

Exiled but not forgotten: Investigating commemoration of musicians in Vienna after 1945 through Visual Analytics

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Abstract

How is music functionalized to urban symbolic politics in the City of Vienna after 1945 until today? To address this question, we present a novel visualization for interactive analysis of multiple biographical timelines connected to Austrian music history. Instead of simply comparing the biographies of over 200 composers, musicians, and conductors in a linear fashion, we connect them with the urban processes that constituted the topos ‘Music City Vienna’, such as street-naming, awards, anniversaries, and exhibitions. The proposed approach intertwines people, events, and locations, allowing the interactive analysis of multi-modal data. Our main goal is to explore continuities and discontinuities, to find underlying trends and different narratives. Ultimately, this work is intended to stimulate the discussion on the challenges of performing visual analytics of historical data.

Keywords: Timelines, Storytelling, Narrative Visualization, Music History, Urban Symbolic Politics

1 Introduction

Vienna is associated to music more than any other European city. The Austrian capital is not only related to iconic composers, among others the *First Viennese School* of the Classical period (Joseph Haydn, Wolfgang Amadeus Mozart and Ludwig van Beethoven) and in the 20th century to the *Second Viennese School* (Arnold Schönberg, Alban Berg, Anton Webern), but it is also well known for the *Wiener Walzer* and the *Wiener Operette* as well as for the *Wiener Opernball* and the *Wiener Philharmoniker*. The Austrian capital has a strong defined and longstanding identity constructed by means of music. Therefore, Vienna successfully claims since the 19th century to be named *Music City of Vienna* (Nußbaumer, 2007; Barber-Kersovan et al., 2014). Besides the cultural, socio-political, and economic potential for tourism and city marketing, the topos *Music City* was also used as an instrument of political power. Particularly, since 1945 the potential of its internationally well known musicians was recognized by the city and its cultural management. The connection between the city and its musicians was topographically manifested by street-naming, monuments, plaques, memorials, and celebrated by anniversaries, concerts, exhibitions, and awards.

In the joint FWF-Peek-project “Interactive Music Mapping Vienna: Exploring a city. 1945 up to the present day” (IMMV) we explore how music acts in the urban context of Vienna as a social identification instrument and how music is functionalized to urban symbolic politics. IMMV aims to unravel the narrative of the *Music City of Vienna* topos in its entirety, by analyzing the basic types of music utilization (city tourism, city politics, image creation) (Zapke, 2017). The concrete subject of our research are the events and festivities in the public space of Vienna during the Second Republic (1945 up to 2018).

In this interdisciplinary project we explore how Visual Analytics (VA) approaches can be used to embed large amounts of historical and musicological data in space and time. VA is defined as the science of analytical reasoning facilitated by interactive visual interfaces (Thomas and Cook, 2006) and provides a means to navigate and interact with multi-modal data in different granularities and levels of abstraction. VA solutions can arise organically in an environment of interdisciplinary research in an effort to both formulate and answer questions about data.

In IMMV we have designed and developed multiple interactive visualizations for exploring the data from different perspectives. We have explored how we can map events to a spatio-temporal overview visualization and how we can embed those same events in a different context with a specific focus on the relational and temporal aspects of the data. Through VA we allow the development of narratives. The festivity becomes the unit of data in chronological and geospatial visualizations, allowing the comparative revision of continuities and discontinuities, and contextualizing them within the city landscape.

In this paper, we explore the timelines of the musicians that were exiled from Austria between 1938 and 1945 and how the City of Vienna chose to recognize and commemorate them after 1945. The main contribution of this paper is to present a novel visualization technique that allows the comparison between many different biographies, in order to create new potential narratives and to contextualize the visualization within a process of historical research. We relay this process and show the impact of different research goals in the development of our visualization.

2 Related Work

Related work falls mainly into two categories: the representation of temporal linearity, and of urban spatiality. Visually comparing timelines and time-oriented data is a well discussed topic within VA (Aigner et al., 2008). “TimeLineCurator” (Fulda et al., 2016) offers interactive authoring of timelines using natural language processing to automatically parse, extract, and structure event data from a corpus of text. The timelines are visualized horizontally and color is used to denote different tracks (events from different sets or documents), distinguishing multiple timelines. Furthermore, glyphs are employed in this visualization to depict the differences between events that span an interval of time or occur at a specific point in time. Glyphs and other visual variables, such as color, size, and shape, can be used to visually distinguish events with different characteristics or categorical dimensions. In a similar manner “TimeSets” (Nguyen et al., 2016) explores visualizing and comparing multiple timelines by using set relations among the individual events. In this approach events are associated with certain topics and this information is encoded by the use of colors. Gradient backgrounds that transition from one color to another are used to depict events that are shared between two topics. In the scope of our subject the focus lies in exploring and visualizing the temporal facet of our data. In “Timelines Revisited” (Brehmer et al., 2017), the authors review related work and literature, analyzing over 200 timeline visualizations, and propose a design framework based on three main dimensions: representation, scale, and layout. This work represents the state-of-the-art in timeline visualization and the design framework can be applied to biographical and prosopographical data visualization. Representation relates to the general shape or disposition of an individual timeline, such as linear, radial, grid, or spiral. The scale deals with the disposition of information over the timeline, and can be chronological, relative, logarithmic, among others. Finally, the layout is the composition schema of the visualization, how different timelines are integrated in it.

