WHOLODANCE

Whole-Body Interaction Learning for Dance Education

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Deliverable 5.4

Final release, testing & validation data management platform report

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Executive summary

Deliverable "*D5.4 Final Release, testing and validation data management platform report"* describes the architecture and functional specifications of the final version of WhoLoDancE Movement Library (WML) and Annotation platform, focusing both on the data management infrastructure of the repository as well as the available functionalities and user interface. This deliverable consists the second and final report for the data management platform, following the deliverable "*D5.2 Beta Prototype Testing & Validation Data Management Platform Report"*, in the first period of the project. The current document reports on the changes and enhancement that have been made to the WhoLoDancE Movement Library, including updates on both back end and front end. One of the major additions to the web-based system is the integration of the extended version of the ontology that was described in "*D3.1 Report on semantic representation models"* and "*D6.4 Final Report on the resulting extension and integration of the ASTE engine in WhoLoDancE"*. The ontology serves to further enrich the repository with tags and metadata that are inferred by the annotations experts as well, as domain knowledge. In addition, during the second period the user evaluation of the user interface and its functionalities, such as browsing, searching and annotating the recordings, has been reported in the deliverables of WP7, but also a relevant paper [3].

Particularly, this deliverable reports on the outcomes of four main tasks of WP5 at the final stage of the project, a*) T5.1 Building and deployment of data management platform, b) T5.2 Conceptual Modelling and Annotation of Data, c) T5.3 Data Modelling, integration and management*, (although some details concerning data management are described in *D5.1 Data Management plan*), as well as *d) T5.7 Platform testing, validation and maintenance plan specifications.*

The main purpose of the WML is to provide access to the repository of the multimodal recordings of the different dance genres through an attractive interface for the end-user. Section 2 provides an overview of the architecture of the platform and Section 3 the specifications of the offered functionalities. The main functionalities provided are: browse, search, view/play and annotate the multimodal recordings. Through this web-based platform the user can browse the recordings by dance genre, and search by using keywords that are included in the metadata of the recordings.

The second part of the document, Section 4, presents the testing and validation activities of the platform that have taken place in the reporting period, as well as a *Maintenance plan* in Section 5. The platform has been extensively tested, while the interface has been evaluated at different stages of the project by UI/UX as well as dance experts. The results have proven that WML is a useful and powerful web-based tool, with rich content and functionalities and that it can be applied in dance education, choreography and research for accessing and enriching movement content. A maintenance plan is foreseen so that the platform and the interface will be running for at least two years following the end of the project.

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1 Introduction

The WhoLoDancE Movement Library (WML) is a web-based tool that allows end users to browse, search and annotate the multimodal recordings that have been acquired during the project. It integrates a data management and user management back-end system, as well as an end-user interface targeting dance practitioners and experts. WML's latest version constitutes an improved version of the older application. By upgrading several libraries to their latest version, not only has the WML tool acquired flexibility, but also compatibility with more devices and browsers. The new version of the WML and annotator, also brings several changes that refer to both user interface and user experience, new functionalities, as well as alternative viewers for the recordings.

Table 1. Changes and improvement during 2nd Period of WhoLoDancE

	Additions/improvements
General modifications to the UI & UX	• Upgrade jQuery to latest version • Total redesign (upgrade to bootstrap 4 framework) • Error handling

Home Page	• Redesign
	  ○ Search bar transferred to the middle of the page
	  ○ Browse options moved below search bar

Results Page	• Redesign and new functionalities
	  ○ Tag filtering system
	  ○ Extra metadata referred to each recording
	  ○ Option for editing metadata
	  ○ Search for playlists
	  ○ Additional filter options
	• Search using database for faster and more accurate results

Mocap Viewer Page	• Redesign and new functionalities
	  ○ Timeline structure
	  ○ Playlist display option
	  ○ Create new playlist
	  ○ Manage recordings by adding them to or removing them from a playlist
	  ○ Metadata field
	  ○ Option for editing metadata

Choreomorphy Viewer Page	• New viewer option with several discrete functionalities
	  ○ Altering the avatar
	  ○ Automatically rotating-following the camera
	  ○ Modifying the scale of the avatar
	  ○ Adding trails and traces

Playlists Pages	• New pages related to the playlist's manipulation
	  ○ Personal channel that demonstrates created and saved playlists
	  ○ Option for managing the recordings of a playlist
	  ○ Option of creating new playlists

User Management	• Actions determine user's role (a user might have several roles)

Database	● Partial redesign of database schema and query writing for efficiency ● New tables related to new functionalities ○ Copying recording metadata in PostgreSQL[1] database ○ Enrichment of metadata using the ontology ○ Enrichment of annotations using the ontology ● Updating the existing tables ● Editing recording metadata using WML (updating both CKAN[2] and PostgreSQL database) ● Type of segment in all recordings (PostgreSQL and CKAN database)
General	● Upgraded Spring security ● Upgraded technologies

[1] https://www.postgresql.org/
[2] https://ckan.org/

2 Architecture & data management

In this section, we describe the main components of the WhoLoDancE Movement Library (WML) that have been upgraded regarding both the interface and the back-end system. The WML architecture has been presented in detail in *D5.4 Final release testing and validation data management platform report*. In addition, we present the components of WML such as Annotation System, Movement Library front end, and Repository in relation to the global WhoLoDancE architecture and their relationship to other components (Figure 1). Several upgrades have been made in order to improve the efficiency of the WML, as well as the user experience. The approach adopts an elevated but flexible architecture, which relies on the efficiency of the platform.

As with the previous version, the WML, being a web-based application, has been developed according to the MVC architecture model (Model-View-Controller). More specifically, the Spring Web MVC framework has been used. Spring MVC3 separates an application into three interconnected parts

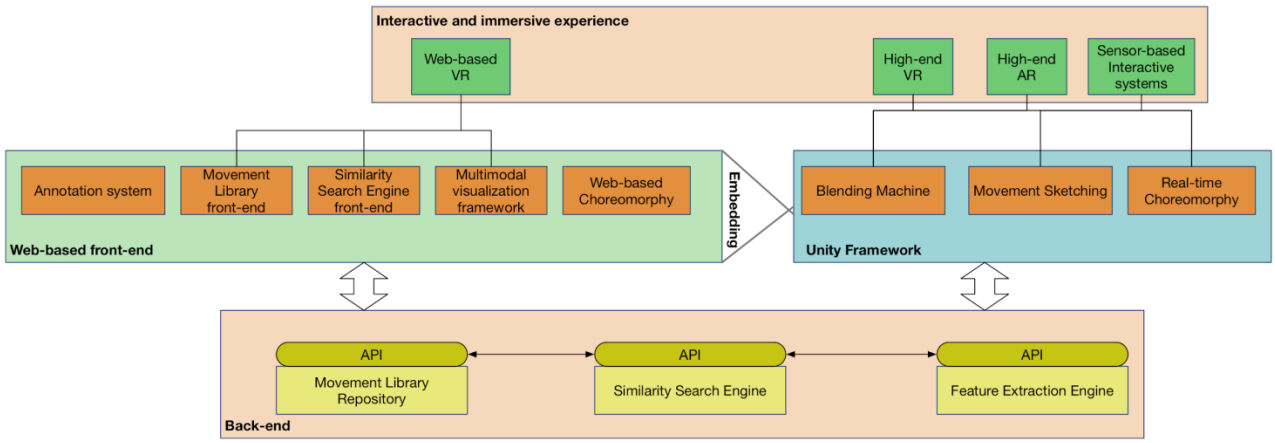

Figure 1. WhoLoDancE overall architecture

2.1 WML back end

The WML back-end system has been upgraded in order to meet the functional and non-functional requirements and users' needs as they have been defined during the evaluation process with the internal (members of the consortium) and external dance experts.

These requirements suggested new specifications, for all of the different layers of the implementation of the WML as a system, starting from the data management and back-end. In particular, changes have been made to the data management, updating the schema and content of the database. Some extra tables have been added, as described above. These updates targeted both an enhanced performance of the back-end system, as well as a richer representation of movement recordings and their descriptors. In order to organise the knowledge that relates the recordings with the dance, movement and other concepts that describe metadata, annotations and other descriptors, the ontology that was introduced in *D3.1 Report on semantic representation models* has been extended and integrated with the WML system. More details

[3] https://docs.spring.io/spring/docs/current/spring-framework-reference/index.html

about the new extended version of the ontology is provided in *D6.4 Final Report on the resulting extension and integration of the ASTE[4] engine in WhoLoDancE*.

An important component of this new version is the ontology. It was used for semantic enrichment of the metadata for each recording regarding the 'Ballet movement', i.e., ballet specific vocabulary that consists of the syllabus and terminology of this particular genre. Ballet, as a dance genre, is one of the examples where particular movements have names and introduce a particular vocabulary which is common not only among the practitioners of the dance genre, but also among other dance practices. In addition, the vocabulary of movements and its corresponding terminology implies particular rules about the difficulty of the steps, hierarchies of movements and relationship with more generic movement principles, qualities and actions such as turn, step, jump etc. More details about the computational applications of particular vocabularies such as the "Ballet Movement" sub-ontology can be found in related papers [4][5]. More examples are also given in "*D6.4 Final Report on the resulting extension and integration of the ASTE engine in WhoLoDancE"*.

Furthermore, a part of this information was incorporated in the annotation process. More specifically, the Ballet movement has been added as an extra field of choice in order to describe the movement of the dancer.

Currently, the WML repository has a total of 786 recordings. These recordings have been incorporated in the database following the schema shown in detail in Figure 4 and Figure 2. They were migrated from the CKAN data management platform, omitting unnecessary data, so as to be tailored to the WML needs. Taking advantage of this form, the search has been redesigned and the response time has been reduced.

2.2 WML data storage

As described in D5.4 the Data storage layer represents the infrastructure which implements the storage of the multimodal recordings. The Data storage layer has been enriched so as to support the extra functionalities and improvements that have been made in the WML. The Annotations Database component consists of the following tables:

1. Recordings: it contains the metadata of the recordings.
2. Dance Genre: it contains the dance genres that describe the recordings.
3. Movement Principle: it contains the specified vocabulary that describes the recordings
4. Users: it contains the users that are registered in the WML.
5. Actions: it contains the actions that a role can do while interacting with the WML.
6. Roles: it contains the role/s that a user has in the WML
7. Annotations: it contains the annotations that are added by the dance experts
8. Categories: it contains the categories from which a user can choose to annotate a recording
9. Labels: it contains a specific vocabulary for each category regarding the annotations.
10. Tags: it contains the keywords that refer to each of the recordings.
11. Playlist: it contains a collection of recordings that the user has saved in their profile either private or public.
12. Ballet movement: it consists of a specific vocabulary that was extracted from the ontology. This table has the information of the specified movement for the recordings.

The tables that were added in the newest version of the WML were the Recordings, Dance Genre, Movement Principle, Actions, Tags, Playlist and Ballet Movement. The Categories as well as the Labels were enriched by adding the Ballet Movement and the related concepts that make up this particular vocabulary.

