

# Connected Virtual Experiences for Small and Less Visible Museum Artefacts

Richard Rhodes  
School of Computing and Mathematics,  
Keele University, UK  
r.t.rhodes@keele.ac.uk

Sandra Woolley  
School of Computing and Mathematics,  
Keele University, UK  
s.i.woolley@keele.ac.uk

**This paper summarises a programme of research motivated by the challenge of achieving engaging 3D virtual experiences for small heritage artefacts, the sorts of artefacts that are difficult to display and may be easily overlooked in museum settings. The challenges are i) a lack of easy-to-use, low-cost solutions for acquiring all around, textured 3D models of small form-factor objects and ii) the inherent challenge of achieving engaging and connected virtual experiences for artefacts that are not visibly striking. The paper summarises the research challenges and outlines the research case study - a virtual reality experience for 'cuneiform tablets', ancient written records impressed on handheld clay 'tablets'.**

*Virtual interaction, Artefact engagement, Digital heritage*

## 1. INTRODUCTION

Despite VR technology being fairly well established (Champion and Rahaman, 2019) there has been limited adoption of VR across museums and cultural heritage sectors beyond a few notable projects and short-term projects and installations. There are opportunities to expand and improve on 3D heritage repositories (Champion and Rahaman, 2020). This paper outlines Computer Science PhD research aimed at contributing toward engaging, open source and connected VR experiences for neglected heritage artefacts; the small and less visible artefacts that, if they are on display, are often overlooked by museum visitors. Approximately, 95-99% of large museum holdings are not on display (Woolley et al., 2021). Objects that are on display are typically housed in glass cabinets, their angles of view may be limited, and visitors cannot interact with them or visualise them in a real world context. This style of presentation means that smaller and less colourful artefacts are overlooked by visitors, who are drawn to larger more colourful artefacts, such as Egyptian sarcophagi. VR experiences for museum artefacts have been shown to increase engagement (Jung, et al. 2016) but resources are limited in the heritage sector have experienced financial difficulties due to budget cuts. This shortage of funding across the sector makes low-cost, open source solutions and ease-of-use particularly important.



**Figure 1:** Connecting cuneiform tablets and virtual Mesopotamian heritage experiences.

## 2. RESEARCH CASE STUDY - ENGAGING VR EXPERIENCES FOR CUNEIFORM TABLETS

The development of humankind's first civilisation began in Ancient Mesopotamia, the region in and around modern day Iraq. Starting 5,000 years ago with simple pictograms impressed in handheld clay tablets, a complex system of 'cuneiform' writing evolved and remained in use for some 3,000 years. The digitization, virtualization and virtual reconstruction of curated cuneiform tablets and fragments (Collins et al., 2017) are ambitions of

The Virtual Cuneiform Tablet Reconstruction (VCTR) Project ([virtualcuneiform.org](http://virtualcuneiform.org)), a project that this research contributes toward. Cuneiform tablets are particularly difficult to access. There are few publicly-accessible international collections and where they are on display often only one side is visible and there is limited space for contextual information. With the exception of a few VR projects (Pietroszek et al., 2021) and on-line collections of selected artefacts (Ashtari et al., 2020)(BM, 2017)(VCTR, 2022) there are very few virtual Mesopotamian experiences and none specific to cuneiform tablets. The challenge of creating engaging opportunities for small and uncolourful artefacts like cuneiform tablets, is not only the lack of visible drama of the artefacts themselves but also the challenge of connecting the artefact with the historical and museum context. An additional challenge is the lack of open source, low cost, and easy to use acquisition systems capable of achieving perceptually pleasing rendered 3D models of small form-factor artefacts (Champion and Rahaman, 2019)(Collins et al. 2019). The majority of high-fidelity 3D acquisition systems are not open source, and are expensive and complex to use (Sebar et al., 2021).

### 3. RESEARCH AND PROGRESS

A literature review and progression assessment have been completed and research questions identified: RQ1; How can a fully open source, low cost, and easy to use 3D all around artefact acquisition system be achieved? RQ2: How can VR improve engagement for small, neglected artefacts like cuneiform tablets?

Initial research has imagined connected portal-type experiences, as shown in Figure 1, with an entrance portal through to a Mesopotamian landscape and ziggurat. Additionally, early stage research contributed to a heritage VR paper on the connectedness of virtual experiences (Woolley et al., 2021) and a prototype 'AR museum' app (Woolley et al. 2020). The Valve Index is being used for the research because it supports up to 10m x 10m space for VR, controllers with individual finger tracking, and a headset with a high resolution, wide field of view, and refresh rate (1440 x 1600 per eye, 130 degrees, 144Hz). Currently a 3D-printable open source acquisition system based on (Collins et al., 2019) is in development and a usability study for 3D acquisition is in preparation.

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