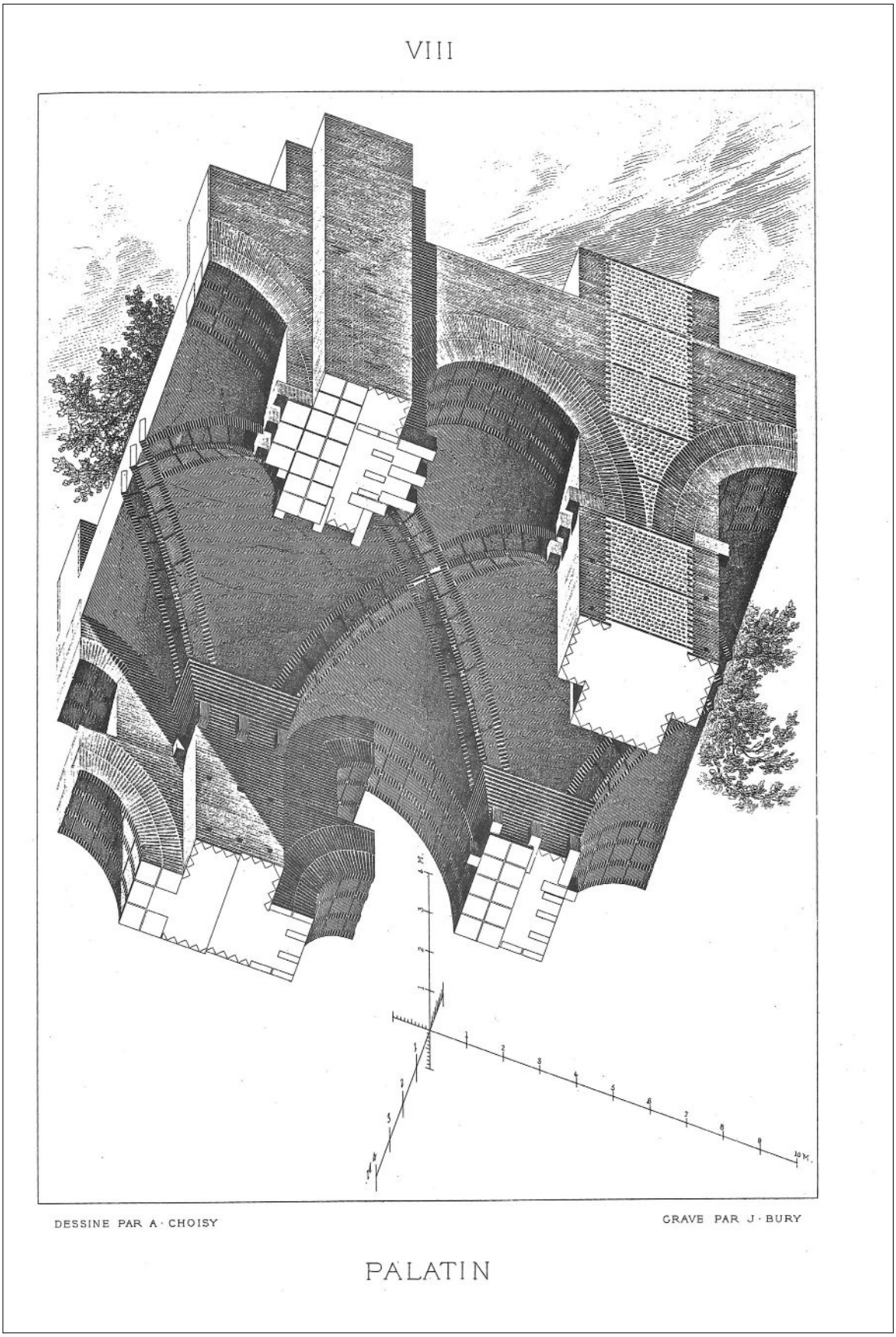


ScanLab Projects, A Museum Made Digital, LIDAR scan of Sir John Soane’s Museum, 2016.