[4] ASsisted TEaching

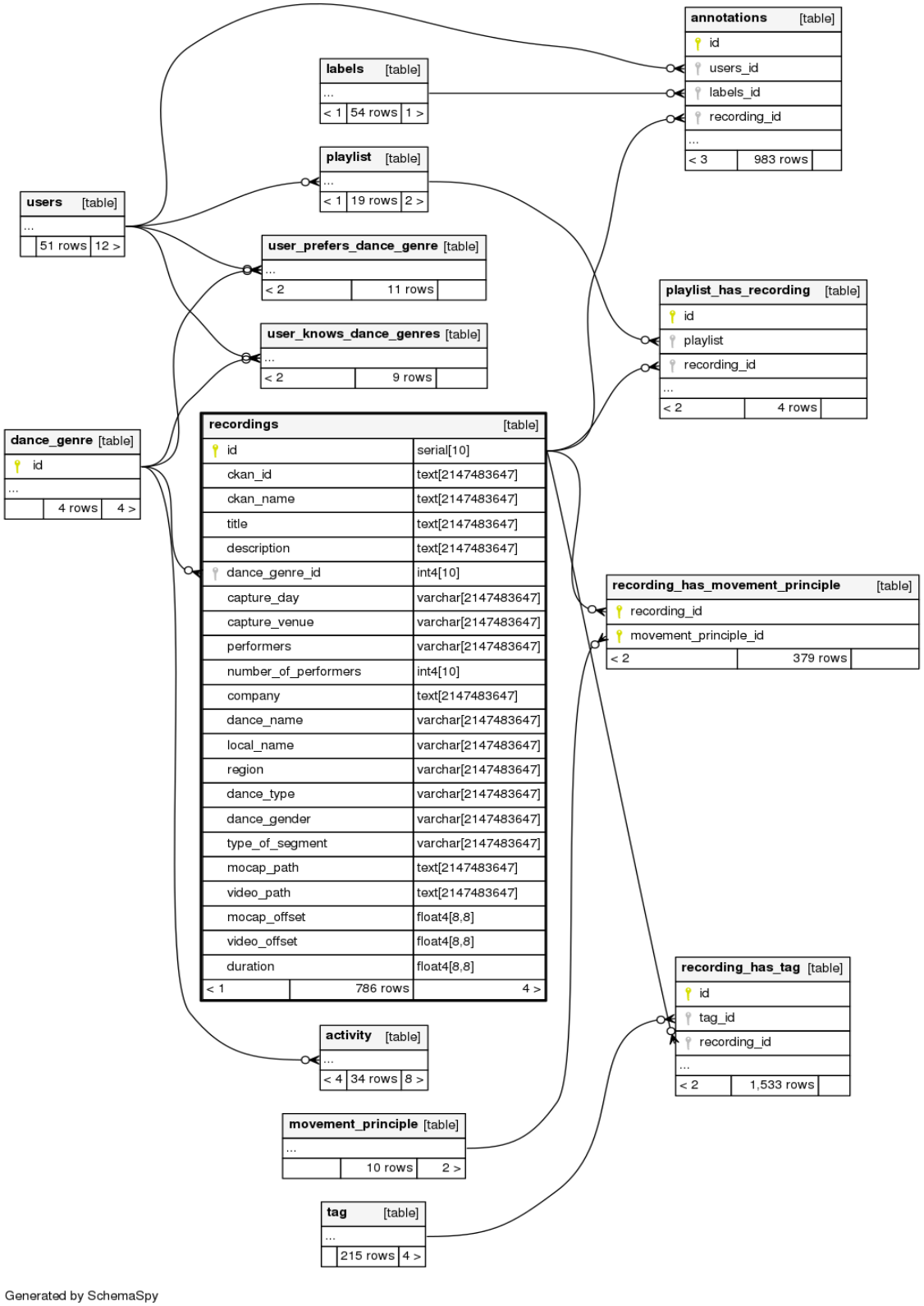

Figure 2. WhoLoDancE Movement Library schema

2.3 WML–ontology integration

In this section we describe the changes that have been made in the database as well as the use of the ontology. In particular, an initial version of the ontology has been described in the deliverable D6.3 [11] and reflects the conceptual framework of the WhoLoDancE project for recording and organizing the movement content and educational scenarios [1][2][6][7]. The ontology has been extended to include more details about the recordings' metadata, annotations and tags, providing interrelations between descriptors (qualities, principles, actions) and educational related details (level, dance genre, dance syllabi and specific vocabularies) and integrate ontologies that have been produced by Athena RC and published in related conference papers [4][5]. The ontology and its integration in the Educational platform are described in detail in "D6.4 Final Report on the resulting extension and integration of the ASTE engine in WhoLoDancE".

Moreover, in order to integrate the ontology with the recordings, we have used Apache Jena[5], a free and open source Java framework. Taking advantage of the wealth of information extracted from the ontology, the metadata of the recordings as well as the annotations were enriched. For example, after this process the recording with title "grand_battement_02_A_001" got the ballet movement "Grand_Jeté" as metadata. The Eclipse RDF4J framework[6], an open source Java framework for processing RDF data, was used.

Regarding the information that derived from the ontology, there were the following additions:

- 87 ballet movements were added as metadata in the WML.
- 76 recordings were enriched from the above metadata.

In Figure 2, an overview of the applied Dance Ontology is show, comprising of concepts describing the Recording, Annotations, Movement, Movement Descriptors and their subcategories Movement Principle, Movement Qualities, Action, Human Body Part, but also concepts related to metadata such as Dance Genre, Dance Company, Dance Performance, Dance Performer, and concepts related to the Educational aspect such Learning Unit, Part_of_Class, Learning Level, etc.

Figure 3 shows the metrics of the asserted Classes, Object properties and datatype properties and provides in the final version of the ontology.

[5] https://jena.apache.org/
[6] http://rdf4j.org/

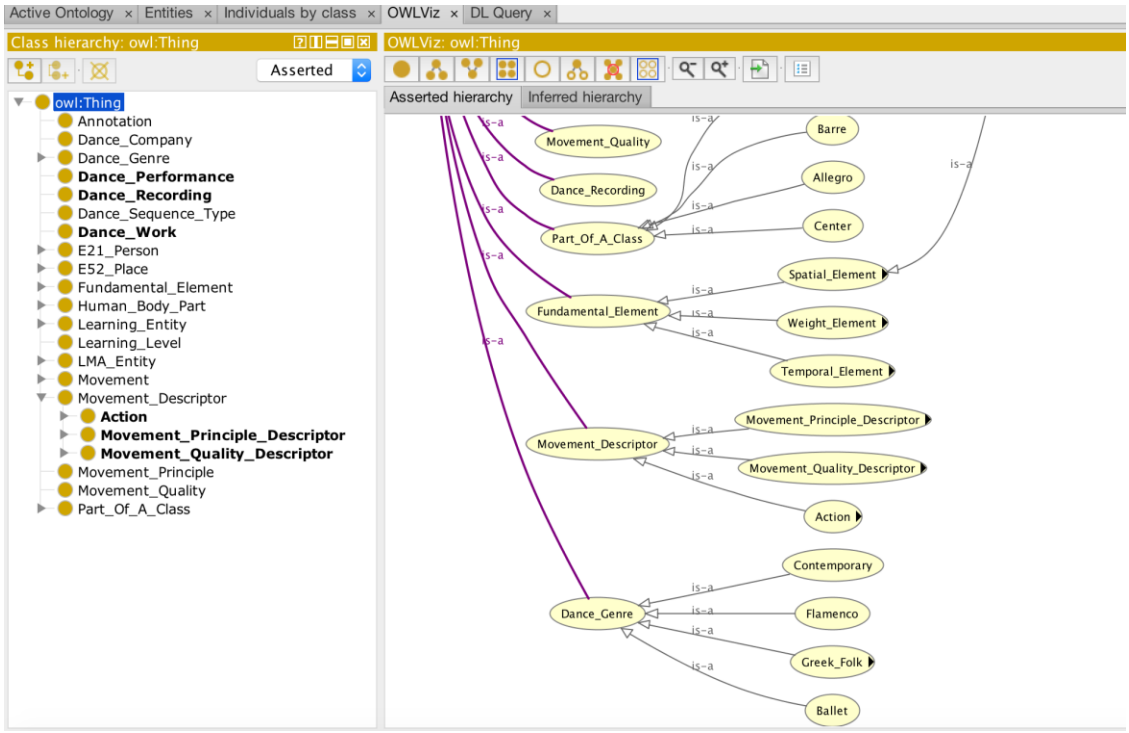

Figure 3. An overview of the Ontology using Protégé

Ontology metrics:

Metrics

Axiom	**8838**
Logical axiom count	**8147**
Declaration axioms count	**501**
Class count	**379**
Object property count	**32**
Data property count	**13**
Individual count	**1340**
Annotation Property count	**4**
DL expressivity	SHOIF(D)

Class axioms

SubClassOf	**464**

Individual axioms

ClassAssertion	**1337**
ObjectPropertyAssertion	**3856**
DataPropertyAssertion	**2416**

Figure 4. Dance-Ontology metrics

2.4 WML user management & security

As described in D5.2 [10] the user management system is a core part of the WML platform. It provides basic security and describes the ability of the administrator to manage user access to various resources and functionalities. The following Figure 5 shows the part of the database schema that is dedicated to user management and role handling.

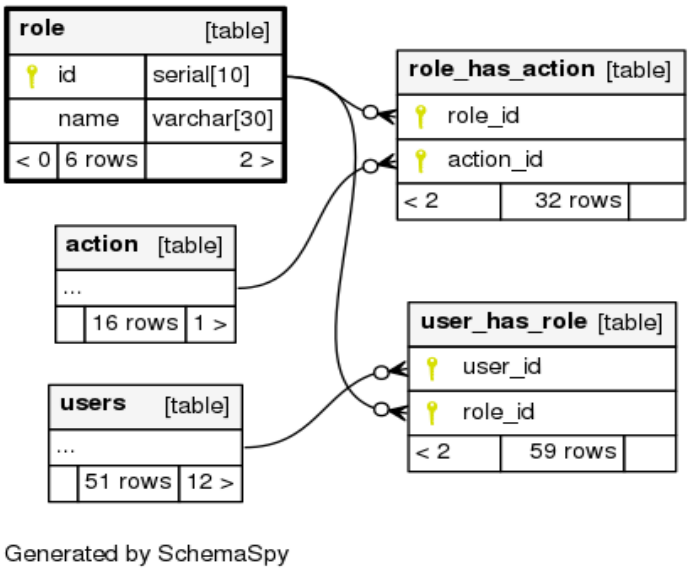

Figure 5. User Management data schema

Through the user management system, the first step of using the WML platform is completing the registration. After a successful registration process, the following message is shown, and the user can access the WML platform through the login form and interact with the tool (Figures 6, 7 and 8).

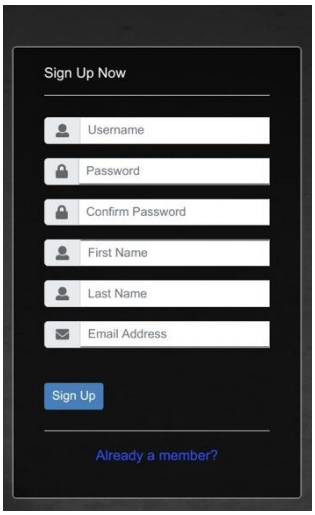

Figure 6. Registration form

Figure 7. Successful registration message

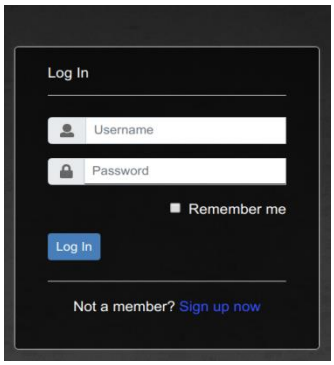

Figure 8. Log-in form

An important component of the WML is security. To ensure the protection of the data within the platform, Spring Security framework[7] was used for authentication and authorization to the WML. Having upgraded to the latest version, a protection throughout the platform is provided.

[7] https://spring.io/projects/spring-security

3 Functionality & user interface

3.1 Evaluating design decisions

The WhoLoDancE Movement Library and the annotator interface has been developed through a user-centred, iterative design approach. The user interface has been evaluated at different stages. More details about the evaluation methodology and results is provided in the deliverable *"D7.2 First evaluation of personalised experience"* and *"D7.3 Evaluation of Learning Personalized Experience Final public report"*, as well as in a in a published paper [3]. A large number of the changes made to the user interface and to the functionality of the platform have resulted from the iterative design process and the requirements and specifications that emerged during the evaluation with UI/UX and dance experts that represent the potential users of the platform.

3.2 Search by keywords and browse using dance genre

3.2.1 Description

Figure 9 and Figure 10 show the application's main interface, the old and new version, respectively. Both pages were designed in order to meet users' needs for both searching and browsing the WhoLoDancE repository.

The Home page's main goal is to guide users by providing an effective and direct medium for discovering, searching and browsing the WhoLoDancE recordings. In both pages (old and new version), the appearance as well as the functionalities are similar.