The second category, the spatio-urban dimension, was in similar projects mainly limited to the geolocation of streets and places. Street-names were analysed in two recent interdisciplinary projects combining historical research (historical, cultural and political dynamics of street-naming) with VA. In the first project a commission of historians (Autengruber et al., 2014)(2011-2013) examined, due to their connection to national socialism, historically critical personas that had streets named after them in the City of Vienna. The project resulted in the geolocation of these streets in an online map ¹, in a publication as well as in explanatory boards next to the street names. The second project, GenderAtlas (Riegler et al., 2015)(2013-2015) is a platform for the visualization ² and provision of information regarding the gender distribution in various fields in Austria. In a specific example, the authors examine the spatial distribution of streets named

after males and females in the City of Vienna. Through the use of geographic visualization and analysis techniques the gender disparities in street naming are made obvious to the user.

3 Data

In this section we describe the data model that we employ in our research and visualization, give an overview of the objects we have along with examples illustrating their structure and connectivity, provide details on how we process the data to arrive to the final dataset that is used, and explain what sources were used to collect and structure the data.

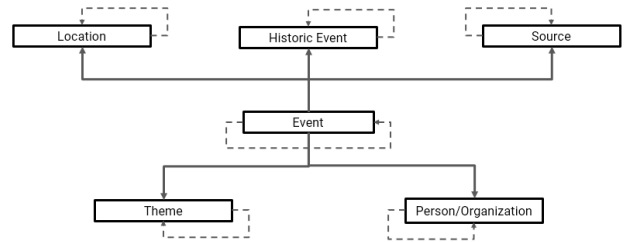


Figure 1: IMMV Data Model - Object types and relationships. Dashed lines indicate intra-object relationships, whereas the thick lines are inter-object relationships.

3.1 Data Model

For the purpose of the Interactive Music Mapping Vienna (IMMV) project, we have constructed a data model to describe large amounts of multifaceted information in space and time, which are depicted in Figure 1.

Our data model is comprised of six types of objects: events, historical events, people/organizations, locations, sources, and themes.

Events or festivities play a central ontological role in our project. They comprise our main data object and relate all other objects. For this reason it is the only object type that can be connected to objects of other different types. Other entities have to be related to each other through an event. This approach simplifies the topology of our semantic network, and enforces scope. Events are considered to be public happenings in the City of Vienna, such as: festivals, celebrations, awards, and open-air concerts. Events are defined by a start and end date, a name, a description, a location, and connected to people that have contributed to it, other events, historic events, themes and sources.

Historic Events are events of historical importance that are not directly related to music, but provide context, such as the end of World War II or the period of the Second Republic. Historic events are defined by a start and end date, a description, a list of references, relations to other historic events and a list of important dates that have occurred during the timespan of the historic event as well as a list of references and further literature.

¹<https://www.geschichtewiki.wien.gv.at>

²<https://www.genderatlas.at/articles/strassennamen.html>

Themes serve as descriptors for events and characterize them based on the topics they are associated with, such as “Musikalisierung der Topographie”, “Wienerlied”, or “Austropop”. They have a similar function to keywords and provide meta-information to augment our semantic topology. Themes are associated with a name, a list of references, a set of categories (theme types), and relationships to other themes.

Sources are the different primary and secondary sources that are gathered about an event. They are an encapsulation of multimedia data, including visual sources (photographs, posters, videos), audio sources (recordings, musical pieces), and textual sources (press articles, publications). Sources are comprised of a name, a list of references, along with media attachments, provenance data and copyright information, a description, and details about the creator(s), contributor(s), or publisher(s) along with relationships to other sources.

Locations describe particular places in the City of Vienna that are of musicological and historical relevance. Locations are defined by their current name along with a list of alternative names (reflecting the change over the course of history), location types (e.g., park, monument, official building, etc.), a list of references, geospatial data, and relationships to other locations.

People/Organizations constitute the set of people that have had a particular impact on the music history of the City of Vienna. We differentiate between people and organizations but use an abstract model for both types. People and organizations are comprised of the following properties: a name along with a list of alternative names, a list of references, a description, and relationships to other people or organizations. The main difference between the two is that people have roles and functions (e.g., composer, conductor, director, musician, etc.) associated with them, whereas organizations have a set of organization types (e.g., NGO, political party, cultural organisation, music band, etc.).

3.2 Data Processing

In the scope of this paper we chose to work with a subset of data, specifically focused on musicians exiled between 1938 and 1945 in order to find out which musicians the City of Vienna chose to recognize and commemorate after World War II. In addition we compare the timelines of the exiled musicians with over 200 musicians who were honored in the same time period by the City of Vienna. As a first step our selection criteria was to find all people related to the theme “Musikalisierung der Topographie” (translated from German: musicalization of the topography). In our data model people are not directly related to the aforementioned themes, but via the event that honors a musician an association is established. For this purpose we aggregate all people that are related to events belonging to the aforementioned theme, which initially resulted in many people that were not of relevance to our subject of research (e.g., curators of an exhibition, vocalists singing at an exhibition opening, politicians participating in an

award ceremony). As a second step we proceeded to filter people based on their roles, since we are only interested in composers, musicians, and conductors. Finally, we separate those musicians, composers, and conductors that have been exiled, in order to compare them later with the rest of the people in the dataset.

We further processed the dataset and applied a categorization of the events. The events can belong to one of the following five categories: street-namings, anniversaries, exhibitions, awards/prizes, and memorials.