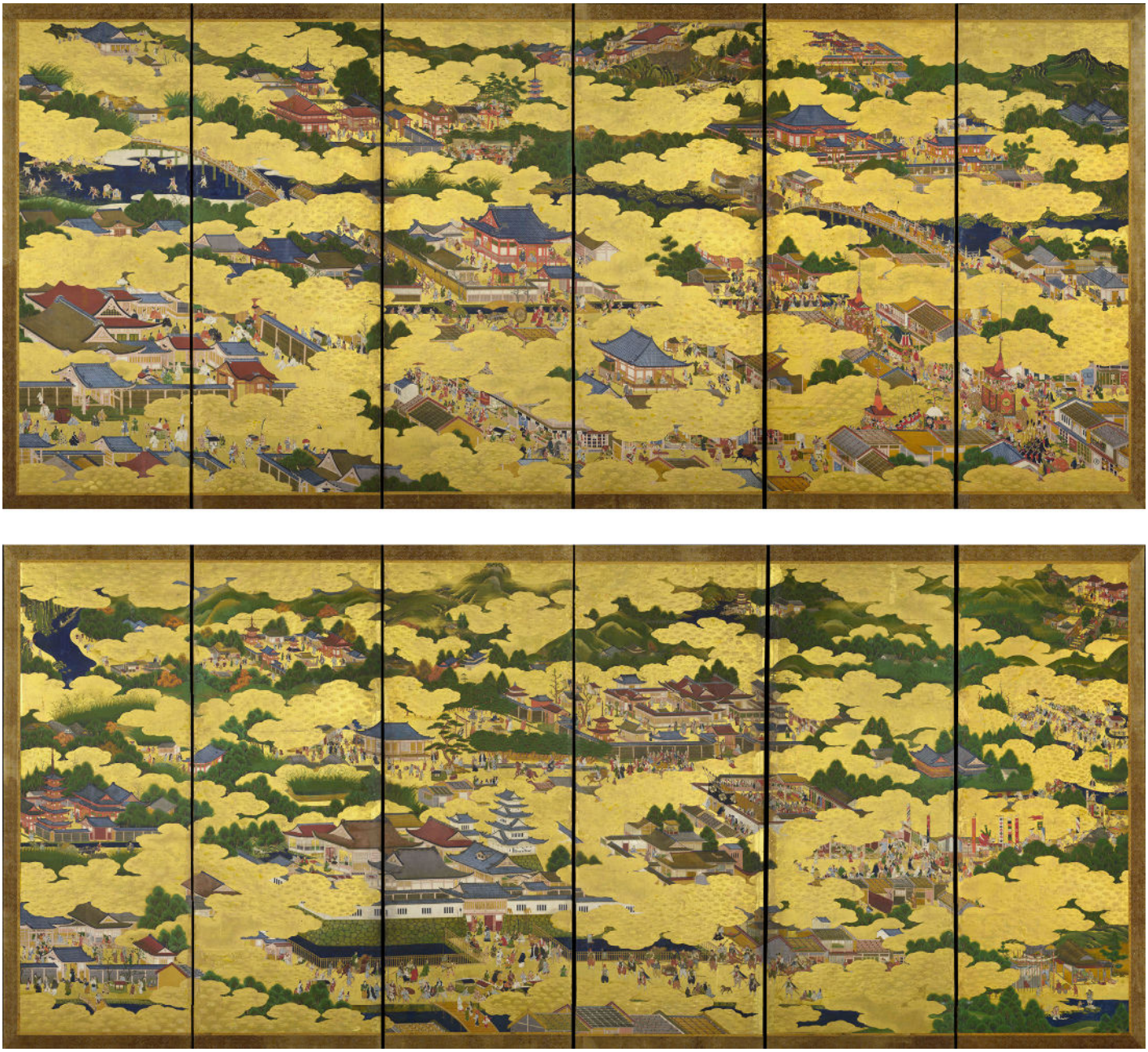
2—

Photogrammetry scan screenshot, showing the spatial positionings of the original photographs used to build the model, drawn by the author.