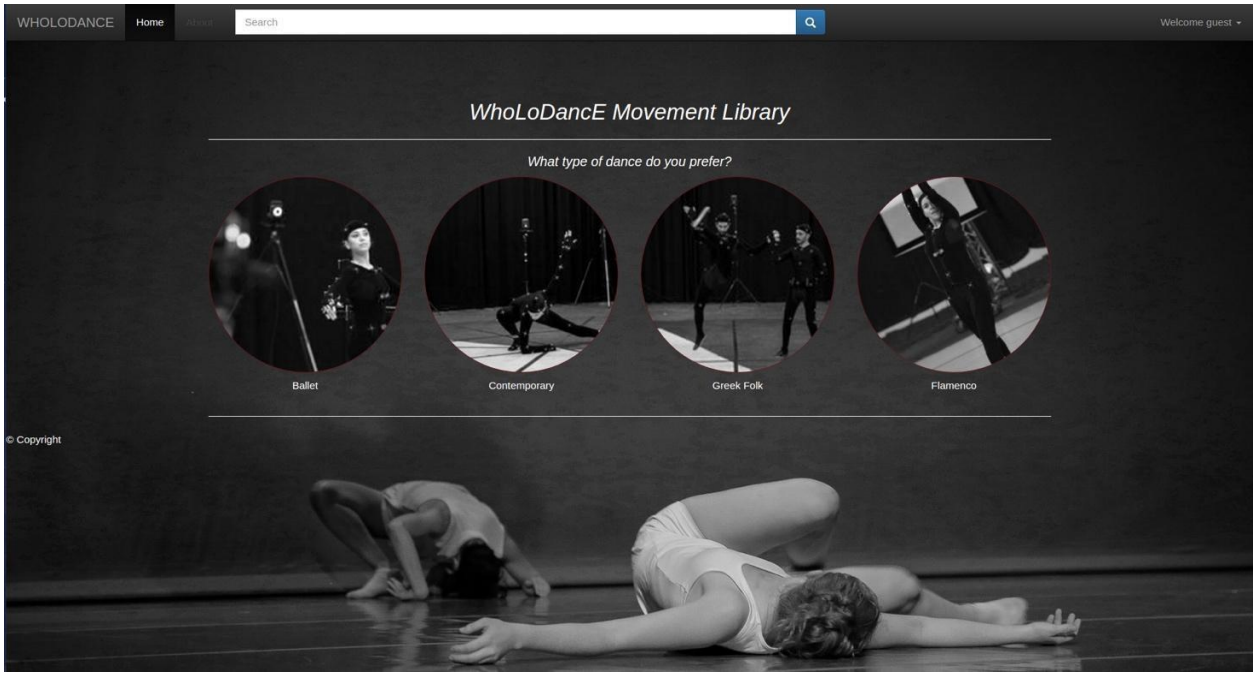

Figure 9. Old version of the WhoLoDancE Movement Library's Home page

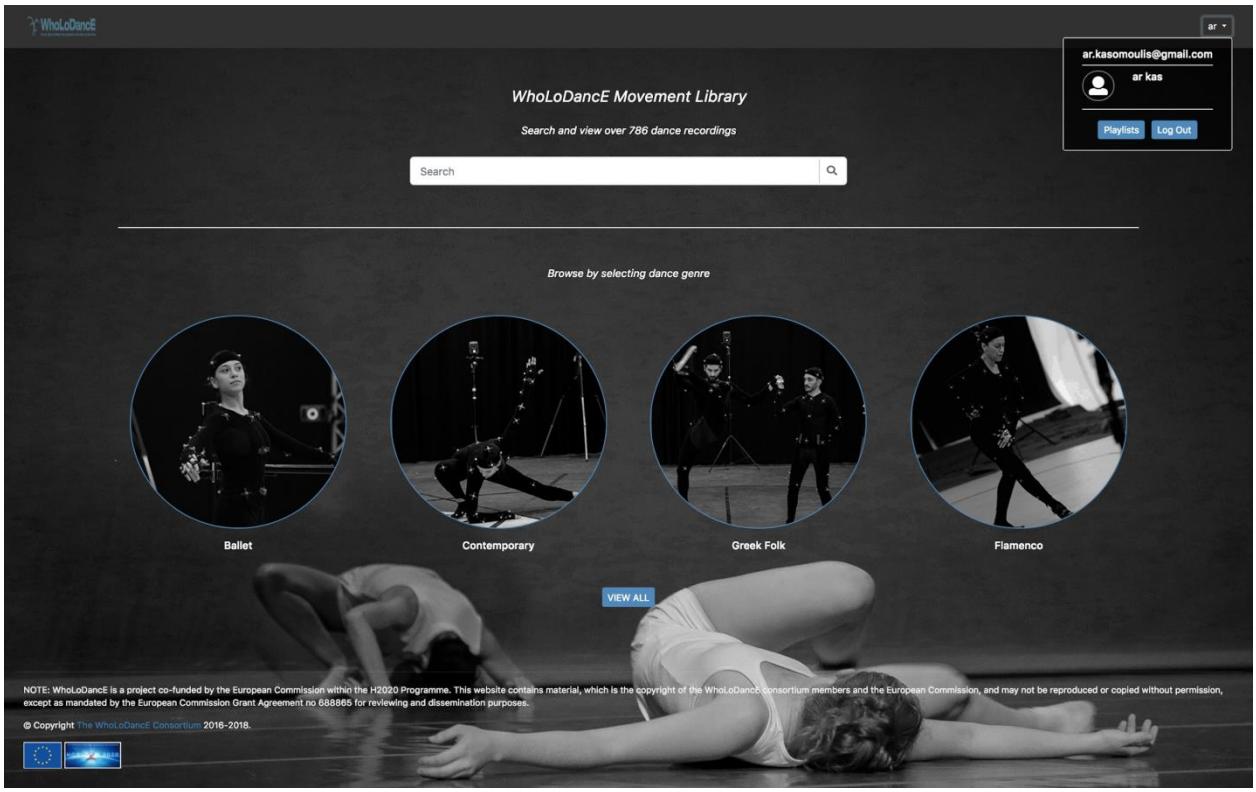

Figure 10. New version of the WhoLoDancE Movement Library's Home page

3.2.2 Related requirement

The WhoLoDancE Movement Library meets the users' need for effectively discovering data. Searching by using keywords that refer to the recordings' description and characteristics is cover through the use of the search bar.

However, there are other cases, in which users are not familiar with specialized dance vocabulary used in the WhoLoDancE ontology and expressions and they are simply interested to explore the repository. Browsing the recordings by dance genre will offer that opportunity.

3.2.3 Specifications

The WhoLoDancE Movement Library serves as a search engine that aims to show off the WhoLoDancE Movement Library repository. The "Home" page has a decisive role in this challenge. The old and new version of the tool (Figure 9 and Figure 10) look similar.

On top of the page, users can still find the navigation bar. The navigation bar is composed by the WhoLoDancE icon, which is also a link to the home page, as well as a small dropdown menu on the right corner. The drop-down menu includes two option buttons, "Playlists" and "Log Out". "Playlists" button redirects users to their personal channel, in which they can detect, play, edit or delete their own playlists.

As Figure 10 shows, the search bar has been transferred from the navigation bar to the middle of the page. Considering the observation that users are prone to examine a layout by following the F rule (F-Layout refers to specific design rules that are related to the UI and UX improvement), altering the position of the search bar was a necessary improvement.

Down below search bar, four circle icons are located, in order to serve as the medium for browsing the repository. Each circle corresponds to a specific dance genre.

3.3 Explore the search results

3.3.1 Description

The search results page has been created, to offer an efficient way of presenting the results of interest, obtaining an insight into the recording through their metadata description, managing the metadata information, as well as browsing the WhoLoDancE repository.

Considering the large number of recordings, combined with several distinguished metadata, it was essential to design an effective way for both searching and managing. As Figure 11 (old version of the result page) and Figure 12 (new version of the result page) demonstrate, the current page has undergone significant changes.

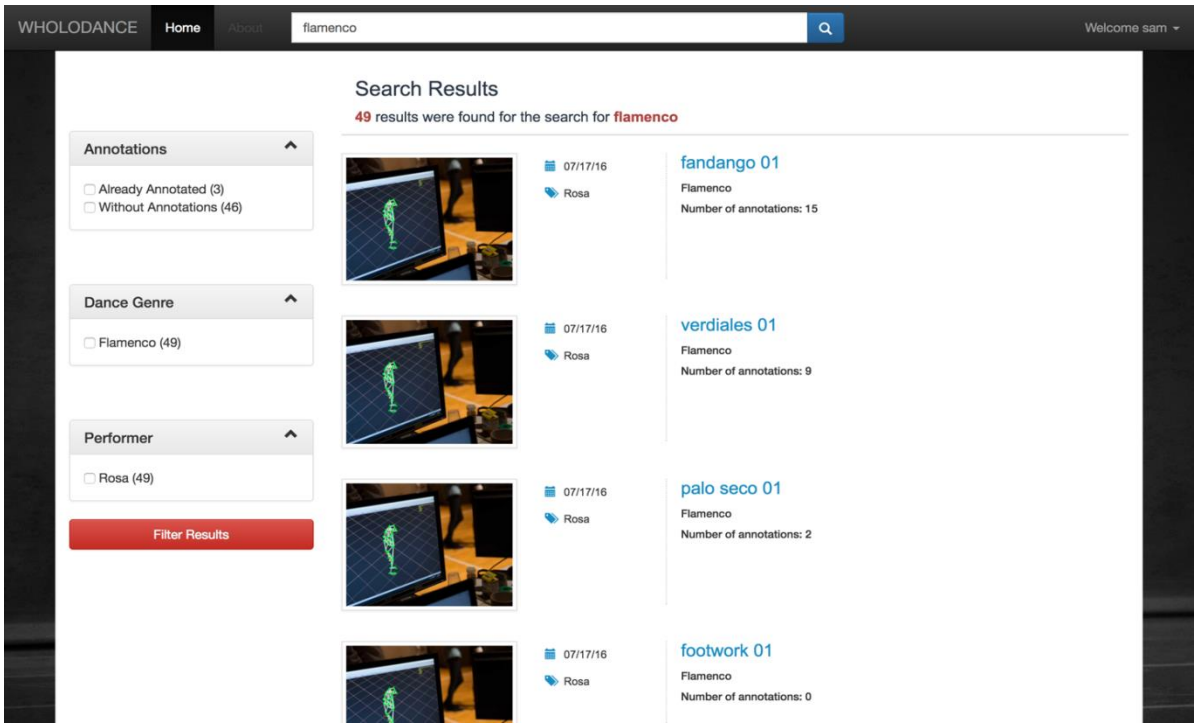

Figure 11. Old version of the search Results page

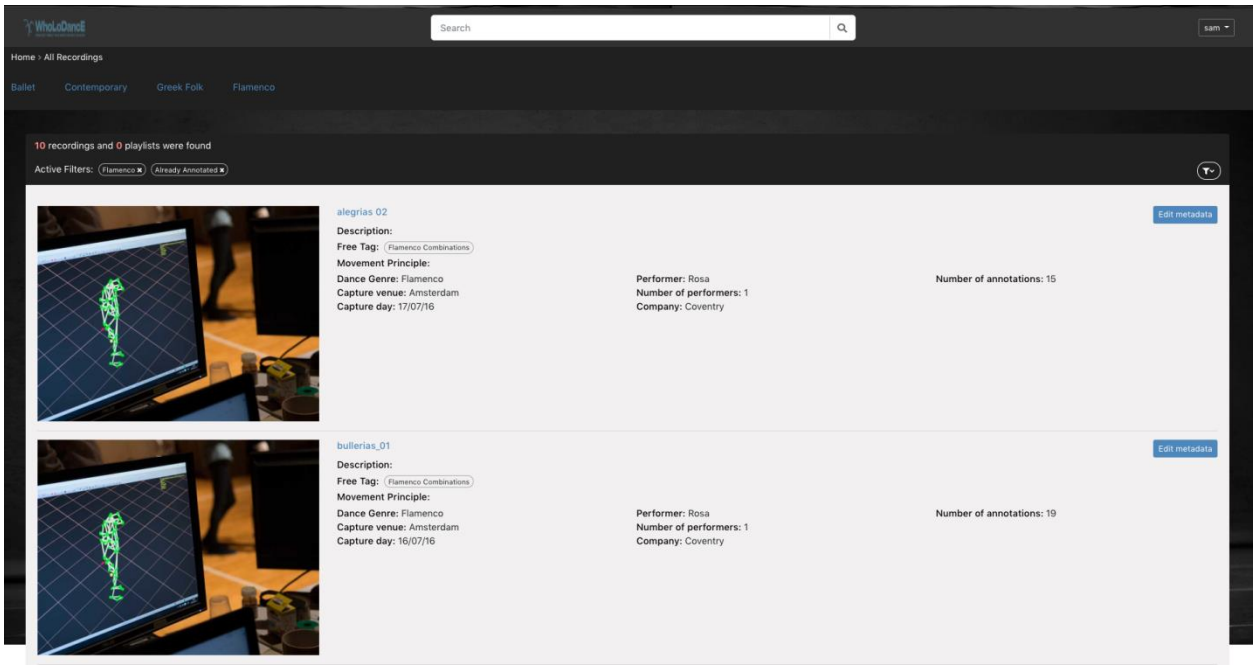

Figure 12. New version of the search Results page

First, the filters panel has been removed from the left side of the results section. Through the latest version, the filters panel is located in a toggle panel just above the results panel (Figure 13). When a specific filter is selected, the option also appears as a tag label. Another design alteration refers to the recordings metadata. As it is presented in Figures 11 and 12, through the last version recordings are enriched with further details as well as with an option of editing. An inline approach has been developed in order to facilitate the edit process (Figure 14).