3.3 Historical Sources

The historical sources used for this paper were either related to the biographies of the musicians or to the events. Regarding the biographies of the musicians, the quantitative collection of names and biographical data was based on existing databases (*Lexikon verfolgter Musiker und Musikerinnen der NS-Zeit*, University of Hamburg), secondary literature (mainly the publications of the *Documentation Centre of Austrian Resistance*, DÖW), and online bibliographical lexica (*Wikipedia*, *Wien Geschichte Wiki*, *Österreichisches Musiklexikon*). We are aware that such sources often provide little more than a snapshot of a person’s life. Therefore, we refer to further relevant bibliography containing secondary sources, (auto-)biographies, or published correspondence.

Regarding the events, each type has different sources of information that were used. Street-names and awards were announced in the official gazette (*Amtsblatt der Stadt Wien*) as well as in *Wien Geschichte Wiki*. Street (re)namings during 1938-1945 and after 1945 were published and visualized in a map by the aforementioned commission of historians (Autengruber et al., 2014). Monuments and plaques regarding musicians are listed in several publications (Nelson, 2006; Kretschmer, 1992) as well as in a more critical approach by the (Exenberger and des österreichischen Widerstandes, 1998). The main source of information for exhibitions were catalogues, press articles, and posters. Speeches by politicians at the inauguration festivities were also taken into consideration as well as photographs picturing these events. In IMMV sources gathered about the events were collected, selected, and developed with the help of our cooperation partners and archives (specifically, the *Vienna City Library* and the *Austrian National Library*).

4 Research use case: Exiled Musicians

We used the prototype to explore the narrative of musicians and exiles after 1945 and to examine its effectiveness in conveying patterns and trends to our domain experts.

After the annexation of Austria into Nazi Germany on 12 March 1938 approximately 130,000 people fled into exile (Neugebauer and Ganglmair, 2003). Among them were expelled musicians, Jewish and non-Jewish, composers of “degenerate music”, but also composers of “Wienerlieder” or “Operettas”, including icons as Arnold Schönberg, Alexander von Zemlinsky, Ralph Benatzky,

Ernst Krenek, Robert Stolz, Hermann Leopoldi, Walter Jurmann, and many more. Most of the musicians left Austria after March 1938 and went to the United States, South America, France, Great Britain, or Switzerland.

Until 1959 only approximately 8,000 returned. Those who decided not to come back to Austria had manifold reasons: the injustice and humiliation they suffered in their homeland, the general situation in post-war Austria with its half-hearted denazification, the anti-semitism still practiced, the unresolved property issues (Knight, 2000), but also personal reasons as the integration in a new country. It is important to note that there have been no official invitations expressed from the Austrian provisional government for the exiled to return. An exception was the Viennese city councilor in charge of cultural affairs from 1945 to 1949, Viktor Matejka, who sent letters appealing artists and scientists to return (Matejka, 1983).

The gap in the cultural life and institutions of Vienna (orchestras, music academies, universities, etc.) left by the exiled musicians, composers, and conductors could never be filled again, it is thus essential for the understanding of the *Music City Vienna* after 1945. But how to visualize this “brain drain” or gap of musicians, who did not return to Vienna after 1945? With the existing IMMV restriction on events, we were unable to make those visible, who were not present. Both the departure and the re-migration, were very personal for the exiled musician, seldom recognized by the public and not officially celebrated. As a consequence, we decided to treat street-namings, awards, anniversaries, and exhibitions as particular events. This allowed us to integrate the exiled musicians that were referenced by such events (even if they were not initially present), into our database and visualization.

Street-naming is a particularly powerful and “timeless” instrument for perpetuating public memory. The monopoly on the toponyms of a city is claimed by the governing authorities. Therefore, street-naming is connected to the ruling regime, which is using streets to inscribe its ideologies and to assert symbolic power and ideological hegemony (Rose-Redwood et al., 2018). Especially, the renamings during the Dollfuß-Schuschnigg-regime (Austrofascism, 1934-1938) and during National Socialism (1938-1945) are pivotal for the understanding of the symbolic relevance of toponymy (Autengruber et al., 2014). Since 1945 the selection criteria of the Viennese city council (*Stadtrat*) requires important personalities, whose “greatness” is generally recognized in association with the location and importance of the named street and the naming has to be at least one year after the person’s death (*Interkalarfrist*).

Awards are an official act of how the city and its mayor are honoring a person for her/his outstanding achievements. The most important and prestigious awards for musicians in Vienna were: awards, rings and medals (*Ehrenring*, *Ehrenmedaille*, *Ehrenzeichen*), the prize of the City of Vienna (*Preis der Stadt Wien*), and the honorary citizenship

(*Ehrenbürger* and *Bürger der Stadt Wien*).

Anniversaries or commemoration days, especially after one or two centenaries of the musicians birth or death, were celebrated in Vienna from the 1920s until today. After 1945 the years of Johann Strauß Jr. (1975), Wolfgang Amadeus Mozart (1991, 2006), Joseph Haydn (2009), and Gustav Mahler (2010) were celebrated with extensive effort, including exhibitions, concerts, and conferences.

Exhibitions are a form of presenting a musician or a group of musicians to the public by using visual sources, handwritten notes, or other objects connected to the exhibitions’ topic. Most of the music related exhibitions took place either in several Viennese museums, libraries and archives or in the apartments and houses of Beethoven, Strauß, Mozart, Haydn, and Schubert administered by the *Wien Museum*. We gathered 110 exhibitions directly connected to Viennese musicians. The exhibitions *Die Vertreibung des Geistigen aus Österreich* (1982) at the *University of Applied Arts* and the series *Musik des Aufbruchs* (2004-2009) by the *Jewish Museum* directly refer to the topic of exiled musicians. The series *Musik des Aufbruchs* presented the life and work of Hans Gál, Egon Wellez, Franz Schrecker, Eric Zeiss, Erich Wolfgang and Julius Korngold and Hanns Eisler to the Viennese public.

