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Real-Time Collaborative environment for interior design based on Semantics,Web3D and WebRTC

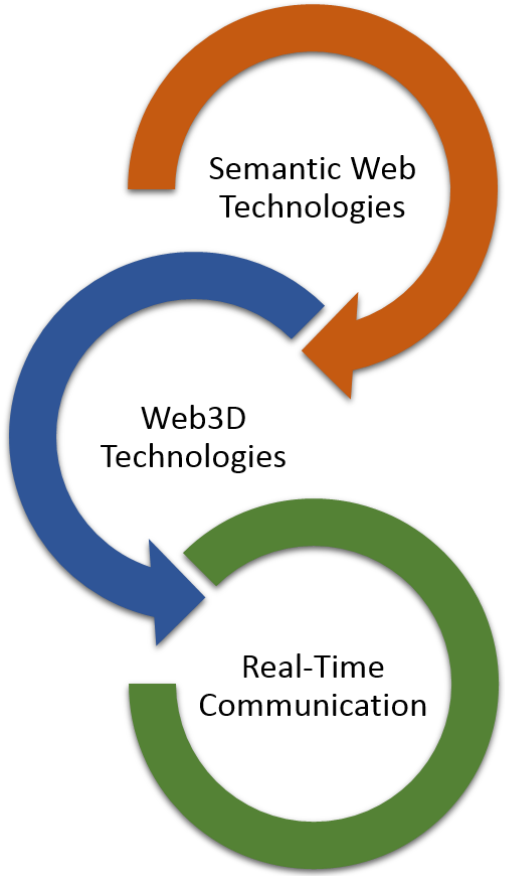
Malvina Steiakaki, Konstantinos Kontakis, Athanasios G. Malamos
Dept. of Informatics Engineering
University of Applied Sciences Crete (TEI of Crete)
Heraklion, Greece

Introduction

Our research in the domains of decoration and interior design pointed out that the majority of applications provide visual representation and customization capabilities according to user's desires. However, despite the fact that their visualization motive can be easily understood by the users and can be enriched with specific content and attributes (furniture, materials, colors, etc.), their overall functionality requires the installation of a custom-made browser plugin or additional software programs.

In our work we merge…

X3DOM is an open-source JavaScript framework capable of integrating 3D content into any webpage without the use of plugins



Semantic Web aims to transform the data by integrating human concepts and their relations to improve organization and boost search capabilities.

WebRTC is an innovative technology that allows Real-Time Communication through several JavaScript APIs