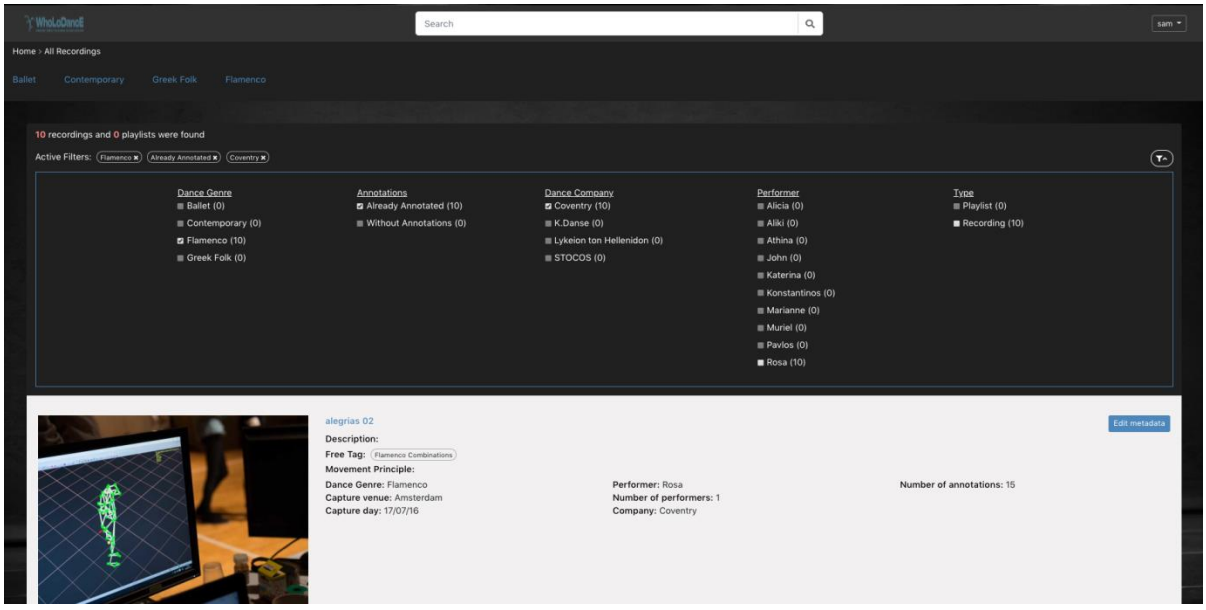

Figure 13. New version of the search Results page - Filters tag system

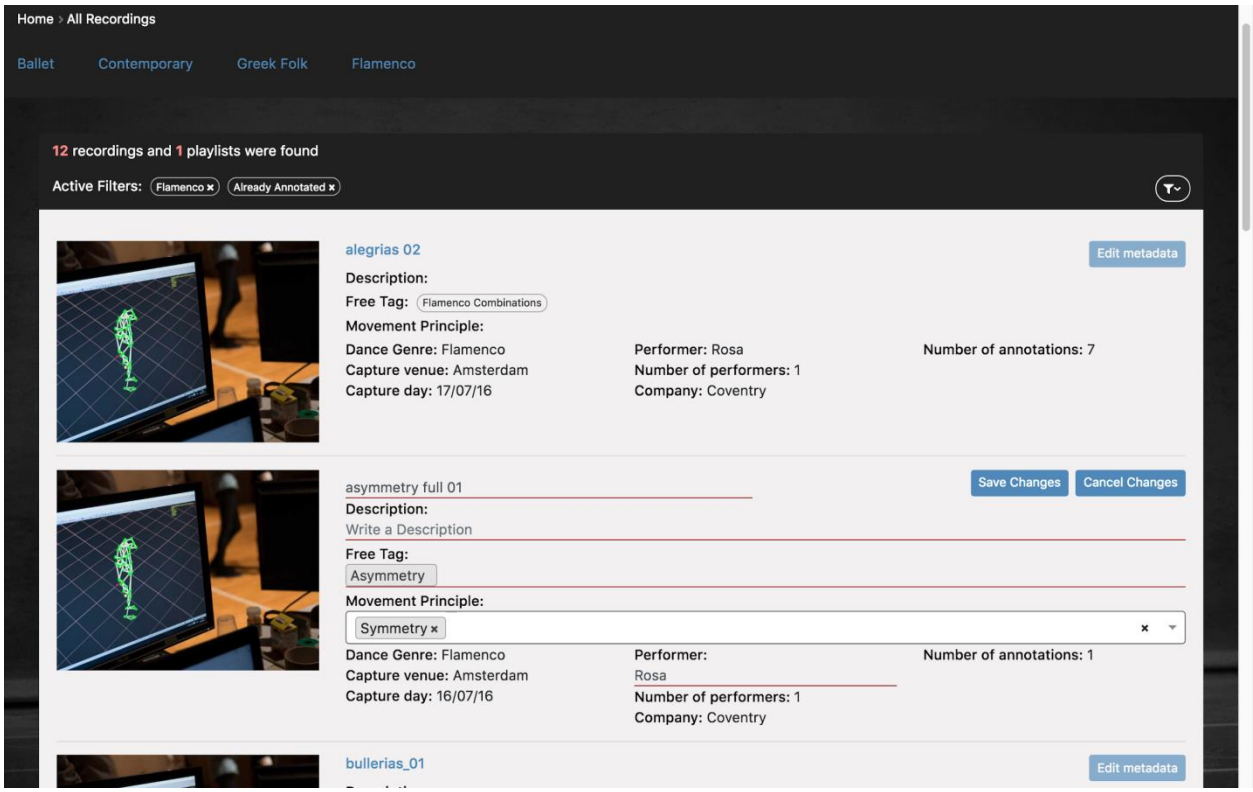

Figure 14. New version of the search Results page - Edit metadata

3.3.2 Related requirement

The search results page serves as the intermediate between the home page and the viewer page. After searching or browsing by using dance genre, users are redirected to the search results page, where the recordings of their interest are presented (Figure 12).

Through the current page not only are users able to search for specific recordings, but also to locate their personal playlists. The process of searching has been enhanced with mechanisms for filtering, paging and editing the results.

3.3.3 Specifications

Through the search results page, users are informed for the total number of recordings, as well as playlists that are produced by their search actions. In order to provide users with an insight into the recordings, each result is combined with even more details than the previous version. More specifically, a result contains: Title, Description, Free tags, Movement Principle tags, Dance Genre, Capture Venue, Capture day, Performer, Number of performers, Company and Number of annotations. As it is shown on Figure 14, a new feature has been developed, so as to allow users to edit the information that were mentioned above.

The function for filtering results has been removed from the left side of the page. Through the latest version, filtering system has been placed above the results panel, on the top of the page. Instead of toggles that contain checkbox options, filtering process has been enhanced with the use of tag labels. Filter panel still contains discrete lists with checkboxes. However, additional filters have been used and each option, selected by the user, is displayed as a tag (Figure 13).

3.4 Mocap viewer/player

3.4.1 Description

On top of the page users will meet the recording's name. In the current version title also works as a toggle button, in order to present all the details of the recording (Figure 17). Not only users can read the recording metadata but also, they have the opportunity to edit some of those details.

Directly below the component of the custom player shown in Figure 18. Player has been developed, in order to offer the ability of simultaneously watching and handling the motion capture file and the corresponding video. Player supports all basic functions, such as play, pause, move forward and backward, seek in specific timestamp, mute, increase or decrease volume and take current and total time.

Moreover, there is a button for hiding the timeline and annotation structures (hide annotations button), a button responsible to redirect users to another player (Choreomorphy viewer has been included as an extra view for the recordings), as well as a button for adding the recording to a playlist.

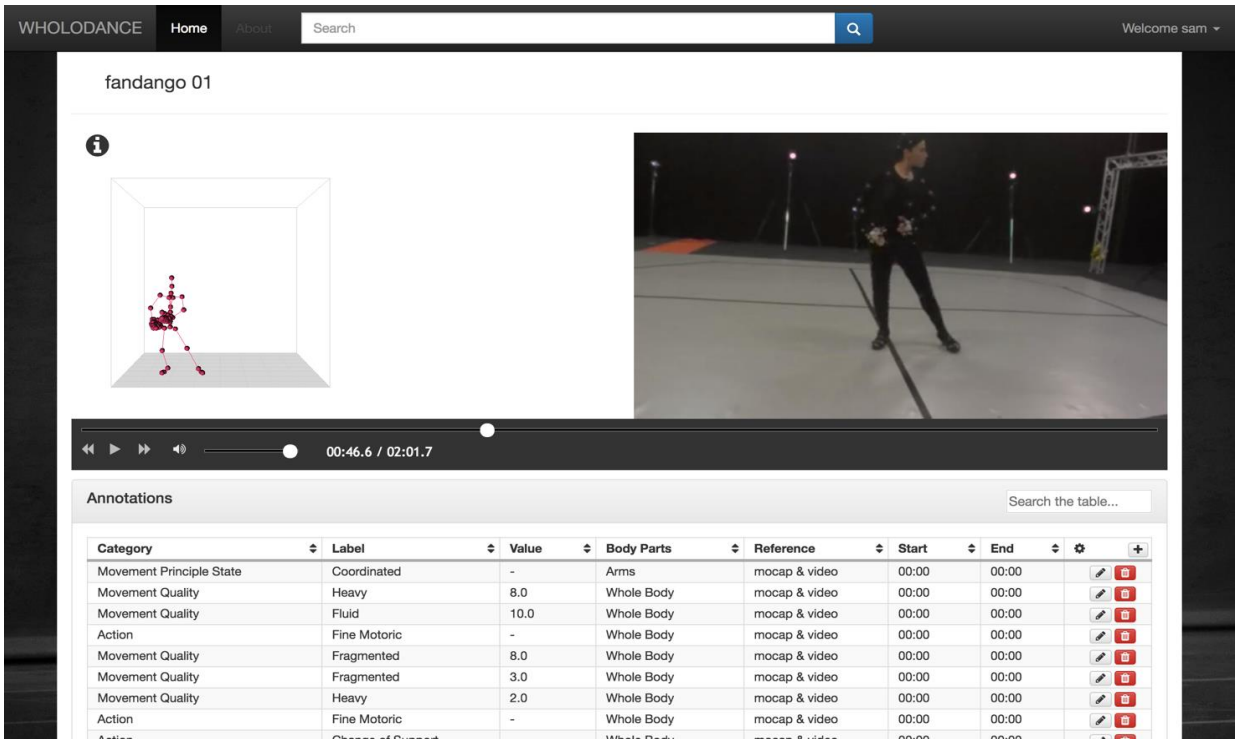

Figure 15. Old Version of the Viewer page - Player

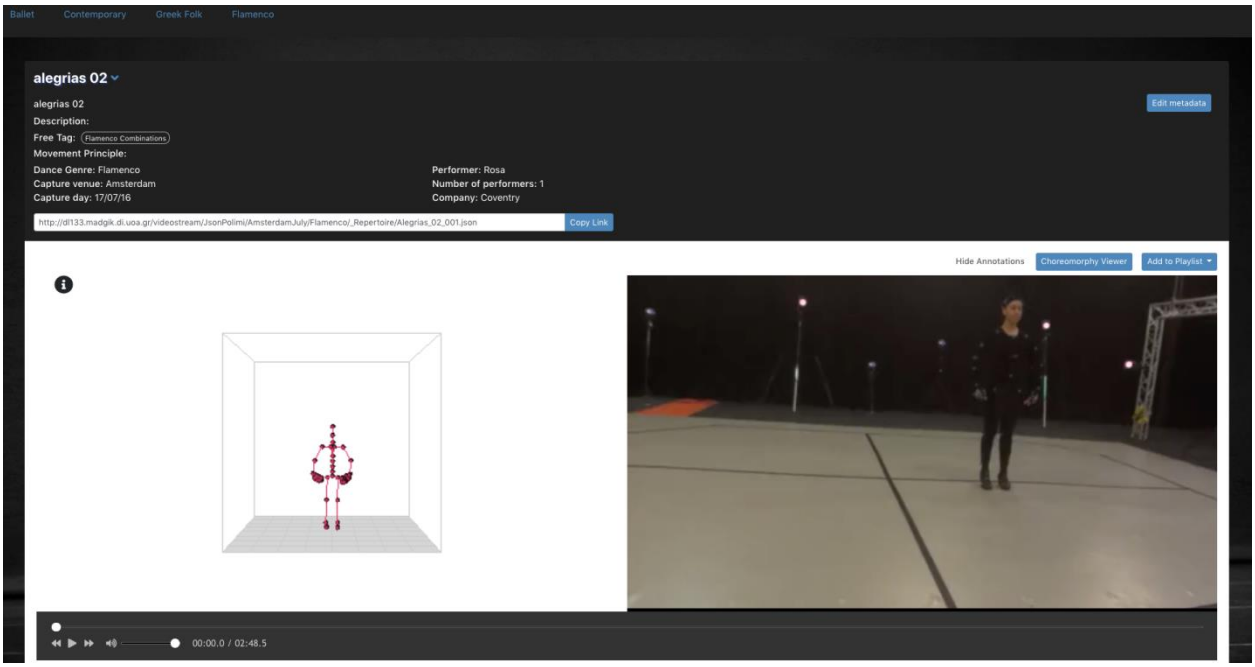

Figure 16. New Version of the Viewer page - Edit metadata

3.4.2 Related requirement

Home, browse and mocap viewer page constitute the basic components of the WhoLoDancE Movement Library application. Regarding the latter, it was essential to build a custom player serving as a view for the recordings. Each recording includes both a video and a motion capture. The need of simultaneously watching those files as well as interacting with them, led to the player's design and development.