3—



Auguste Choisy, Fragment of a Gallery Vault at the Palatino, Rome, from *L'art de bâtir chez les Romains* (Paris: Ducher, 1873).



This version of *Rakuchu Rakugai zu* is known as the 'Seiganji screens' due to its prominent portrayal of the Seiganji temple. Anon., *Sights in and around Kyoto*, 1615–1624. Ink and colour on gold-leafed paper, pair of folding screens, each screen 170 x 366.2cm. Property of Bureau of Public Enterprise Shimane Prefectural Government/Deposited in Shimane art Museum.

5—

Anon., *Scenes in and around the Capital*, 17th century. Panels 1 and 2, right screen, of pair of six-panel folding screens; ink, colour, gold, and gold leaf on paper, each screen 170 × 366.2cm. Acc. no. 2015.300.106.1, .2, Metropolitan Museum of Art, New York, Mary Griggs Burke Collection, Gift of the Mary and Jackson Burke Foundation, 2015.

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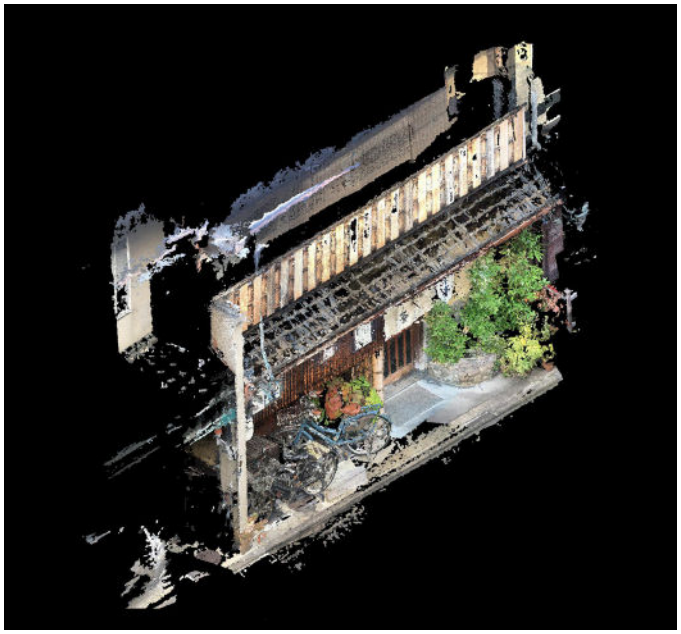

