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Nota di contenuto	Cover -- Copyright Information -- Contents -- Abstract -- Preface -- 1 - Introduction -- 2 - State of the Art -- FIGURE 1 - A drawing detailing the various line types as established by the Museum of London Archaeology for use in the single context method of archaeological drawing. (Redrawn by J.J.L. Kimball 2014, symbology established by Museum of London Archaeology -- FIGURE 2 - An example of early archaeological photography -- pictured is the apex of the excavation of the Oseberg Ship, Norway. (Photograph © Kulturhistorisk Museum, UiO 2014). -- FIGURE 3 - Another example of early archaeological photography -- pictured are the excavators and archaeologists, in the background the Oseberg Ship, Norway. (Photograph © Kulturhistorisk Museum, UiO 2014). -- 3 - Theory -- 4 - Methodology -- 4.1 - Review of Established Methodologies and Associated Technologies -- 4.2 - Introduction to Utilised Technologies -- 4.2.1 - Camera Systems -- 4.2.2 - Adobe Photoshop Lightroom 5.4 -- 4.2.3 - Agisoft's Photoscan 1.0.4 -- 4.2.4 - EDM Total Station -- 4.2.5 - ArcGIS 10.2.1 -- 4.3 - Limitations -- FIGURE 4 - A visual depiction of the pipeline of technologies used in this work's experiment. Included in the above list are the following: (A) the physical archaeological object -- (B) digital SLR camera -- (C) control points for geospatial recording -- (D) RA -- FIGURE 5 - (Screen-captures of a 3D model) Steps in MSR production with Photoscan -- (top) estimation of

internal camera parameters and camera projections -- (left) dense-point cloud -- (right) mesh. (Image by J.J.L. Kimball 2014 -- 3D model by J.J.L. Kimball 201 -- FIGURE 6 - (Screen-capture of a 3D Model) The final stage of MSR-a photorealistic 3D model of the runestone DR 330 "Gårdstångastenen 2" located in Lund, Sweden. (Image by J.J.L. Kimball 2014 -- 3D model by J.J.L. Kimball 2014).
5 - Experiment: 3D Delineation -- 5.1 - General Background of Uppåkra -- 5.2 - Documentation Methodology at Uppåkra since 2011 -- 5.3 - State of the Art: 3D Modelling at Uppåkra -- 5.4 - Experiment Overview -- 5.5 - Experiment Methodology -- 5.6 - Results Concerning 3D Archaeological Drawings -- (Photograph © J.J.L. Kimball 2013). -- FIGURE 7 - A photograph looking southward over top of several of the 2013 excavation trenches. -- FIGURE 8 - A photograph from one of the acquisition campaigns around Trench 5 -- note the markers along the edges of the trench. (Photograph © J.J.L. Kimball 2013). -- FIGURE 9 - (Screen-capture) The 3D models located within their proper geospatial locations within ArcScene. (Image by J.J.L. Kimball 2014 -- 3D models and GIS implementation by N. Dell'Unto and the Department of Archaeology and Ancient History, Lund Univers -- (Image by J.J.L. Kimball 2014). -- FIGURE 10 - A short example of some of the database fields and values during the input stage. -- (Photograph © J.J.L. Kimball 2013). -- FIGURE 11 - A photograph displaying some of the complexities faced in Trench 5. -- FIGURE 12 - (Screen-capture of a 3D Model/3D drawing) this example show the general range of complexities to be drawn -- the green polyline denotes a small and relatively non-complex layer whereas the blue polyline denotes a large and complex layer. (Image -- FIGURE 13 - (Screen-capture of 3D models/3D drawing) Here the same model and drawings as are displayed in the above figure are shown in their geospatial relation to other 3D models within the GIS. (Image by J.J.L. Kimball 2014 -- 3D drawings by J.J.L. Kimba.
FIGURE 14 - (Composite screen-capture image of a 3D Model/3D drawing) An example showing the development of the drawing process overtop of the stone-packing layer. Notice the increase of orange polylines between the top and bottom images. (Image by J.J.L. -- (Images by J.J.L. Kimball 2014 -- 3D models/3D drawings by J.J.L. Kimball 2014). -- FIGURE 15 - (Composite screen-capture image of a 3D model showing/3D drawing) (i) stone-packing with no drawing -- (ii) stone-packing delineated by polylines -- and (iii) stone-packing visualised only as polygons. -- FIGURE 16 - This image shows a comparison between traditional methods and digital methods. The top image is a 3D representation of the stone-packing layer -- to the left is a hand-drawn plan -- and to the right is a 3D drawing in plan perspective. (Image by J -- (Image by J.J.L. Kimball 2014 -- 3D models/3D drawings by J.J.L. Kimball 2014). -- FIGURE 17 - (Screen-capture of 3D model/3D drawing) a composite image showing the relationship between a 3D model and its 3D drawing. Starting in the bottom left corner is an oval shape of the 3d model without any drawings -- the next oval shape outward is -- (Image by J.J.L. Kimball 2014 -- 3D model/3D drawings by J.J.L. Kimball 2014). -- FIGURE 18 - (Screen-capture of a 3D model/3D drawing -- section perspective) This image was captured during the drawing process. At first glance, one might believe that these nodes have been accurately placed upon the surface of the model, allowing for the -- FIGURE 19 - (Screen-capture of a 3D model/3D drawing -- Slightly oblique plan perspective) This image was captured after the drawing process had been completed. On closer inspection, some nodes have 'lifted' off of the surface, creating a very tedious task -- FIGURE 20 - (Screen-capture of a 3D drawing.