3.4.3 Specifications

Viewer page constitutes an essential interface for the WhoLoDancE Movement Library tool, as it includes several important functionalities. Both in the old and new version (Figure 15 and Figure 16), viewer page is composed by three discrete components, the custom player, the timeline structure and finally the annotations table. However, during that last version a series of new functionalities have been developed.

Regarding the player's component, the new version has maintained all its key features. The player still supports play, pause, move forward and backward, seek in specific timestamp, mute, increase or decrease volume and show current and total time. Moreover, it still offers the opportunity to interact (zoom in/out, rotate, move) with the motion capture 3D skeleton.

During the last version, the player structure has been extended with options for creating a playlist, adding or removing the recording from a playlist (Figure 17), selecting another view (Choreomorphy viewer) and finally interacting with the timeline structure.

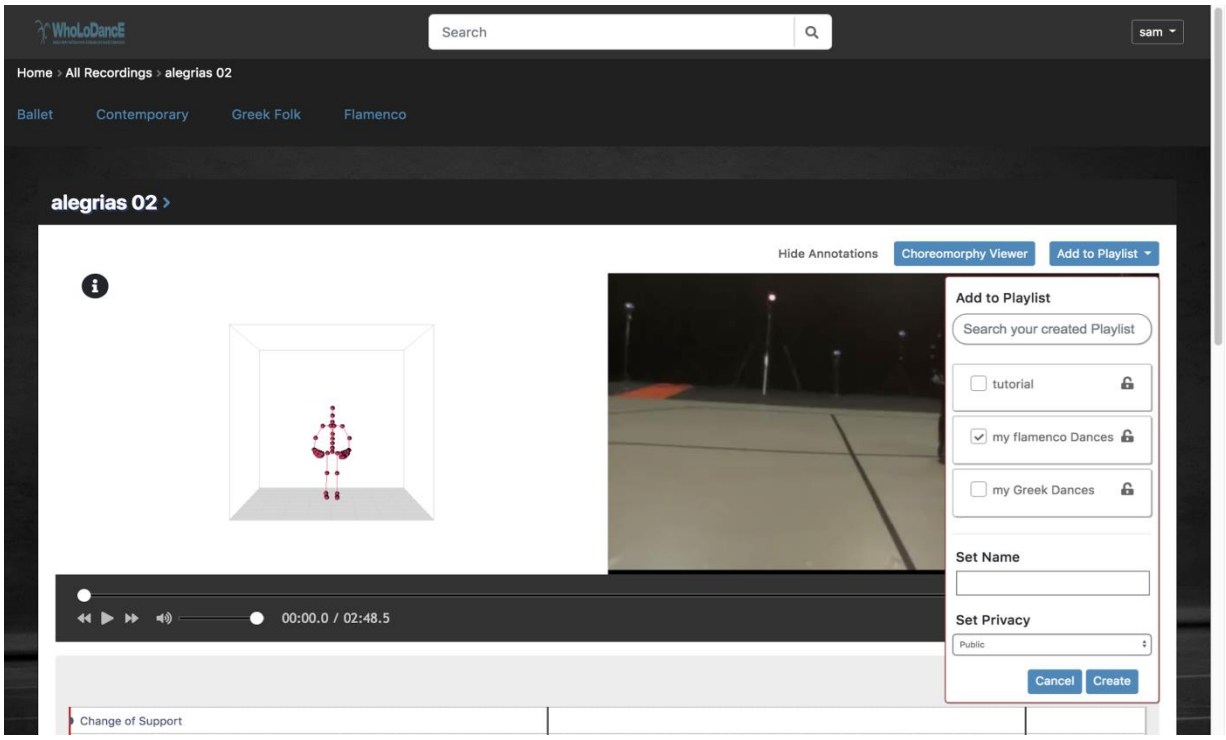

Figure 17. New Version of the Viewer page - Add to playlist

3.5 Annotation timeline

3.5.1 Description

Each recording stored in the WhoLoDancE Repository could be combined with several annotations that aim to describe and analyse the dancer's motion. Through that direction, the new version of the WML application includes a new structure for viewing the annotations.

More specifically a specialized timeline structure has been developed (Figure 18, Figure 19) that offers the opportunity to watch a movement and the relative descriptions, simultaneously. The Timeline structure not only does serve as an annotation viewer, but also allow users to add new annotations, edit or delete them. Several functionalities have been included to create a strong mean of viewing the annotations.

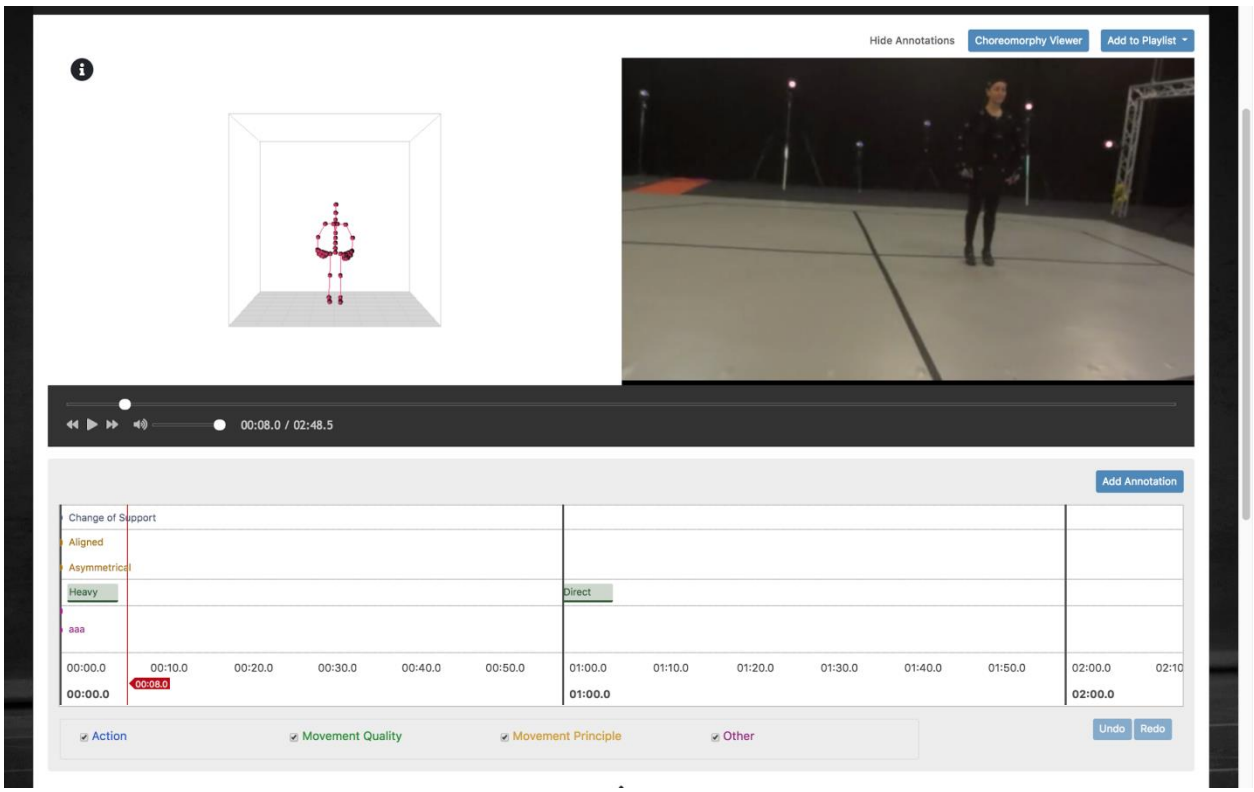

Figure 18. Annotation Timeline

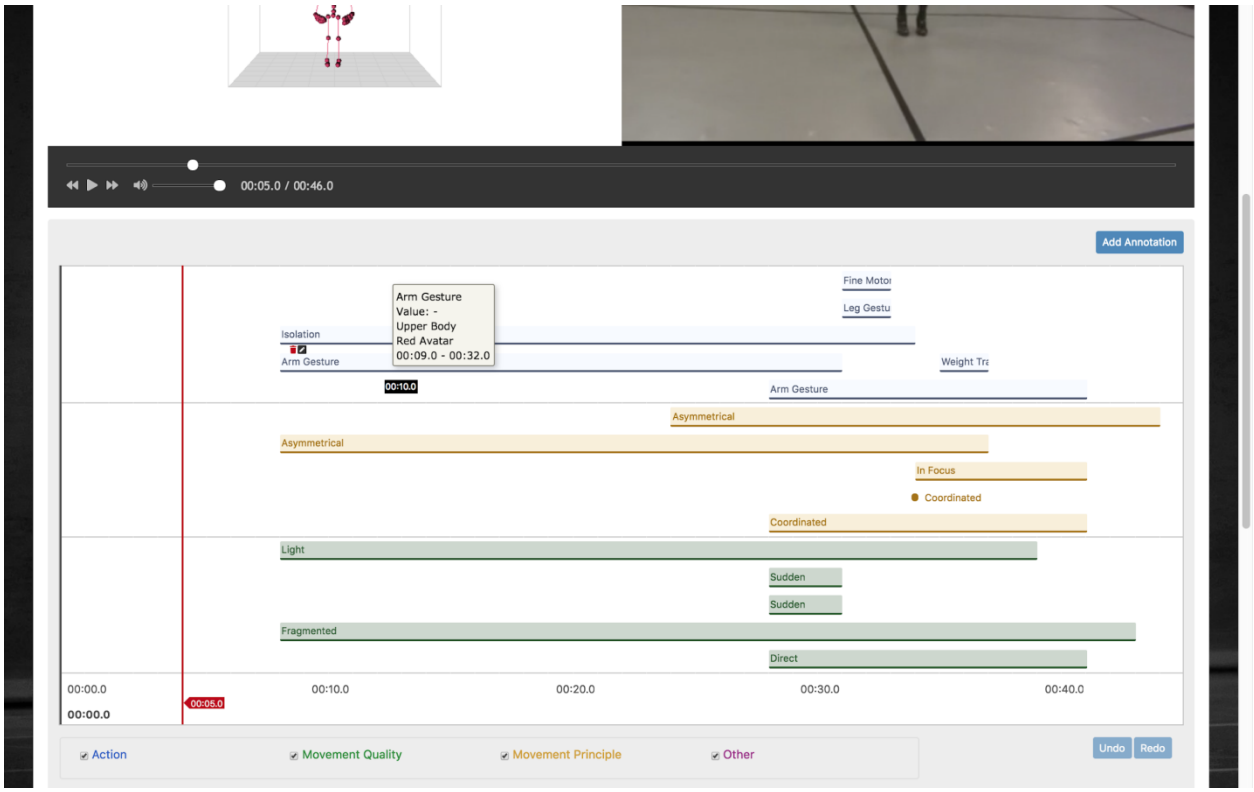

Figure 19 Annotation Timeline on hover option

3.5.2 Related requirement

During the previous version a table had been used serving both as viewer as well as a tool for the management of the annotations. However, the new version includes also a timeline structure. The timeline has been developed as an alternative view and management system for the annotations.

The new structure is able to provide a totally new perspective of viewing the motion capture files by relating time with comments. The timeline allows a more flexible and effective synchronised view of annotations while the recordings play. Specifications

The timeline structure serves as an alternative view option for the annotations of the recordings. Within the timeline, the user can add, edit or delete an existing annotation.

The range of the structure is dynamically adjusted accordingly to the recording's duration. The time scale is displayed every 10 seconds. A vertical red line synchronized with the player's seek bar, moves during the recordings playback and displays the current time. Moreover, when the mouse moves over the timeline structure, a tooltip follows the cursor and shows the time. At this point, users are able, by double clicking in an area of the timeline, to seek the specific timestamp of that recording (Figure 18, Figure 19).