Our work

extends the capabilities of the room designer to a

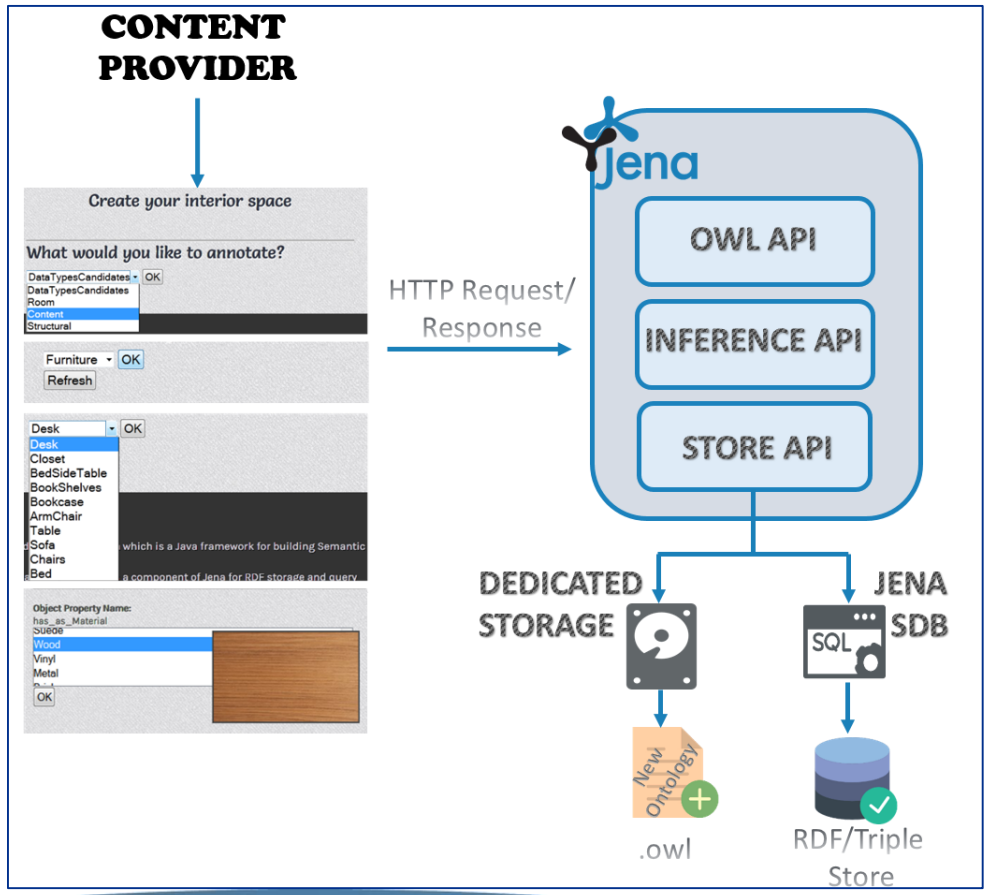
- ✓**fully interactive**
- ✓**real time**
- ✓**plugin free**
- ✓**Multi-point conferencing environment**

Moreover enhances our designer with a **recommendation system** supported by

- ✓**a semantic triple-store repository** of designs pre-stored by experts and
- ✓**reasoning system** by a SPARQL queries