4.1 The Anatomy of Our Visualization

Our visualization consists of different elements, as depicted in Figure 2. On the left side (A), a short menu allows filtering, searching for a specific person, and changing the ordering and grouping criteria of the data. On the right side (B), the list of all people can be seen, with the count of their associated events. This list is updated when a temporal selection is made and reflects only those people who have been active in the time span selected. It can also be used to show additional information about the selected individual, such as dates of birth, death, exile, and events. The core component, however, is the radial timeline (C) where the multiple timelines and associated events are displayed. The prototype also includes a timeline at the bottom (G), which visualizes the events as a dotplot that are color-coded according to their category and allows the user(s) to select and interact with individual items. We multiple design iterations with different component configurations, including a line-chart, and came to the realization that for the tasks of displaying, counting, and interacting with the individual events in the timeline the dotplot performed better as a solution. The prototype is made available to the general public and research communities ³

In the visualization time radiates outwards from the center, with the innermost circle being the birth of Vivaldi at 1678, and the outermost being the present date. The date of 1945 is highlighted (E) due to its importance in the scope of our subject, providing a key temporal reference for the visualization. A time period is mapped to a ring in this mode of viewing, and can be selected through clicking and dragging for filtering a specific time range. In

³<https://immv-app.cvast.tuwien.ac.at/biographical>

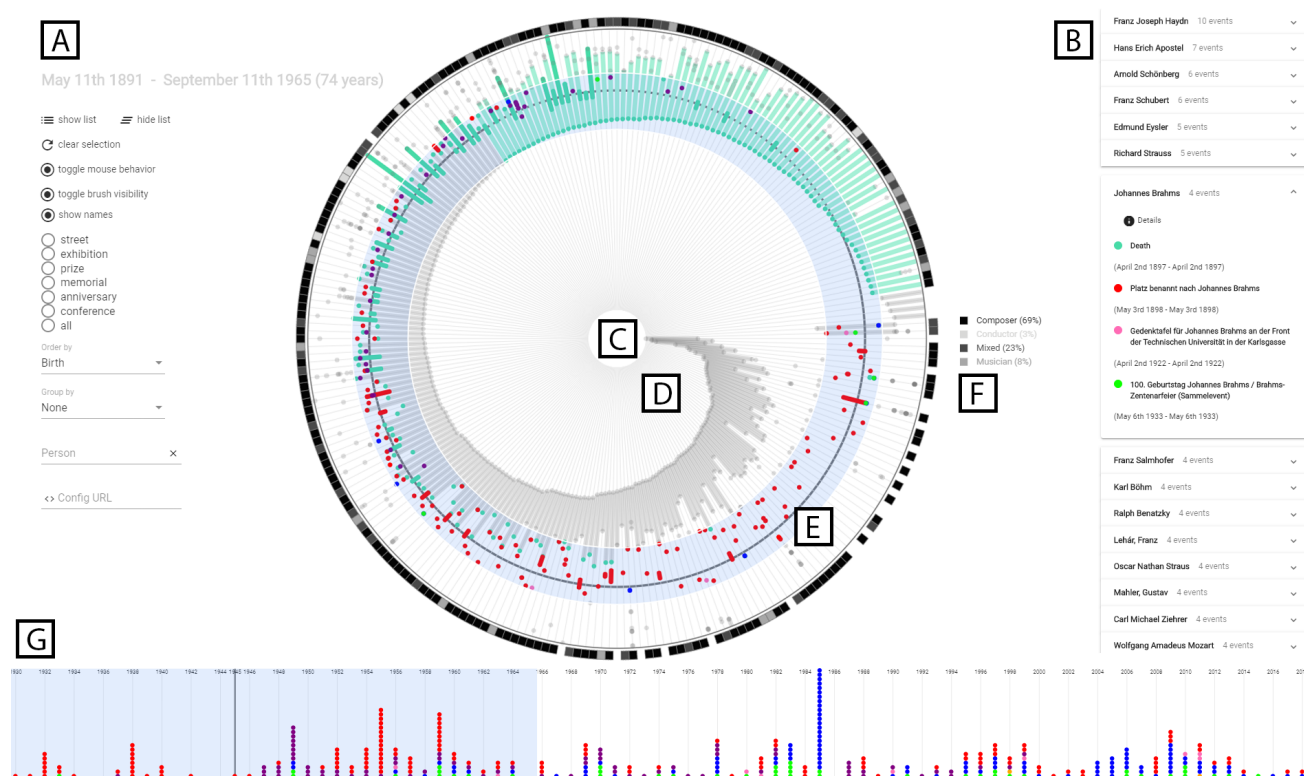


Figure 2: Overview of the visualization dashboard. A) Filtering controls. B) List of musicians being displayed. C) Main radial display component. D) Life timelines of musicians. E) Circle indicating 1945. F) Categorical data. G) Timeline visualizing post-death events

Figure 2, a random period of 74 years (March 11th 1891 - September 11th 1965) is selected, showing a light blue highlight and graying out those peoples lifelines and events that do not fall into the selected time span.