Zoom in, zoom out, slide left or right are also some of the functionalities that were developed to enhance the timeline.

Depending on the duration, annotations could be divided in two categories. Those that refer to a specific time moment are displayed with a dot and those that refer to a time period with a square. Each annotation belongs in one of the following categories, "Action", "Movement Quality", "Movement Principle" and "Other". Depending on their category, annotations are presented with a different colour (Figure 19). When the mouse hovers an annotation, a tooltip with details appears, as well as options for deleting and editing.

Finally, users can filter the annotations by simply using the checkboxes that are placed below the timeline structure.

3.6 Annotations table

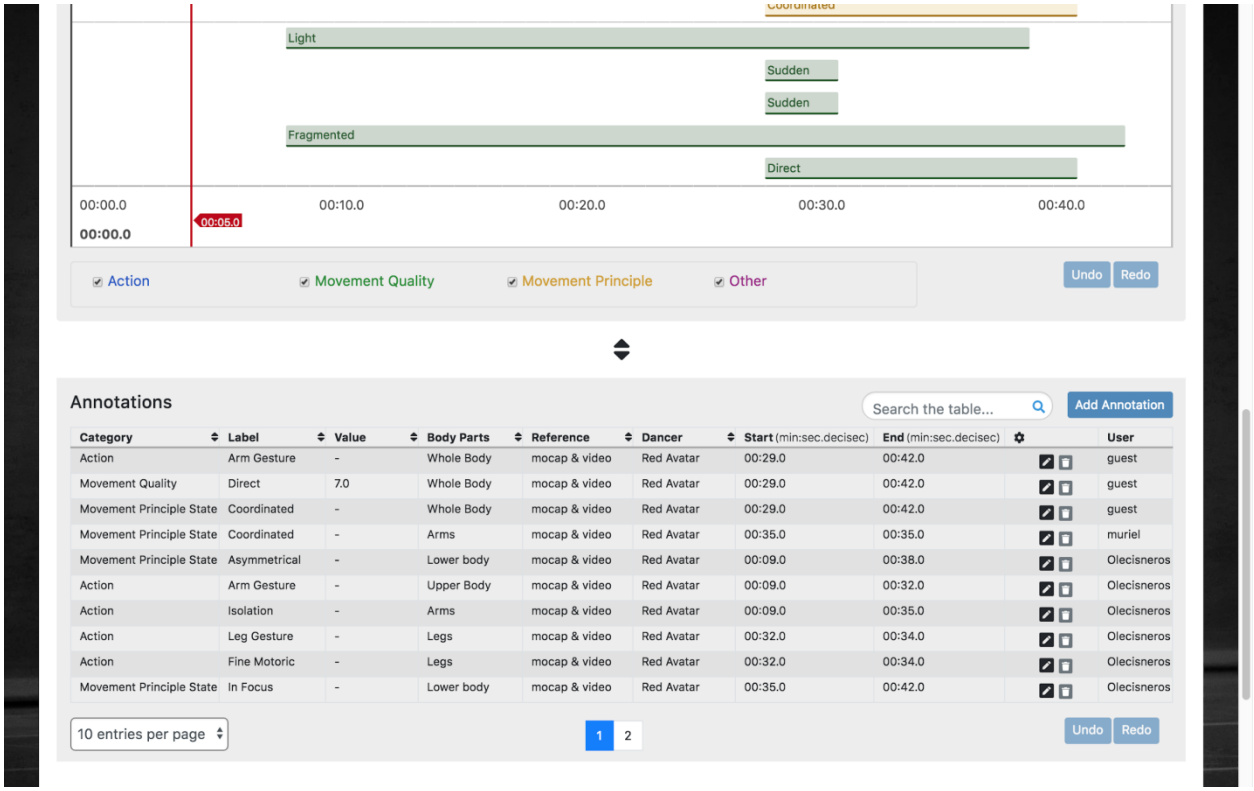

Figure 20. Annotations Table

3.6.1 Description

The Annotations table is a structure that has been developed in order to provide users with an effective tool for managing and viewing annotations. That structure that is also included in the previous version of the application, has been developed so as to support the necessity to quickly manage annotations.

The table structure supports several functionalities such as pagination, sorting and searching. It also allows users to add, edit and delete annotations. Each action is also connected with the timeline structure.

3.6.2 Related requirements

Annotations table has been created as an effective tool for viewing and especially for managing annotations. Combined with the timeline structure, users have the opportunity to select, which of those two structures is more suitable with their needs. The most important aspects of the annotations table structure are related to the process of comparing annotations, searching and sorting them.

3.6.3 Specifications

As it was described in the D5.2 report the annotations table is a specialized structure, which provides an efficient way to add, edit and delete annotations. It also includes several useful traits, such as searching the

table with keywords, regulating the number of annotations that will emerge in each page, as well as sorting the columns of the table. Undo and redo methods have also been implemented.

The table is enhanced to support the processes of adding new annotations, editing and deleting them. Add, edit and delete functionalities take place in-line on the table structure, offering extra flexibility and effectiveness.

3.7 Add, edit, delete annotations

3.7.1 Description

Two ways have been developed, in order to allow users to add, edit and delete annotations. Both the timeline as well as the annotations table have been developed as a means of viewing and managing annotations.

3.7.2 Related requirements

The decision to create a tool for viewing the WhoLoDancE recordings and combining the dancer's motion with specific annotations, has automatically created the functional requirements of easily adding, editing and deleting annotations.

That is the basic reason for which both view options are also combined with functionalities for managing the recordings. The timeline structure offers a fastest way for reading and managing annotations. On the other hand, the table appears more effective when several annotations must be managed, as it allows proceeding with the process by comparing and sorting them.

3.7.3 Specifications

The old version of the WhoLoDancE Movement Library tool was allowing viewing, adding or managing annotations only by using the Annotations table structure. However, during the last version of the tool, a timeline structure has been also included.

Figure 22 demonstrates the add annotation process in the table structure. Adding a new annotation results from the "Add Annotation" button, on the top, right corner of the table. The edit and delete options are reached from the corresponding buttons that are included in every table row. Add and edit actions take place directly on the table structure, without using any popup windows.

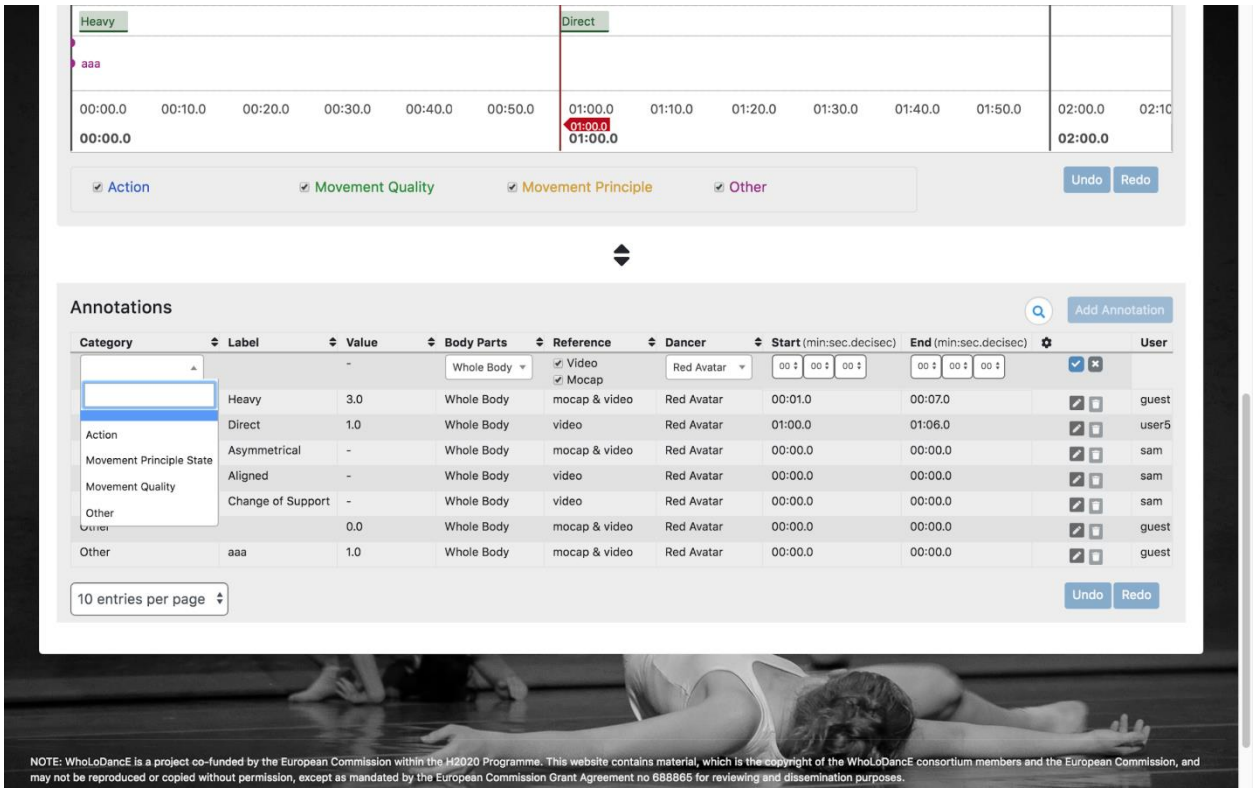

Figure 21. Annotation table

On the other hand, add and edit annotations by using the timeline structure, is achieved with popup windows (Figure 22). The Timeline structure also includes an "Add Annotation" button on the right, top corner. However, edit and delete options appear only when the mouse hovers a specific annotation.

Each action affects simultaneously both the timeline and the table structure.

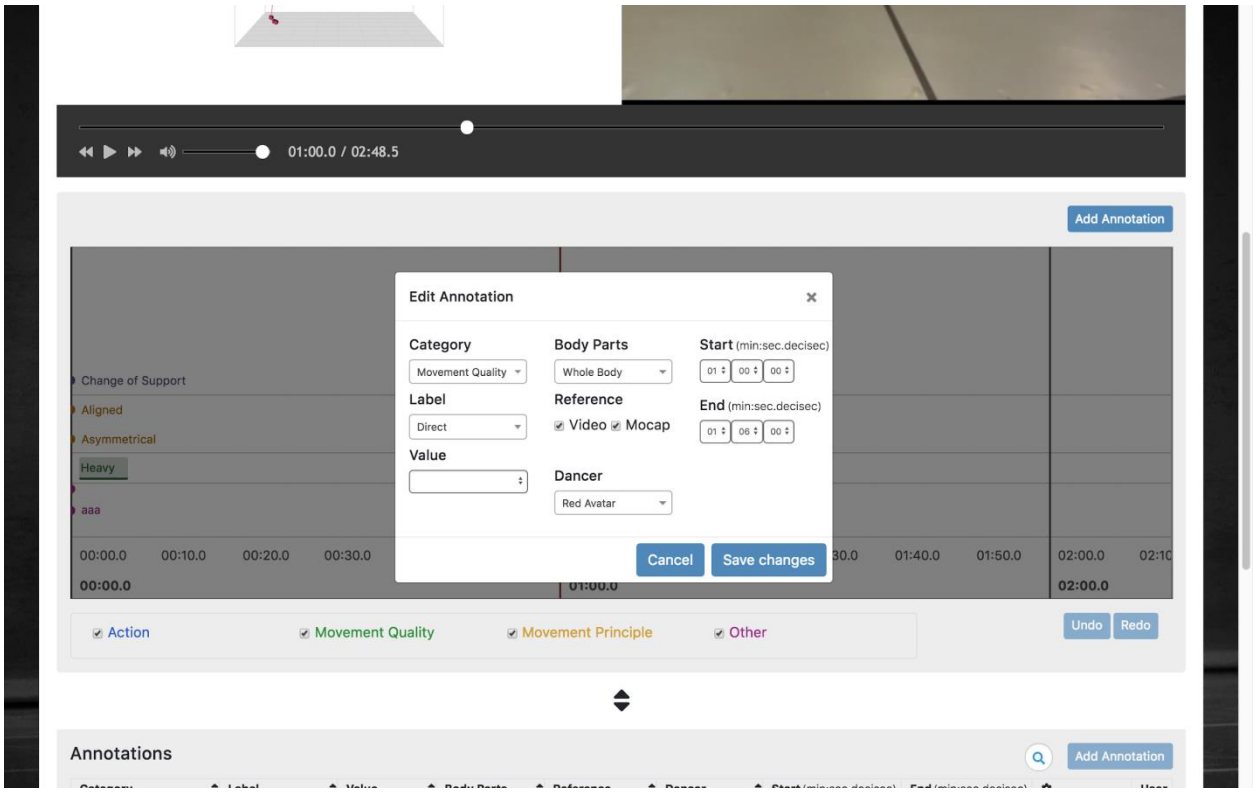

Figure 22. Using Timeline to add/edit annotations

3.8 Choreomorphy viewer

3.8.1 Description

WhoLoDancE Movement Library application has been developed to serve as an effective tool to bridge the gap between the users and the WhoLoDancE repository. In order to achieve that, it was essential to emphasize on the processes of searching and viewing the recordings. Regarding the latter, a new viewer, combined with specialized functionalities has been developed (Figure 23, Figure 24).