section perspective) This image was captured after the drawing process had been completed. A major drawback of drawing in 3D with polygons is that the polygon is projected as individually segregated pieces-note -- FIGURE 21 - (Screen-capture of a 3D model/3D drawing) the only examples where polygons were used successfully to distinguish between layers. The model itself has been made more transparent to help the reader see the complete extents of the section drawing -- FIGURE 22 - (Screen-capture of 3D Drawings). This image shows a variety of contexts and sections projected in the same environment and in relation to one another. (image and 3D drawing by J.J.L. Kimball 2014. Reference 3D model by N. Dell'Unto 2013). -- FIGURE 23 - (Screen-capture) Here are two examples of the current drawing methodology at Uppåkra. [left] a plan drawing of contexts acquired via total station -- [right] a digitised section drawing. By design these drawings must be viewed out of context fro -- FIGURE 24 - (Screen-capture of a 3D Model/3D Drawing) An example of chronological layering: a model of a younger phase of the excavation is reduced in transparency and superimposed over top of a drawing of rock-packing (an older phase). (Image and 3D draw -- FIGURE 25 - (Screen-capture of 3D models) Another example of chronological layering: this time the overlaying 3D model is significantly reduced in transparency so that the base model can be seen. To help delineate the location of the overlay model's featu -- FIGURE 26 - (Screen-capture of 3D model/3D Drawing) Here the 3D drawing has been slightly transparent and overlayed on top of the first 3D model of trench 5. (Image and 3D drawing by J.J.L. Kimball 2014 -- 3D model by N. Dell'Unto).
FIGURE 27 - (Screen-capture of 3D model/3D drawing) The top image shows completed 3D drawing for the second 3D model of Trench 5. The bottom image shows a transparent overlay of the 3D drawing overtop of 3D model. (Images by J.J.L. Kimball 2014 -- 3D models -- FIGURE 28 - (Screen-capture of 3D models) 3D drawings of the latest stage of excavations in Trench 5 displayed in their geospatial relation to other 3D models within the GIS. (Image and 3D drawing by J.J.L. Kimball 2014 -- Base 3D model for Trench 5 by J.J. -- 6 - Discussion -- 6.1 - Statement of Perceived Impact -- 6.1.1 - Guidelines and Symbologies for 3D Archaeological Drawing -- 6.2 - Cautions and Limitations -- 6.3 - Concerns Regarding the Photographic Process -- FIGURE 29 - (Screen-capture of a 3D drawing) One of the measure tool features in Arcscene: here the tool has been used to measure diagonally across the stone-packing layer which provides a result of 1.959 meters across. (Image by J.J.L. Kimball 2014 -- Refe -- FIGURE 30 - (Composite screen-capture of 3D models) Shown here is how ArcScene projects lines. the top image is a simple line that is easily projected -- bottom is a complex line which ArcScene cannot project. For both images, the corresponding line symbolo -- FIGURE 31 - A proposed standard symbology for 3D drawing: (A) limit of excavation -- (B) extent of context -- (C) edge of context truncated by latter intrusion -- and (D) extent uncertain. (Image by J.J.L. Kimball 2014). -- FIGURE 32 - (Screen-capture of 3D drawing) Despite placing the nodes in a logical sequence, the resulting polygon is not correctly projected. Instead of a single polygon, ArcScene breaks it into nine different pieces or 'parts'-each with its own specific.
FIGURE 33 - (Photograph) Buckets, strings, finds markers, range poles-all of these must be cleared from the site to ensure as clean a model as possible. (Photograph © J.J.L. Kimball 2013).

Sommario/riassunto

How can 3D models be integrated more fully alongside other forms of archaeological documentation? This work presents a method that combines the interpretative power of traditional archaeological

drawings and the realistic visualisation capacity of 3D digital models.