Deco system

Semantic triple-store repository

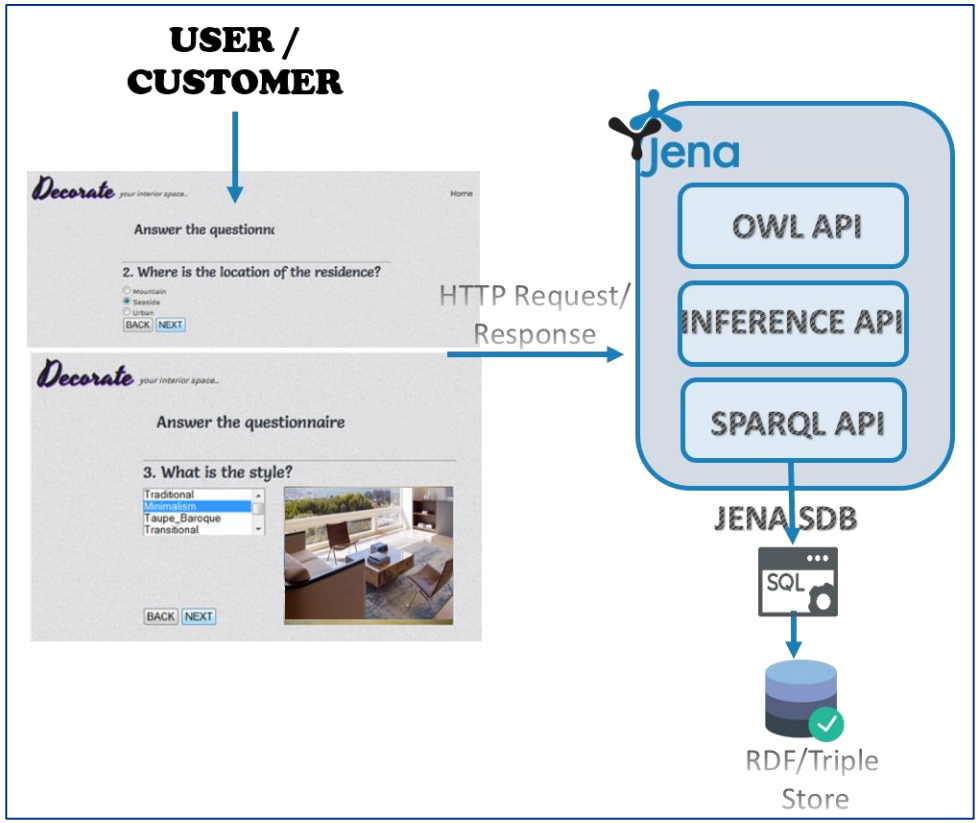


The first step in the process of DECO system is the population of the knowledge base with items to be used in rooms. A content provider, can use the web-based platform interface to assign individuals to classes and define their properties.

The content provider is able to modify the ontology through Jena Framework with the assistance of dynamically generated dropdown menus, add new individuals, modify existing ones, or add new statements to the current instance of the OWL-DL ontology.

Deco system

Reasoning system



User/consumer is able to query and search all the ontologies through an easy-to-answer questionnaire backed by an SDB Triple Store mechanism with reasoning capabilities with SPARQL API. The results of this query are then sent back to the user as the potential decoration solutions that match their needs.

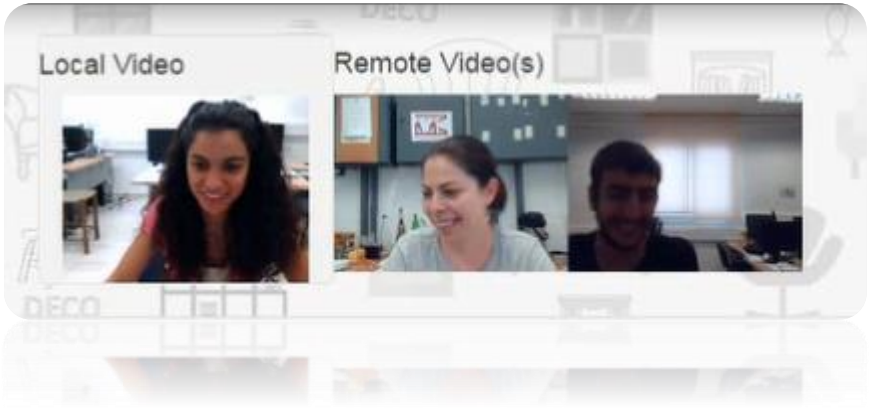
Collaborative environment

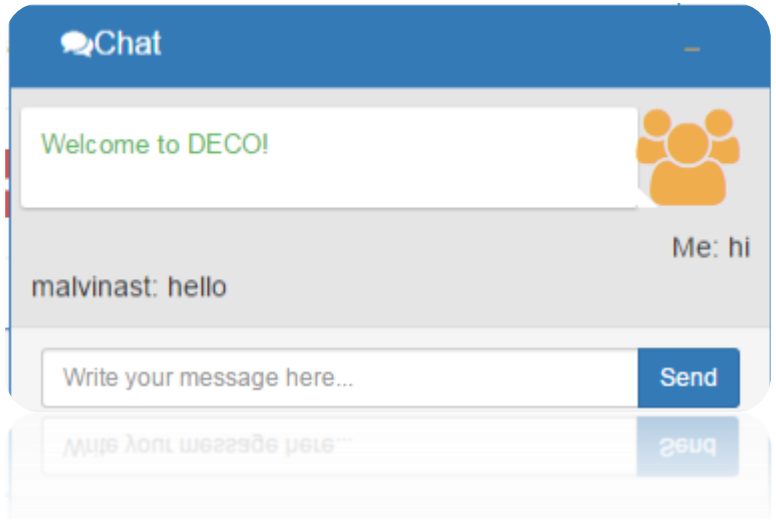
In order to provide friendlier UI experience to the end users

- ✓We use Node.js and socket.io to provide a collaborative environment with real-time communication capabilities
- ✓Our application ensures data integrity through a secure channel of communication via HTTPS protocol
- ✓We have developed our own MCU for the streaming of messages through the server

