A Computer-Vision Approach to Visualizing 'Indented' Poetry by W. H. Auden

Simon Brenner – CVL, TU Wien
Timo Frühwirth – ACDH-CH, Austrian Academy of Sciences
Sandra Mayer – ACDH-CH, Austrian Academy of Sciences

1 Introduction: W. H. Auden in Austria

W. H. Auden (1907-1973) was one of the most influential writers in the English language in the twentieth century. His poetry was at the center of the modernist avant-garde in 1930s England. In 1939, he moved to the United States, where he received the Pulitzer Prize for Poetry in 1948. From 1958, Auden divided his time between New York City and Austria: for up to six months of each year, he lived in the Lower Austrian village of Kirchstetten, where he wrote most of his late poetry (see also Quinn 2015).

Whereas the poet's English and American periods have been intensively researched, W. H. Auden's life and work in Austria have only recently attracted scholarly attention (see also Smith 2004). The emerging field of Austrian Auden Studies (see especially Denzer and Seidl 2014 as well as Neundlinger 2018) is now being enriched by an open-access digital scholarly edition making available (still) privately owned, and previously inaccessible, documents that cast a fresh light on one of Auden's most prolific creative periods: the 'working correspondence' sent by the Anglo-American poet to Welsh-Austrian writer Stella Musulin (1915-1996).

2 Indented Impressions

A small number of documents in the collection is distinguished by specific material properties: these pages contain indented typewriter impressions of lines of poetry, indicating that W. H. Auden reused sheets of paper which he placed underneath the ones on which he typed his poems.

Standard image digitization technologies, which are technically optimized for creating digital representations of 2D surfaces and distinct color difference, cannot capture these three-dimensional typewriter indentations. Therefore, the project takes advantage of computer-vision methods applied in the cultural-heritage research of 3D objects: at the project's partner institution, TU Wien's Computer Vision Lab, high-resolution photometric-stereo reconstructions of those sheets of paper that contain indentations are being produced.

3 Computer Vision: Photometric Stereo

Photometric stereo (PS) is a computer-vision method that enables the reconstruction of 3D surfaces from a set of images taken under a constant camera view and varying lighting directions. In comparison to other 3D acquisition methods (such as structured light scanning or photogrammetry), PS is especially efficient for the acquisition of small local surface details (see also Jackson, Yang, and Parkin 2007; McGunnigle and Chantler 2003; Thumfart, Palfinger, Stöger, and Eitzinger 2013).

The pages containing the typewriter indentations were imaged with a prototypical PS acquisition system, originally developed and used for capturing surface details in medieval parchment manuscripts such as dry-point ruling lines. The system consists of a dome-shaped structure carrying 54 individually controllable LEDs and an achromatic medium-format camera. The source images acquired of the pages in question have a spatial resolution of 405px/cm (or 1030 dpi) and serve as an input to the PS depth reconstruction. Based on the depth maps obtained, visualizations are created that clearly distinguish the indented text from other structures in the paper, that is, from the texture of the paper itself, wrinkles, as well as

overlapping typewriter texts that do contain print ink and leave still more pronounced indentations in the paper.

In addition to the depth-based visualizations, the input images are used to generate Reflectance Transformation Imaging representations of the pages, which enable the interactive re-lighting of the surface (to be presented in a web-based viewer). As a part of the digital edition currently in the making, these dynamic representations convey the three-dimensionality of the original documents and illustrate the workflow employed to extract their contents.

4 Preliminary Results

First results show that the sheets in question incorporate multiple strata of the material traces of text production. This is exemplified by W. H. Auden's letter to Stella Musulin from 10 June 1969: below the handwritten message in ink, the paper contains three distinct layers of indented text. First, there are mirror-inverted, vertically aligned impressions of the handwritten address that have pushed through the envelope (thereby permitting to relate the letter to the postmarked envelope and, thus, to date the document). Second, there are horizontally aligned indentations of typed lines from W. H. Auden's poem "Epistle to a Godson". Finally, mirror-inverted, horizontally aligned lines from the same poem constitute a third layer of indented impressions.

5 Expected Outcomes

Thus, computer vision can help to afford a twofold glimpse into the poet's workshop in Austria. On the one hand, the 3D surface reconstructions will provide evidence of the material writing practices employed by W. H. Auden in his 'Cave of Making' (the title of Auden's poem dedicated to the attic study of his Kirchstetten house). This pertains especially to the poet's use of the typewriter and his management of paper.

On the other hand, the acquired data will contribute to our understanding of the relationship between, as well as the development of, texts written by Auden. Reconstructing indented poetic typescripts will allow for establishing spatio-temporal relations between the indented writing ('second-page writing'), the (dated and located) texts over-writing them, and the poetic typescripts housed in Auden collections outside Austria (at institutions such as the New York Public Library, the Harry Ransom Center in Austin, Texas, or the Bodleian Library at the University of Oxford). Moreover, as is the case with other documents in the collection, the reconstructed surfaces may contain unknown early versions of poems that provide new insights into Auden's poetic practices of composition and revision.

6 Implications

By means of creating 3D surface models of documents from the Austrian collection of W. H. Auden's 'working correspondence' to Stella Musulin, the project will pioneer computer-vision technologies in the context of twentieth-century literary papers. At the same time, we will show how computer vision can expand the inventory of technologies available to digitally researching and editing materials from the typewriter era. Thereby, the project will also seek to contribute to re-conceptualizing sheets of paper as 3D objects in the DH-driven research of twentieth-century literary documents.

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