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A Virtual 3D Cuneiform Tablet Reconstruction Interaction

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The interaction authors are collaborators of The Virtual Cuneiform Tablet Reconstruction (VCTR) Project - an international collaboration inspired by the ambition to support virtual access to cuneiform artefacts and to reconstruct cuneiform tablets by joining virtual fragments together. The project aims to support and resource low-cost and easy-to-use 3D acquisition systems, advance automated virtual reconstruction algorithms, evolve a collaborative reconstruction environment and facilitate interactive on-line 3D archiving. The author disciplines include Computer Science, Electronic Engineering and Assyriology.

1. OVERVIEW

This paper describes an Interaction that accompanies the 2017 BCS HCI Conference paper "A Collaborative Reconstruction Environment" by the same authors.

The interaction provides users with an opportunity to manipulate and join 3D models of two cuneiform tablet fragments.

Cuneiform script originated in Mesopotamia 5,000 years ago and evolved into a sophisticated writing system that remained in use for 3,000 years. Clay tablets inscribed with the cuneiform script were the original portable information technology.

The 3D models in the interaction are of photogrammetrically acquired fragments from the ancient city of Ur, currently held on study loan at The British Museum. Many thousands of fragmented tablets have been excavated in modern times and their reconstruction poses a puzzle of enormous complexity, not least because access to the fragments is necessarily limited and because pieces that join together are distributed within and between different collections.

Users will experience the difficulties faced when attempting to identify joining surfaces of 3D fragments, as well as the challenges implicit in virtual reconstruction via a simple web-based interface with point-and-click interaction with a mouse or touchscreen.

The interaction's minimal web-based user interface renders the two virtual fragments and provides tools to 'Rotate', 'Translate', 'Rotate-camera-view', 'Undo' and 'Auto-solve'. These actions are selected using icon buttons on the side of the display. 'Rotate' and 'Translate' allow the manipulation of a single fragment. 'Rotate-camera-view' allows the viewpoint of the pair of fragments to be altered so the goodness of a join can be assessed from all angles. 'Undo' cancels the last action. 'Auto-solve' automatically animates the translation and rotation of the fragments to their correct joining positions and orientations.

In addition to the conference installation in the Interactions Gallery, the same interface can be accessed on PCs and mobile devices via the URL: http://virtualcuneiform.org/interaction.html

2. EXAMPLE SCREENSHOTS

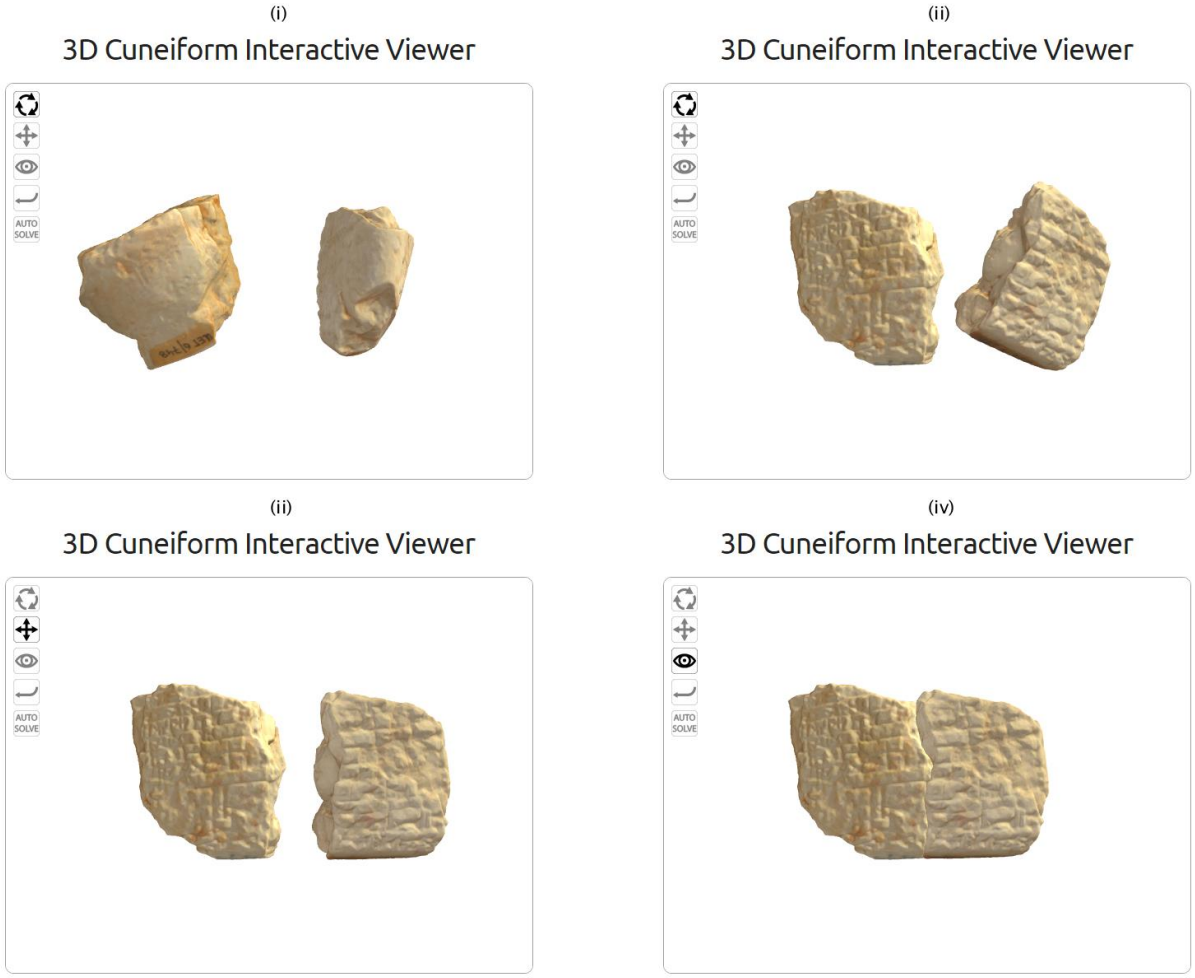

Figure 1: *The Virtual 3D Cuneiform Tablet Reconstruction Interaction. (i) Opening screenshot, (ii) incomplete solution requiring fragment rotation, (iii) incomplete solution requiring fragment translation, (iv) joined fragments after AUTO SOLVE.*

Figure 2: *Interaction tools.*

3. RATIONALE

The concept behind the interaction relates to the ambition to virtually reconstruct the large numbers of fragmented cuneiform tablets – a task that could not be physically achieved. The accompanying paper describes reconstruction experiments in which participants worked physically and virtually to reconstruct whole tablets. The experimental results were used to design a new virtual reconstruction interface and establish a benchmark for assessing the effectiveness of future tools. The interactive installation was designed to give users a hands-on feel for the nature of the problem and the challenges of virtual cuneiform tablet reconstruction.

4. ACKNOWLEDGEMENT

The cuneiform tablet fragments presented are held on study loan at the British Museum. The authors wish to thank the Trustees of the British Museum for permission to access the fragments and Dr

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