Every line radiating from the circle is the timeline of a person, with their life span highlighted in green with circles indicating birth and death. People who have been exiled also feature an extra dark green timeline that is superimposed over their life lines. This extra timeline indicates the time of exile, from the point of their departure from Austria to their return. It is important to note that estimating the exact duration of exile is difficult, as we seldom know the exact date, when the border was crossed. Most exiled people left Austria after the 12th of March 1938, some even during the authoritarian regime of Dollfuß-Schuschnigg. But when did the exile end? Was it on the 27th of April 1945, when the provisional government announced that the exiled were legally allowed to leave the host country (e.g., in the U. S. after spring 1946)? What if the exiled did return just for a short period of time? Such is the case of Erich Wolfgang Korngold, who came back in 1949 for two years and left again disappointed. In order to make the musicians decision not to return visible, we decided to visualize as 'exile' the period from crossing the Austrian border until the person's return. If a musician died without returning to Austria this period after 1945 was also marked as exile leading up to their death.

The focus of the visualization itself isn't on the achievements of a person within their lifespan, but rather on their superimposition with posthumous events that happened in the City of Vienna. For this purpose we chose to classify the events based on the following categories: street-namings, memorials, awards/prizes, anniversaries, and exhibitions. Due to the importance of these events we chose to highlight them with a different colors as to contrast them to the person's life and draw attention to the patterns that they create when using certain ordering strategies, such as the date of homage (see Figure 4 C, D, E).

On the outer rim of the circle we encode the categorical information about each person (see Figure 2 F). In this specific use case we encode the profession (role) of the person. The prototype also allows the users to choose a different categorization and grouping of the dataset, including exiled musicians, those that were born after 1945, and those that died before 1938 as these two dates play an important role in our subject of research, with 1938 marking the starting point of exile and 1945 denoting the end of World War II. This element can be used to detect patterns in any sort of categorical attribute of the selected musicians, according to the grouping criteria used. Our color encoding reflects our efforts in balancing the comparison between timelines, events, and displaying categories.

At the bottom (see Figure 2 D) we have augmented

the prototype with a timeline that contains only the events that are belonging to one of the five categories described in Section 3. The advantage of this timeline is that it easily shows temporal trends, such as in which decade the most street-namings or exhibitions happened. Furthermore, the timeline displays each event as a circle that is color-coded depending on its category as to remain consistent with the rest of the visualization. The circles allow the user to interact with individual events as well as count events belonging to the same category in a given time interval in a more straight-forward fashion compared to other visualization techniques. Both the radial and timeline visualizations are linked, meaning that mouseovering an event in the timeline will highlight the corresponding person’s lifeline and event in the radial part of the visualization and vice versa.

During our discussions with the domain experts (historians and musicologists) we realized the need for analytic tools to interact with the data in detail. To support them we have added filtering features such as visualizing only exiled musicians (see Figure 3), and the selection of time rings, which also provide a list of the people that have been active during this period sorted by the amount of events they are related to. Furthermore, upon selecting any person the visualization reorients itself and highlights the selected person displaying her/his details in a side panel. This allows the users to also explore a person’s information and links to external resources, as well as, the details about the events of her/his homage by the City of Vienna.

The visualization is developed to provide the domain experts with a tool to interact with the data in detail but also gain an overview and realize patterns or trends in how the City of Vienna recognized and commemorated it’s musicians. The intent of the visualization is to also provide casual users that are not acquainted with the musical, political, and cultural history of Vienna with a tool to explore and investigate. The goal is to provide both the domain experts and casual users with an interactive exploration environment to unravel the narrative of the Music City of Vienna.

4.2 Comparing Timelines

Considering all possible combinations of representation proposed in “Timelines Revisited” (Brehmer et al., 2017), including scale, and layout, there are $5 \times 5 \times 4 = 100$ different design possibilities. The proper design choice depends on the data, tasks, and users of the visualization. Our work, however, cannot properly be characterized in this framework. Our main goal is to highlight events and patterns occurring after the deaths of the selected people, while simultaneously allowing the user to see trends within their lives as within their posthumous commemoration. Furthermore, most of the proposed approaches do come with significant drawbacks when considering the number of timelines that they can simultaneously represent. This is also the design rationale for our radial layout, because of the amount of people that we are visualizing the radial layout generally has a better aspect ratio, area efficiency when drawing, and allows for more timelines to be encoded

and visualized compared to other layouts.

One of the questions that this visualization was designed to answer is: which musicians came back after the exiled were officially allowed to return to Vienna? For this reason we decided to represent time differently than the aforementioned approaches. As we are interested in having a visualization where it is more obvious to notice certain trends and patterns occurring at different decades throughout Vienna’s history (with a special focus on the years after 1945).

Figure 4 show three different ways to order the timelines of people, and how they affect the visual subject. In each case, different trends stand out. In Figure 4A the biographical timelines are ordered by the birth date of the person and grouped by their role (composer, conductor, musician), which is the first event on its timeline, marked as a green circle. A clear spiral forms growing outward, which is complementary to that of Figure 4B, where timelines are ordered by death date and grouped by role. In this case, the spiral signifies a ceiling, the limit of one’s life. It is much easier to identify musicians that are alive in the second case, as all timelines with no death date will form a contiguous arc.

It is important to note that the data and individual timelines remain the same in all cases. By simply re-ordering and grouping them according to different criteria it is possible to obtain unique patterns that can tell us something about the underlying behavior of the data. This is used in Figures 4C, D, and E to explore the subject of when musicians are recognized and commemorated by the City of Vienna. Each person is ordered according to the date of homage given by the city, resulting in a spiral, that can be clearly seen, formed by the events in a contrasting color.