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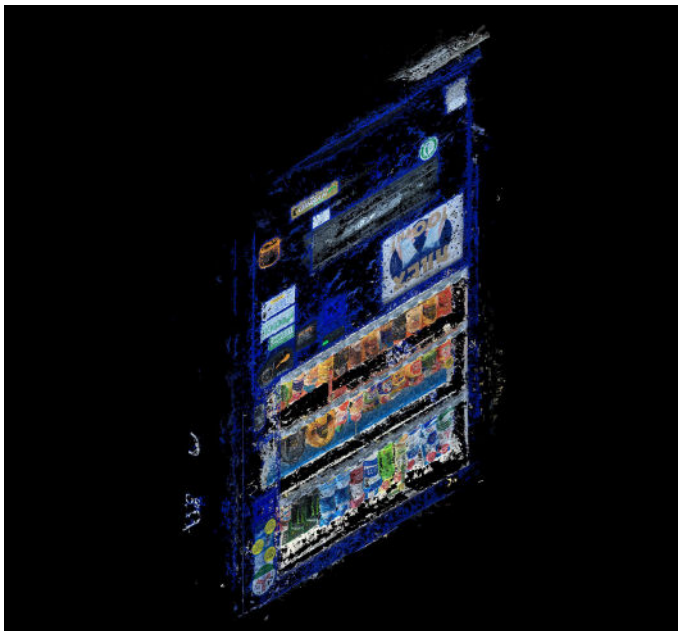
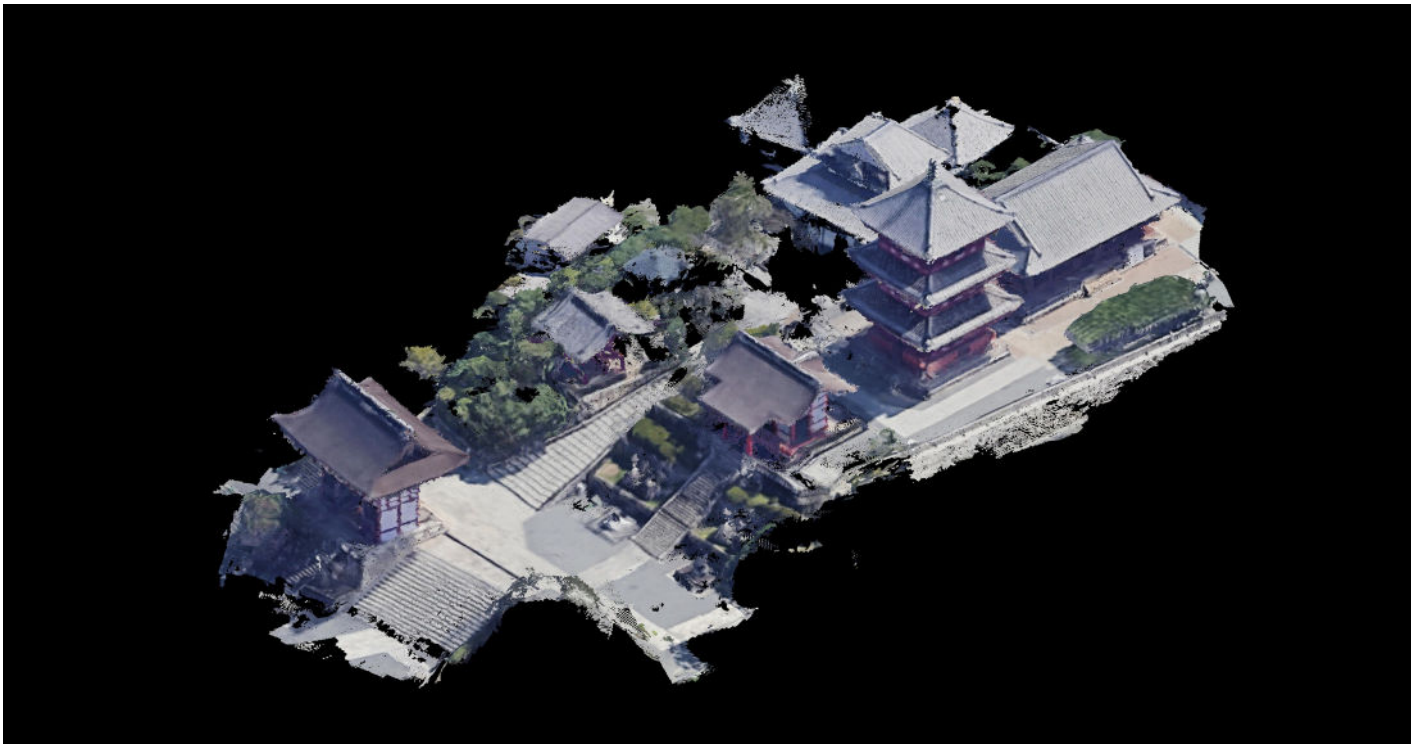


