Voices Drawn in Conductive Ink: The OVE II Control Prints as Scientific Heritage and a Phonetic Resource

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Abstract

The OVE synthesizers played a central role in early speech synthesis research at KTH. They made it possible to submit acoustic hypotheses about speech production to auditory testing, translating assumptions about formant structure and source characteristics into controlled synthetic utterances. Described by Fant and Mártony in a publication in 1962, OVE II extended this tradition beyond isolated vowels and simple voiced gestures by generating connected utterances from time-varying parameter trajectories. In practice, these trajectories were drawn by hand in conductive ink on plastic sheets, as illustrated in Fig. 1. These control prints, which functioned both as notation and as circuit interfaces, are the material focus of an ongoing documentation. They preserve important technical evidence but are fragile as physical and operational objects. They are accessible only in situ and under restricted handling conditions; they are often opaque without the tacit knowledge of those who once used them; and they remain vulnerable to loss through ageing, repeated handling, and the retirement of the analogue hardware that once read them.

This project undertakes a systematic documentation of the 125 surviving OVE II control prints at KTH. These documents constitute a substantial but heterogeneous body of material, varying in legibility, completeness, and contextual recoverability. The work is driven by two complementary concerns. One is archival, and aims to preserve and describe a body of primary material that bears directly on the day-to-day operation of one of the most influential early formant synthesizers. The other is methodological, and aims to build a documentation framework (Fig. 2) that lets these materials be re-used, for historical reconstruction, for analysis of synthesis practice, for teaching, for exhibition, and, where the evidence allows, for experimental re-synthesis. We treat the prints as carriers of procedural knowledge rooted in a specific laboratory culture. The documented corpus will be deposited and made accessible through Språkbanken Tal, the Swedish spoken language bank. For each print, the record links archival image files to sheet-level metadata, parameter-layout notes, and interpretations whose evidential status is marked, so that later users can distinguish what is directly visible on the sheet from what has been inferred.

Each sheet is digitised at high resolution and described using a protocol that records its physical state, legibility, parameter layout, annotations, and signs of use. Particular attention is paid to features relevant to future reconstruction: axis conventions, parameter identities, F0, formant frequencies, bandwidths, nasal and frication controls, amplitudes, time scales, manual corrections, and relations between sheets belonging to the same utterance or demonstration. A recurring finding is that a single sheet rarely stands on its own. A curve, label, or contact area may take on different functions depending on its place in a series, the target utterance, and the conventions used in a particular synthesis session. Much of the meaning therefore resides in contextual cues that were never written down. Ambiguous traces, partial identifications, and competing readings are recorded as part of the description rather than smoothed away. Preliminary inspections further suggest that the prints exhibit recurring graphical and organisational conventions that can be described systematically and may inform future reconstruction efforts. The protocol therefore distinguishes explicitly between directly observable features of the sheet, parameter interpretations supported by internal evidence, and more tentative reconstructions dependent on external comparison or historical inference.

The OVE II prints should therefore be described both as parameter records and as working interfaces between notation, manual inscription, and machine control. Beyond the utterances they encode, they show how analysis-by-synthesis was carried out as a manual practice: parameter curves were handled, inspected, compared, and redrawn by hand. For experimental phonetics, the prints preserve evidence of how timing, source characteristics, spectral shaping, and coarticulatory patterning were understood and operationalised. Once documented, the corpus will support comparative study of early synthesis strategies, interpretation of the prints as parameter data, experimental playback through modern synthesis software where feasible, and teaching in phonetics, speech technology, and media archaeology.

This work presents a first documentation model for the OVE II prints, one that can be revised as the corpus is digitised, interpreted, and compared. The model preserves the visual artefact together with the interpretive information required for reuse, and it treats analogue synthesis material as reusable research data. It connects work on scientific heritage, reproducibility in the history of technology, and analogue data in digital research environments. The aim is to turn these documents into an operational research resource, and in doing so to return OVE II to scientific use beyond the commemorative frame in which it now most often appears.

Keywords: OVE II, speech synthesis, speech technology, documentation, scientific heritage, Språkbanken Tal

References

Fant, G., & Mártony, J. (1962). Instrumentation for parametric synthesis (OVE II), synthesis strategy and quantization of synthesis parameters. STL-QPSR, 2/1962, 18–24.

Fant, G. (2009). A personal note from Gunnar Fant. Speech Communication, 51(7), 564–568. https://doi.org/10.1016/j.specom.2009.04.001