5 Discussion and Future Work

By exploring the data using the proposed overview visualizations certain interests and questions arise, leading to the main question of how the City of Vienna chose to remember it’s musicians by embedding them in the city’s topography and collective memory (Erll, 2005). We explored how we can visualize this information and generate patterns that might provide answers to the following questions related to chronology, the person’s biography and the type of event: Is there a caesura in the visualization, which can help us recognize patterns in the interconnection between events remembering exiled musicians and political caesuras (e. g., the announcement of the provisional government in 1945, the end of Allied-occupation in 1955, the fall of the Berlin Wall in 1991), political and cultural turning points (e. g., the *causa Waldheim* in the late 1980s or changes of government)? Is there any pattern or trend of the honored person identifiable relating to her/his popularity during lifetime and after death, any link to a political party or cultural institution, or the music style the person is associated with? Was there any difference in chronology and quantity of events between those musicians, who returned from ex-

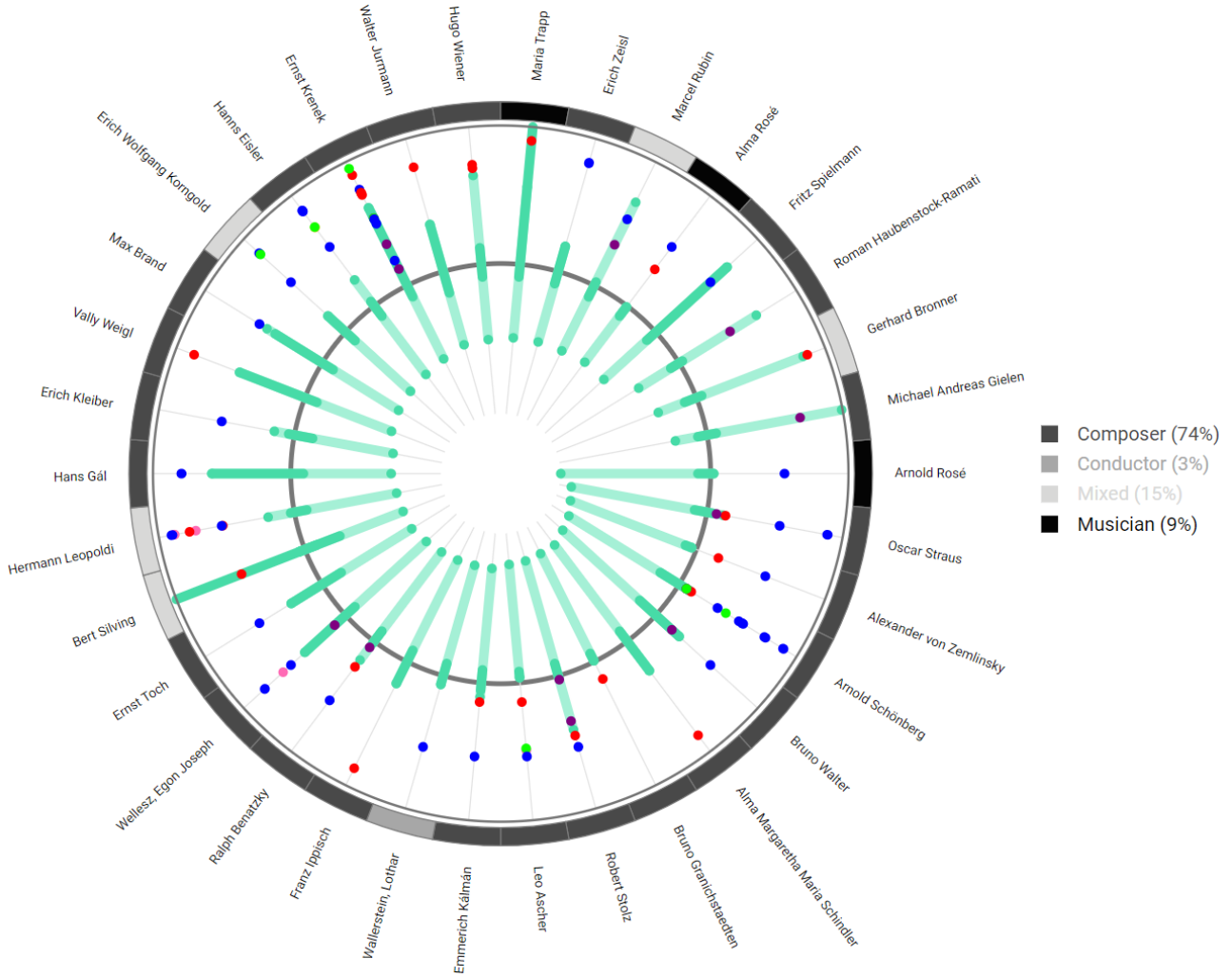


Figure 3: Filtered visualization containing only exiled musicians.

ile and those who remained in the host countries? Which category of honoring events were preferred by the City of Vienna and have there been any changes during the time span analyzed? These questions opened up some interesting points and directions for future work that we would like to explore, including:

- Exploring the encoding of information in the outer ring, which provides an additional dimension for the emergence of patterns;
- Visualizing group similarities through clustering, in addition to ordering strategies;
- Inferring categorical dimensions such as political orientation using information from organization affiliation, and involvement in particular events;
- Geographically mapping and visualizing the spatial facet of the events and implementing metrics that would take this information into account.

Furthermore, our database is also in a continuous process of expansion and refinement. As new sources come to light, they are added to the database and are automatically included in the visualization. This entails a cyclic process

of research, where both new information and new means to visualize it brings us closer to developing our questions in a nonlinear fashion.