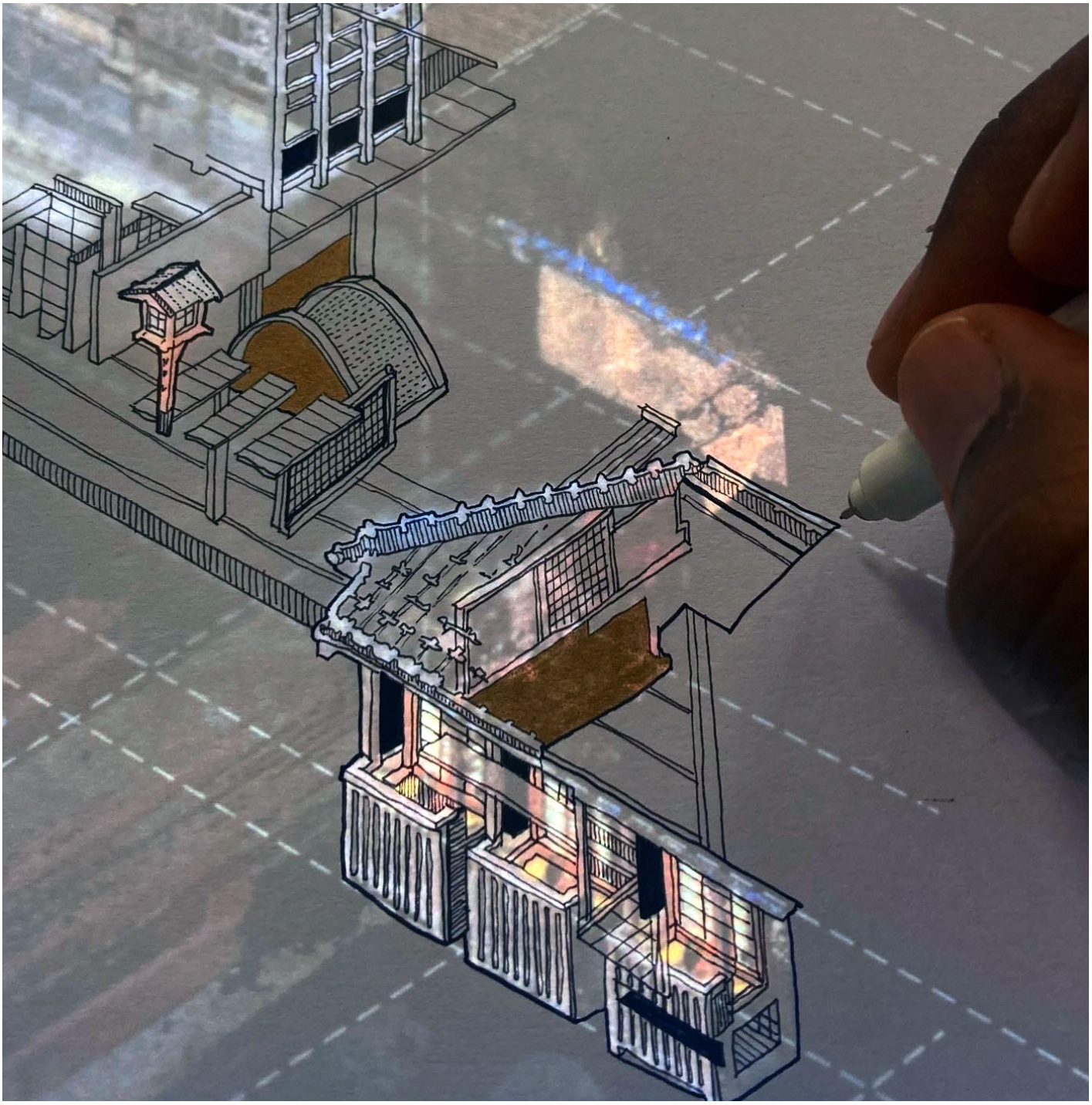
6— Sayan Skandarajah, Photogrammetry scan of Kyoto *machiya* house, isometric view of dense cloud, 2020.
7— Sayan Skandarajah, Photogrammetry scan of Kyoto vending machine, isometric view of dense cloud, 2020.
8— Sayan Skandarajah, Photogrammetry scan of rickshaw wheel, isometric view of dense cloud, 2020.
9— Sayan Skandarajah, Photogrammetry scan of Kyoto *machiya* house, isometric view of dense cloud, 2020.