During the first version of the WhoLoDancE tool, mocap viewer was the only interface that was provided as a view option for the users. However, the last version comes up with two distinguished viewer interfaces. By clicking the Choreomorphy Viewer button on the top of the mocap viewer's interface, users would be redirected to the new player. Choreomorphy viewer's interface provides an alternative view for the motion capture recording.

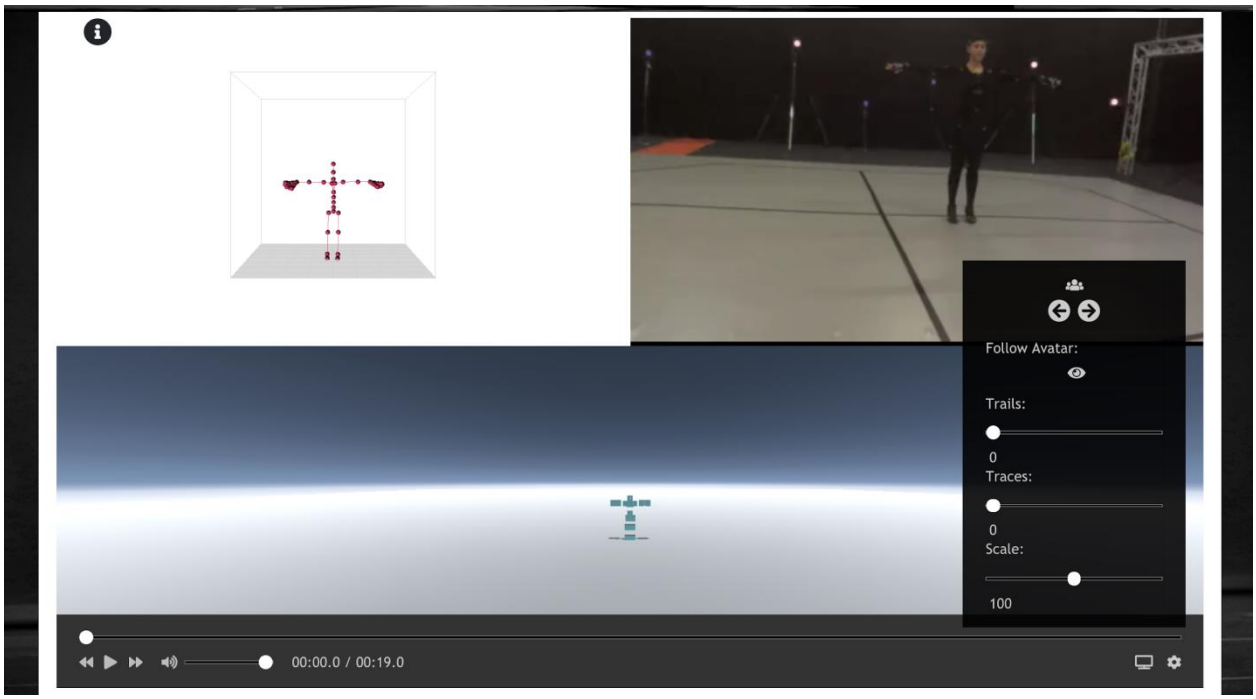

Figure 23. Choreomorphy Viewer Page

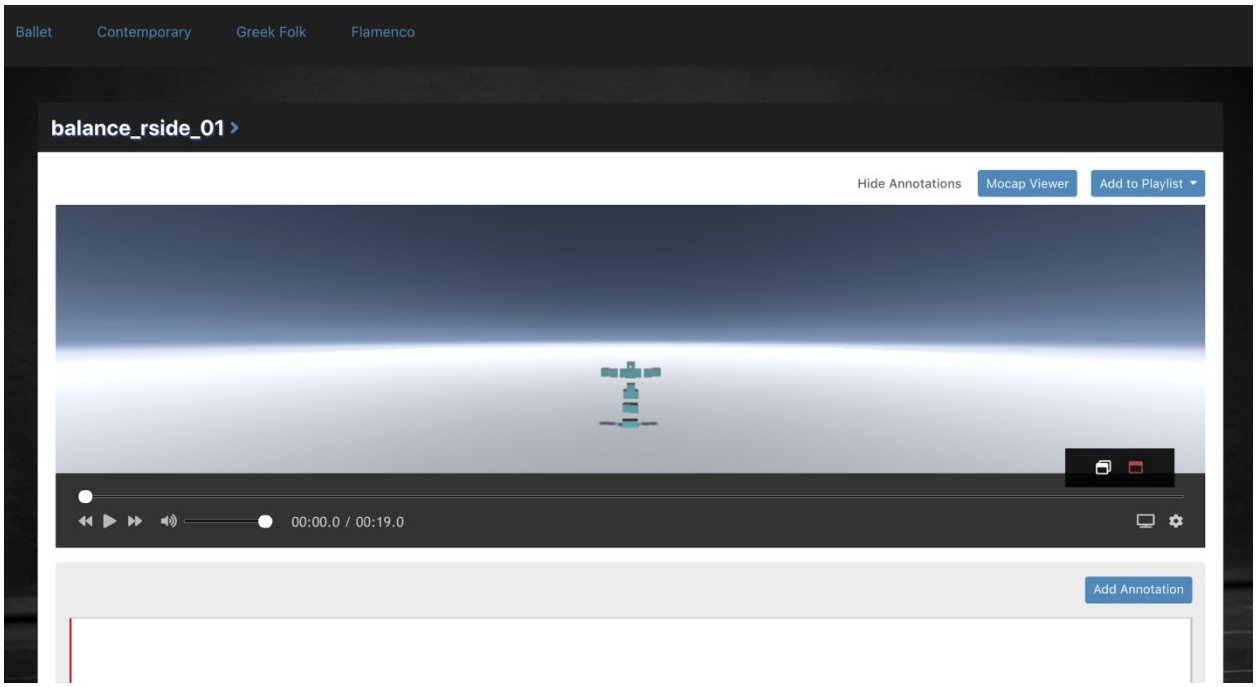

Figure 24. Choreomorphy Viewer Page 2

3.8.2 Related Requirements

Viewing the recordings of the WhoLoDancE repository and managing annotations on the recordings were some of the most important needs that the Movement Library tool tried to cover.

As it was shown by the evaluation process, both the motion capture 3D skeleton and the video, each one of them for different reasons, were extremely useful in understanding the movement of dancers.

The Choreomorphy Viewer has been developed in order to enhance the view structures by suggesting one more option.

3.8.3 Specifications

The Choreomorphy Viewer page includes all the functionalities that were mentioned for the "Mocap Viewer" page. On top of the page and by clicking the title of the recording, the recordings' metadata as well as an option for editing are provided. Below the metadata panel, the components of the Choreomorphy player, timeline and annotation table are located.

Choreomorphy player (Figures 23 and 24) is composed by three discrete structures. There is a view of the motion capture representing the dancer's body as a 3D avatar in a cube, the video of recording and finally the Choreomorphy viewer with a 3D avatar placed in a virtual environment. By selecting the monitor's icon, users can keep only the Choreomorphy structure (Figure 24). All three represent the movement of the dancer and they are totally synchronized not just between them but also with the timeline structure.

Even though both 3D avatar components look resemble, there are several differences not only in the environment that these are placed but also at their functionalities. In both views, users have the opportunity to rotate and zoom in/out the scene. However, Choreomorphy view also offers options for altering the avatar, automatically rotating-following the camera depending on the avatar's movement, modifying the scale of the avatar, adding trails and traces. Those functionalities appear when the user clicks on the gear icon (Figure 24).

Initially, Choreomorphy view component constituted a distinguished Unity project. However, the WebGL build option has been used, in order to allow Unity to publish content as JavaScript program which use HTML5 technologies and the WebGL rendering API to run Unity content in a web browser.

3.9 Playlists

3.9.1 Description

WML application latest version comes also with a complete playlists system. Avoiding the repeated process of searching among several recordings, playlists system provides a more personalized experience by offering users the choice to create their personal channel, in which they can save their own playlists.

3.9.2 Related requirements

The vast number of recordings, the difficulties that might emerge from the lack of experience with the use of the tool, as well as the probably unknown semantics, had played a decisive role in the decision of creating personal channel and playlists.

The creation and management of a personal repository that includes grouped recordings of interest, offers a totally different and more personalized aspect on the platform.

3.9.3 Specifications

Assuming the role of a personal repository, this new feature allows users to gather recordings of interest in playlists and directly search, select and display their selections.

Figure 18 demonstrates the interface of a personal channel. Under the title “Created playlists” users would find their created playlists combined with a title and the included number of recordings. By hovering the image of a playlist, the “Play All” option appears. Current interface includes also an option for the creation of a new playlist. The “Create Playlist” button reveals a dropdown menu (Figure 25), in order to clarify the new playlist characteristics. Title, description and privacy are the three traits that could describe a playlist.

The playlist’s title also serves as a link, which redirects users to the “Playlist Info” page.