In the future of IMMV the presented visualization will be connected with a map of the City of Vienna. Thereby the spatial dimension of the data, the distribution of streets and events between the center and periphery of the city can be made immediately visible to the user. Zooming in place and time will enable the user to analyze a certain time period or location more detailed than the rest. The users have the possibility to create their own story depending on their research question. The possibility of comparing people by selecting multiple timelines and highlighting differences or commonalities is another direction for future work. Research questions regarding differences in periods of government could be answered by inspecting and comparing multiple timelines, and exploring different ways of encoding event data (moving from color coding to glyphs or shapes representing the category of the events).

6 Conclusion

We introduce a radial visualization supporting our domain experts in investigating the biographical data of musicians

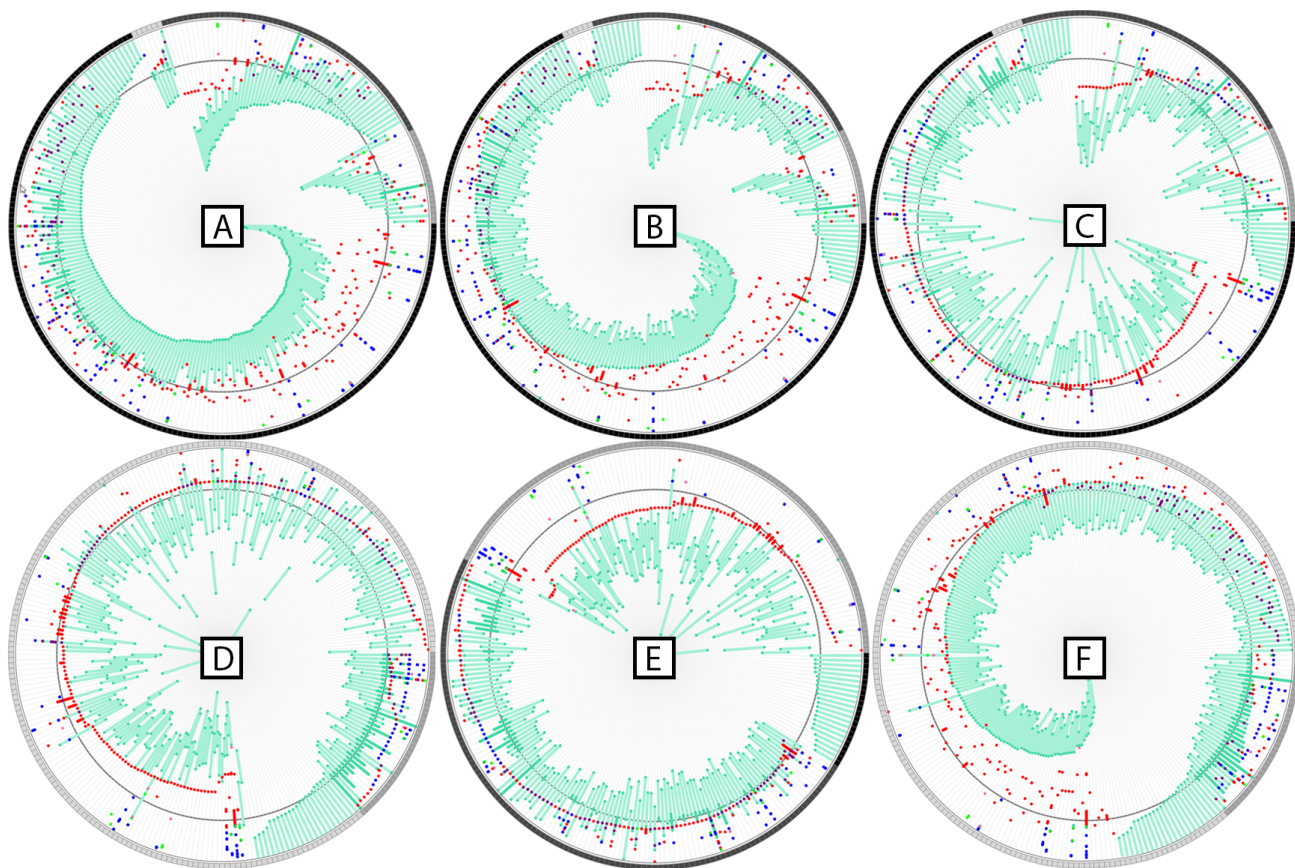


Figure 4: Six different orderings of the timelines around the central axis using different combinations of the grouping and ordering criteria. A) Ordering by birth date and grouping by role; B) Ordering by death date and grouping by role; C) Ordering by date of the first post-death event and grouping by role; D) Ordering by date of first post-death event and grouping by exile status; E) Ordering by date of first post-death event and grouping by people who died before 1938; F) Ordering by death date and grouping by exile status. In each case, a different spiral pattern forms, which allows for the detection of trends and outliers.

exiled from the Vienna along means to find out how and when they were honored or commemorated by the City of Vienna in terms of street-naming, exhibitions, awards, and anniversaries. In the interdisciplinary collaboration of the IMMV-team the visualization helped to validate and verify the correctness of the data in the database. Those exiled musicians, who neither received an award, nor had a street named after them fall through the cracks. Furthermore, the importance of a musician or the quality of their music cannot be implied from the fact that the City of Vienna chose to honor them or not. Other elements such as the concerts that happened in the Vienna Opera, the *Musikverein* or the *Konzerthaus*, as well as record sales figures or their popularity, were not part of our research. Furthermore, the research case exiled musicians, enabled us to concentrate on a small selection of persons, to see patterns, prove our hypotheses, and open new research questions and directions for future work.