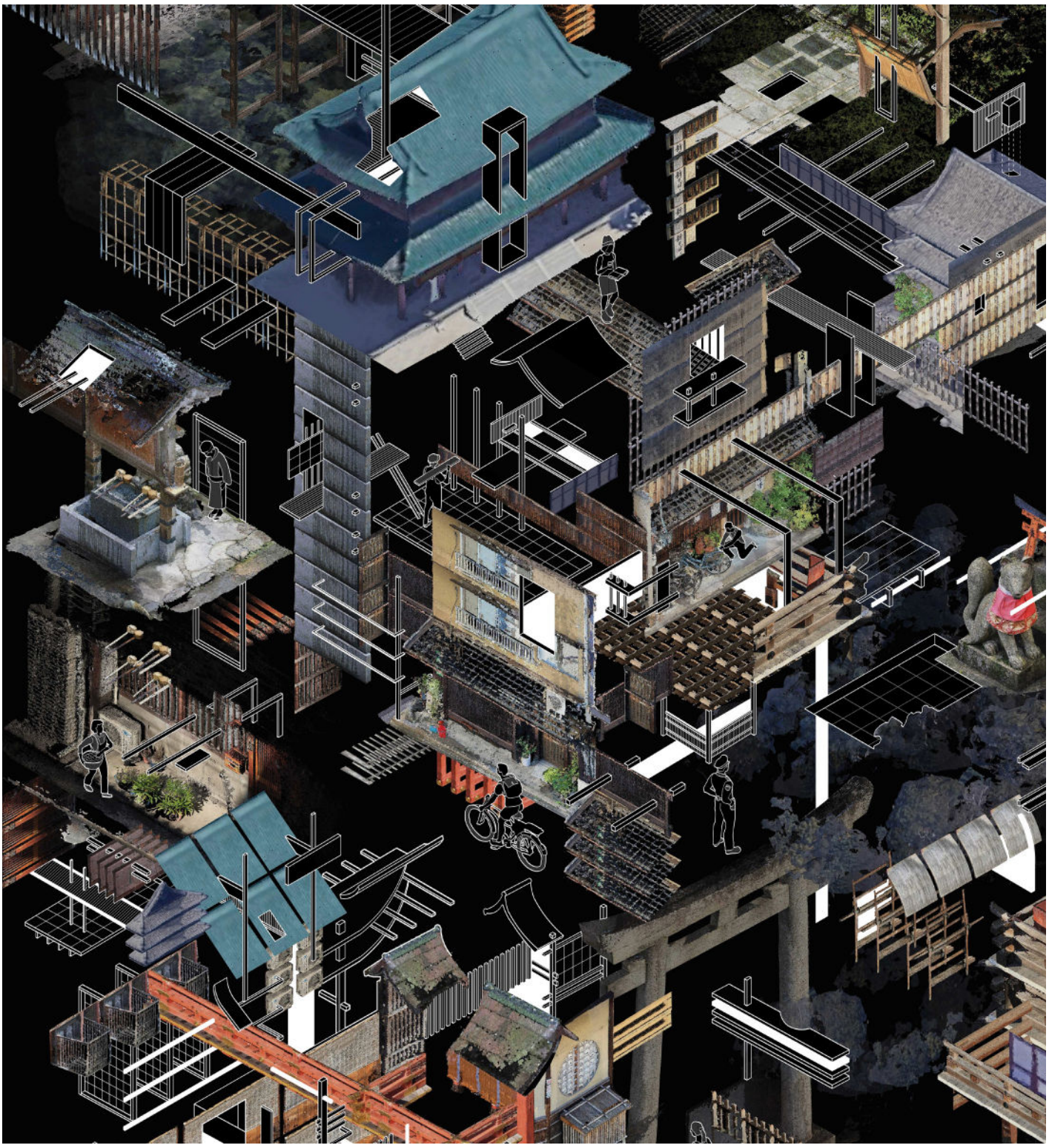
Sayan Skandarajah, Photogrammetry scan of *Kiyomizu-dera* using views from Google Earth, isometric view of dense cloud, 2020.

11—

Sayan Skandarajah, *Inside/Outside Kyoto*, initial montage layer. Digital drawing, 153.5 x 65cm, 2021.



Sayan Skandarajah, *Inside/Outside Kyoto* (detail), Inhabiting the montage through hand drawing, 2022.



Sayan Skandarajah, *Inside/Outside Kyoto* (detail), inhabiting the montage through digital drawing, 2022.