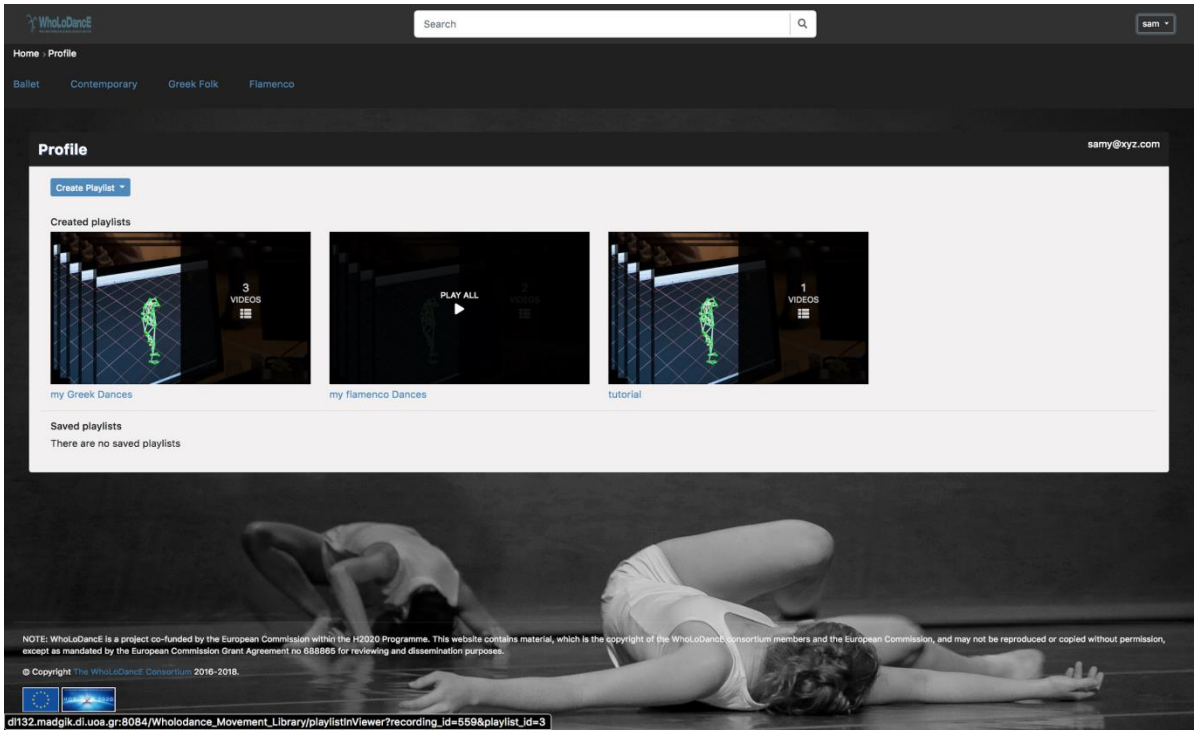

Figure 25. Personal channel and created playlists

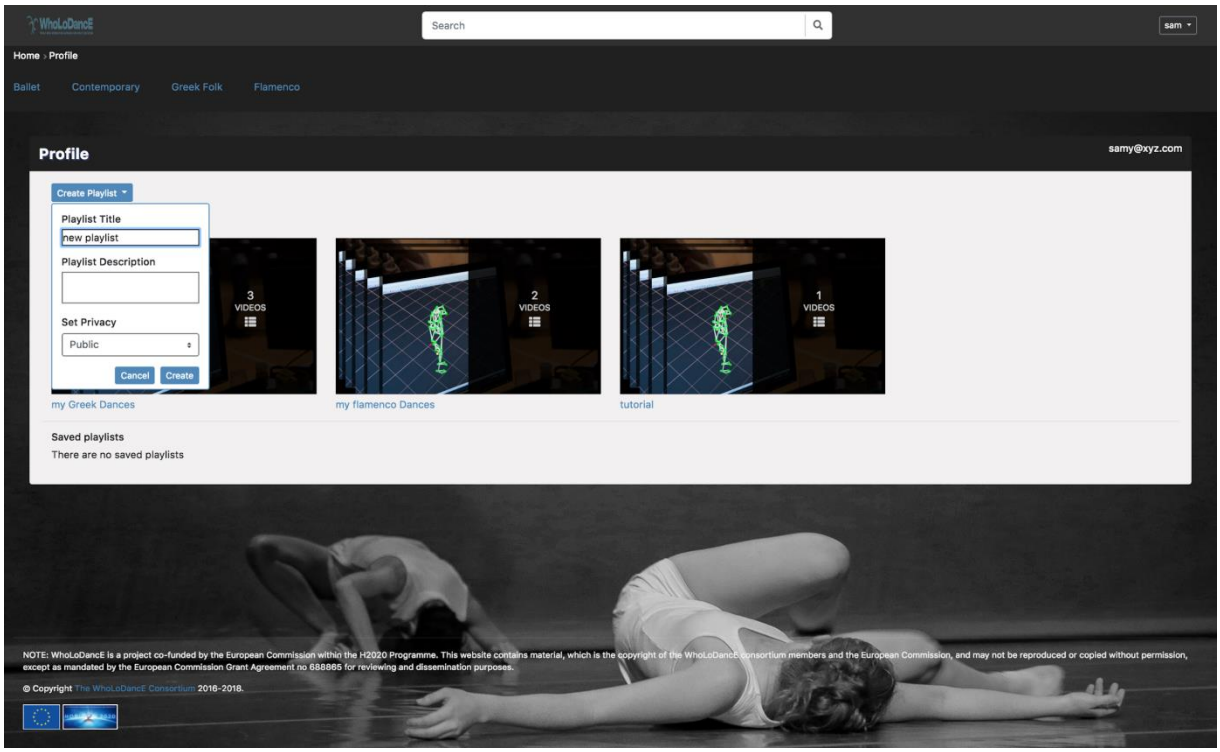

Figure 26. Personal Channel - Create new playlist

In the "Playlists Info" page (Figure 27), users can read the list of tracks that are included in a playlist, as well as details relevant to that. Moreover, users have the opportunity to select the play button, to change the Playlist settings or even delete a playlist. Deleting specific recording from the list is also supported.

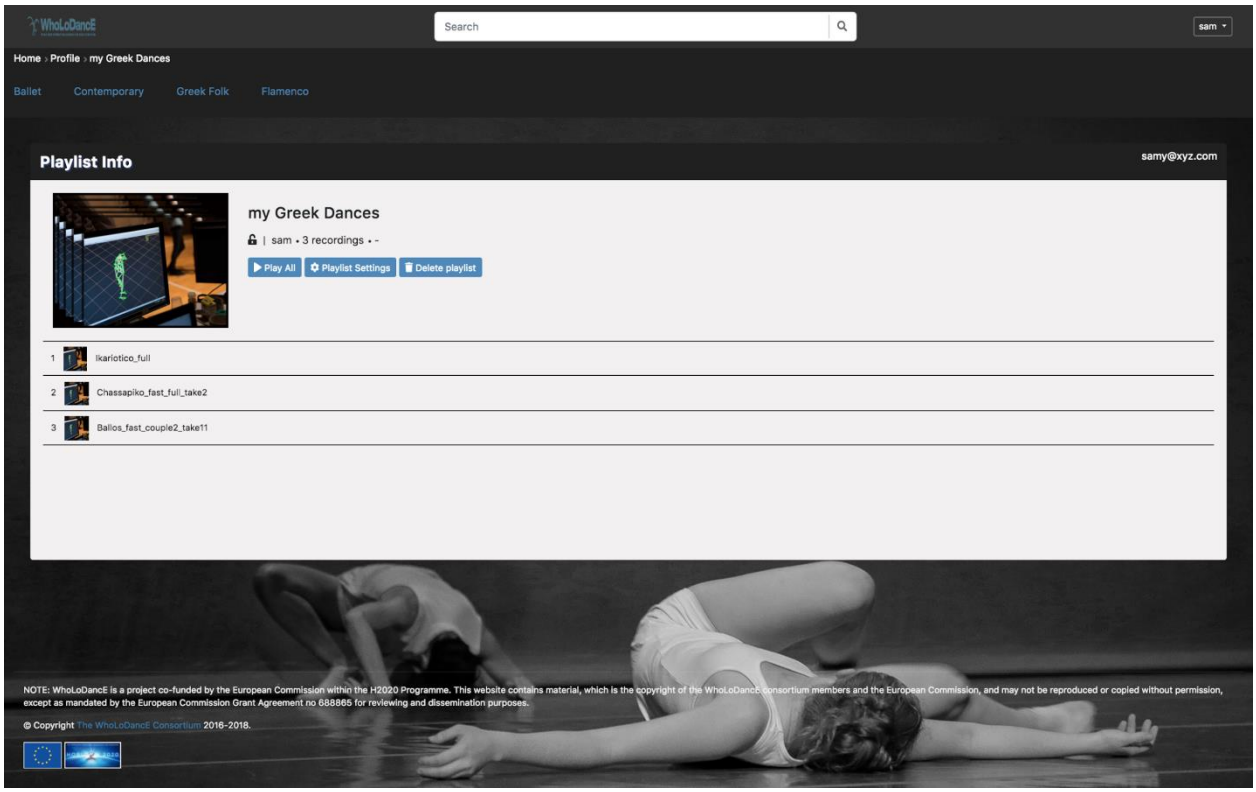

Figure 27. Playlist's Info page

Creating a new playlist is both provided through the viewer and Playlists/Profile pages. On the top right corner of the "Viewer" page, the "Add to Playlist" button is located. This button reveals a dropdown menu, allowing to include the current recording in a new playlist or in any of the already created lists. Figure 28 demonstrates, how the custom player is formed, when the play all (all tracks of a list) button is selected.

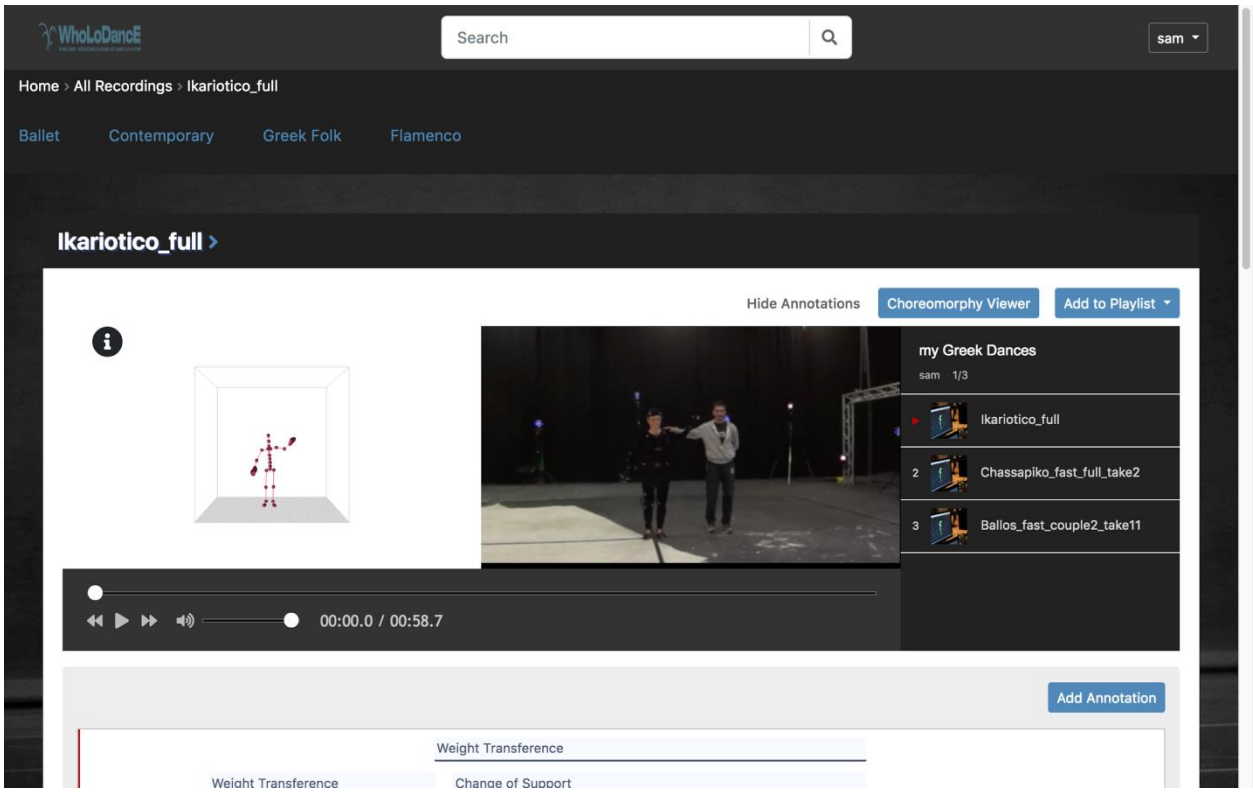

Figure 28. Mocap Viewer - Play the tracks of a playlist

4 Testing and validation

This section presents the results of the testing and validation activities of the WhoLoDancE platform.

4.1 SWOT analysis

This section presents the SWOT analysis of the WhoLoDancE platform (Table 1).

Strengths	Weaknesses
WhoLoDancE Movement Library ▪ Several functionalities are supported from the same platform, such as searching, browsing, viewing and annotating the WhoLoDancE recordings ▪ Responsive design allowing to use the Platform from personal devices, such as smartphones **Search/browse** ▪ Search WhoLoDancE repository using metadata as keywords ▪ Add or Edit recording metadata ▪ Manage results with filtering and pagination functionalities **View recordings** ▪ View motion capture recordings with different viewers ▪ Interact with the 3D avatar of the mocap (zoom, rotate, move, change 3D avatar, add traces and trails) **Annotations** ▪ View, add and manage annotations through a timeline or a table structure ▪ Custom annotations (without vocabulary restrictions) could be created **Playlists** ▪ Create and manipulate personal playlists	**WhoLoDancE Movement Library** ▪ Offline use of the Platform is not supported **Search/browse** ▪ Browsing is focused only on dance genre selection ▪ Search process requires specific vocabulary **Annotations** ▪ Recommended annotations are not offered
Opportunities	**Threats**

WhoLoDancE Movement Library ▪ Could support specialized lessons, depending on the user's dance interests and skills ▪ Could be used as a tool for dance lessons preparation ▪ Able to provide integration with other dance tools **View Recordings** ▪ Project Annotations directly on the 3D avatar of the mocap ▪ Provide suggestions depending on similar traits ▪ Provide suggestions depending on similar annotations ▪ Provide suggestions depending on users' interests and dance skills **Annotations** ▪ Annotating by clicking on specific body parts of the 3D avatar	**Choreomorphy viewer** ▪ Using the Choreomorphy Viewer from personal devices, such as smartphones, might be impossible **Search/browse** ▪ Users may not be positive towards a searching process with specific vocabulary **Annotations** ▪ Users might have difficulties, with annotating on a table structure or a timeline, while watching the recordings

4.2 Testing of the platform

Bugs/Improvements	Status
Show timeline with the annotations	Completed
Alternative view options (Choreomorphy Viewer)	Completed
Personal channel for each user	Completed
Create, manage, view and display playlists	Completed
Methods for editing metadata	Completed
Enrich metadata shown in each result	Completed

5 Maintenance plan

The Data management platform is installed at the ATHENA Research Center Servers. The Servers are maintained, and the content is backed up on a regular basis.

Overall, the project consortium and ATHENA Research Center in particular commits to retain the platform operational and the data available for at least years after the end of the project. Migration patterns are planned to take place in line with the development of the standards and technologies adopted by the project.

After this period the maintenance of the platform will be defined according to potential exploitation plans by the project consortium. The strategies for covering the platform sustainability costs are closely related with the strategies and approaches the project will put in place for the exploitation and sustainability of the entire project results.

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