Focusing on temporally anchored events, will allow us to extract salient events or periods of time which can be further used to identify other elements in a person's timeline. Further academic research also has to find traces of musicians in Vienna before 1938 in order to recognize

continuities or discontinuities before and after the periods of exile.

A central statement of this project is the relativity of history and the plural forms of understanding and interpreting historical facts. We show in this paper how VA approaches can support experts in the domain of historical and musicological research to gain a chronological overview and to combine music with political history and the City of Vienna with its musicians. Historical research helped to define the events, people and to collect the information that was needed to perform research on the subject. The lack of potential interactions had to be tracked in advance as spatial and temporal data extracted from texts can be ambiguous or uncertain. By using visualization as a tool for data presentation we can recognize potential patterns, overlaps, and trends and offer new methods of research. Furthermore, the interactive elements of the visualization help the user to open additional information and sources about the selected event and person or about neighbouring events and people. This offers on the one hand a selective, subjective reading and interpretation, which can be on the other hand combined with combinatorial and interactive reading, offering new ways for interpreting historical

data. The multimodality and complexity of historical data with various sources and media connected to events and biographies can be diversified and concretized via VA. This opens up new elements of narration, substituting the existing methods by a new and unique visual narrative.

By remembering the exiled musicians via several commemorative events, the City of Vienna in a way *re-emigrated* those who left Vienna after March 1938. Today they are again a part of the city's memory. Of course ambiguities and ambivalences of each fortune and the complexity of each biography cannot be simplified via visualization. Their collective displacement thus bequeathed a gap, which we tried to fill at least visually.

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7 References

- W. Aigner, S. Miksch, W. Müller, H. Schumann, and C. Tominski. 2008. Visual methods for analyzing time-oriented data. *IEEE Transactions on Visualization and Computer Graphics*, 14(1):47–60.
- P. Autengruber, B. Nemec, O. Rathkolb, and F. Wenninger. 2014. *Umstrittene Wiener Straßennamen. Ein kritisches Lesebuch*. Wien.
- A. Barber-Kersovan, V. Kirchberg, and R. Kuchar, 2014. A. Barber-Kersovan, V. Kirchberg and R. Kuchar (eds.): *Music City. Musikalische Annäherungen an die „kreative Stadt“*, chapter Music City. Musikalische Annäherungen an die kreative Stadt, pages 9–30. Bielefeld.
- M. Brehmer, B. Lee, B. Bach, N. H. Riche, and T. Munzner. 2017. Timelines revisited: A design space and considerations for expressive storytelling. *IEEE Transactions on Visualization and Computer Graphics*, 23(9):2151–2164.
- A. Erll. 2005. *Kollektives Gedächtnis und Erinnerungskulturen. Eine Einführung*. Metzler, Stuttgart.
- H. Exenberger and Dokumentationsarchiv des österreichischen Widerstandes. 1998. *Gedenkstätten zu Widerstand und Verfolgung, Exil, Befreiung. Eine Dokumentation. Gedenken und Mahnen in Wien 1934-1945*. Wien.
- J. Fulda, M. Brehmer, and T. Munzner. 2016. Timelinecurator: Interactive authoring of visual timelines from unstructured text. *IEEE Transactions on Visualization and Computer Graphics*, 22:300–309.
- R. Knight. 2000. *"Ich bin dafür, die Sache in die Länge zu ziehen": Die Wortprotokolle der österreichischen Bundesregierung von 1945 bis 1952 über die Entschädigung der Juden*. Wien.
- H. Kretschmer. 1992. *Wiener Musikergedenkstätten*. Wien.
- V. Matejka, 1983. J. Jung (eds.): *Vom Reich zu Österreich. Kriegsende und Nachkriegszeit in Österreich erinnert von Augen- und Ohrenzeugen*, chapter War 1945 ein Anfang? Oder: Chancen eines Anfangs, pages 39–47. Salzburg/Wien.
- D. L. Nelson. 2006. *Vienna for the music lover. The complete guide to Vienna's musical sites and performances today*. Vienna.
- W. Neugebauer and S. Ganglmair, 2003. *Dokumentationsarchiv des österreichischen Widerstandes (eds): Jahrbuch*, chapter Remigration, pages 96–102. Wien.
- P. H. Nguyen, K. Xu, R. Walker, and B. W. Wong. 2016. Timesets: Timeline visualization with set relations. *Information Visualization*, 15(3):253–269.
- M. Nußbaumer. 2007. *Musikstadt Wien: Die Konstruktion eines Images*. Wien.
- M. Riegler, M. Wenk, E. Aufhauser, F. Ledermann, M. Schmidt, and G. Gartner. 2015. Genderatlas österreich - Entwicklung eines zielgruppenorientierten online-tools. *Mitteilungen der Österreichischen Geographischen Gesellschaft*, 157:323–339.
- R. Rose-Redwood, D. Alderman, and M. Azaryah. 2018. *The Political Life of Urban Streetscapes. Naming, Politics, and Place*. London and New York.
- J. J. Thomas and K. A. Cook. 2006. A visual analytics agenda. *IEEE Comput. Graph. Appl.*, 26(1):10–13.
- S. Zapke, 2017. Y. Franz and C. Hintermann (eds.): *Unravelling Complexities. Understanding Public Space*, chapter Mapping the Music City in the 20th century. Theoretical Approaches, pages 71–76. Wien.