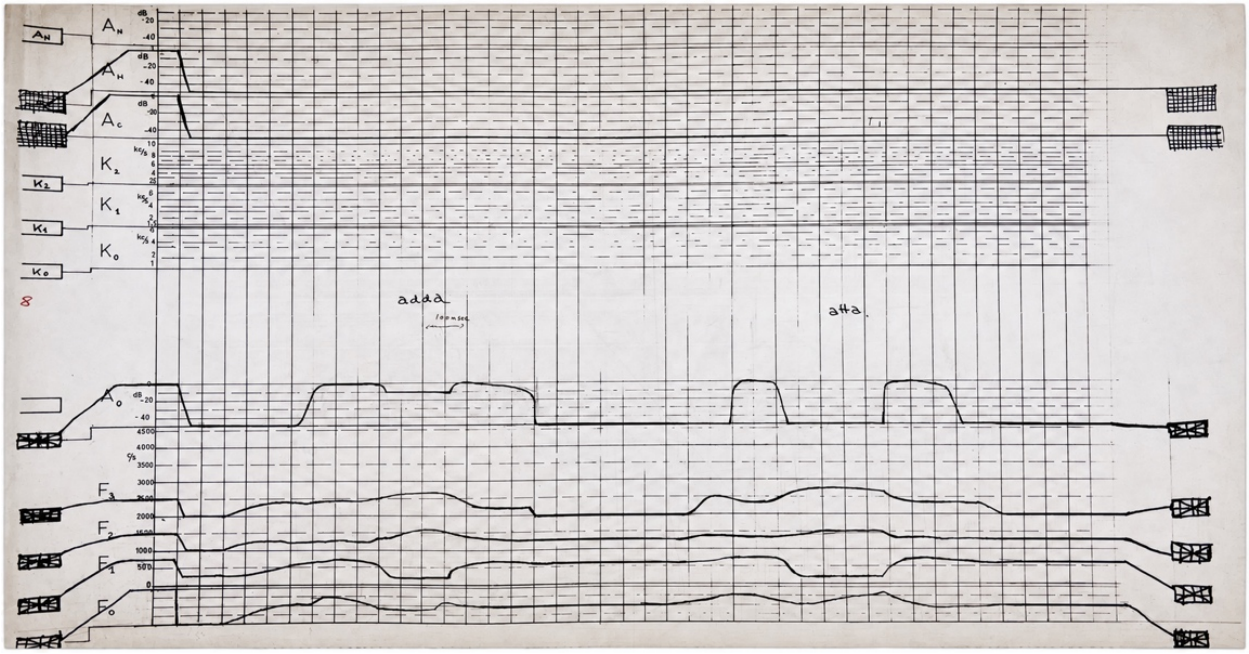

Figure 1. An OVE II control print annotated with the test sequences “adda” and “atta”. Each row carries a time-varying parameter trajectory drawn in conductive ink on a plastic sheet. The upper section specifies source-amplitude controls for the nasal, aspiration, and frication branches (A_n, A_h, Ac) together with K-parameters (K_0–K_2), while the lower section specifies voicing amplitude (A_0), fundamental frequency (F_0), and formant trajectories (F_1–F_3). Contact areas along both edges provide the interface to the synthesizer hardware. Sheet 8 of a numbered series; marked interval: 100 msec.

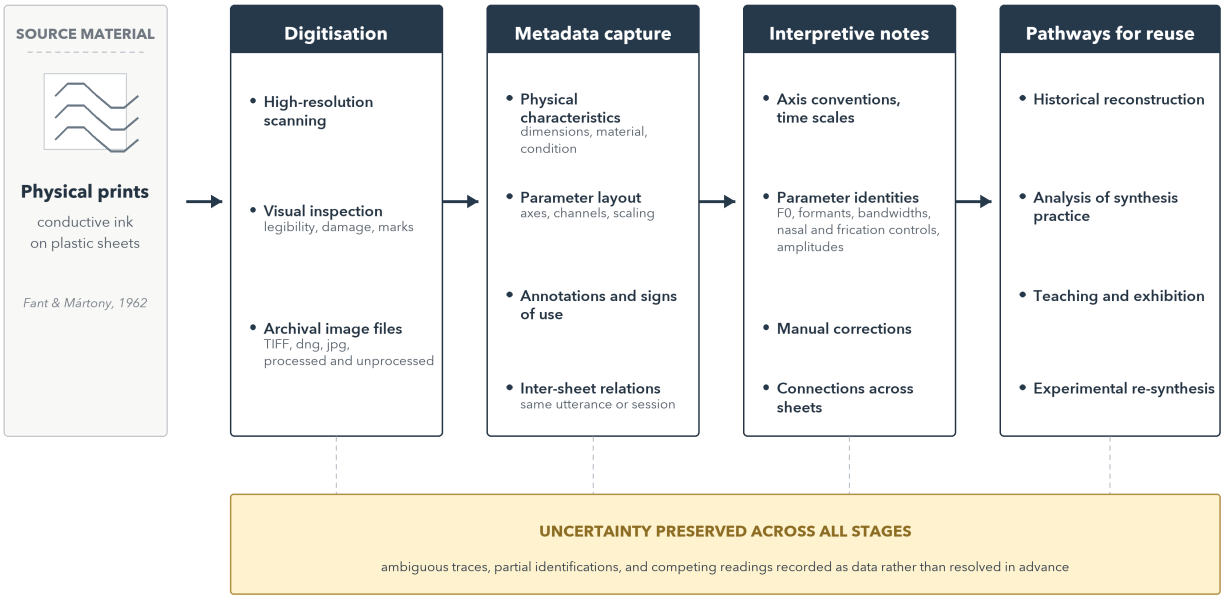

Figure 2. Proposed documentation schema for the OVE II prints, covering digitisation, metadata capture, interpretive notes and pathways for future reuse.