Collaborative environment

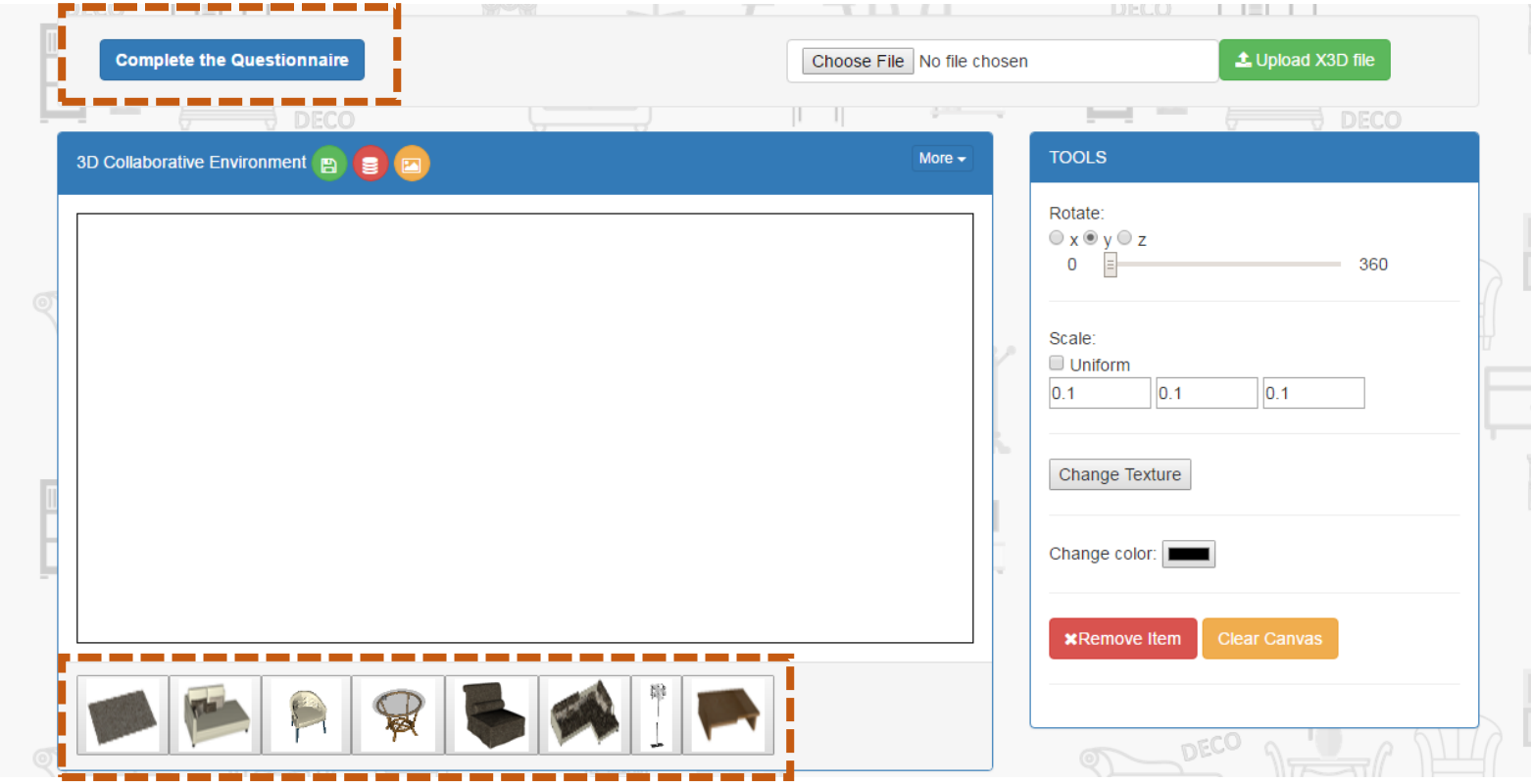
Multi-point conferencing (Video calls & Chat)





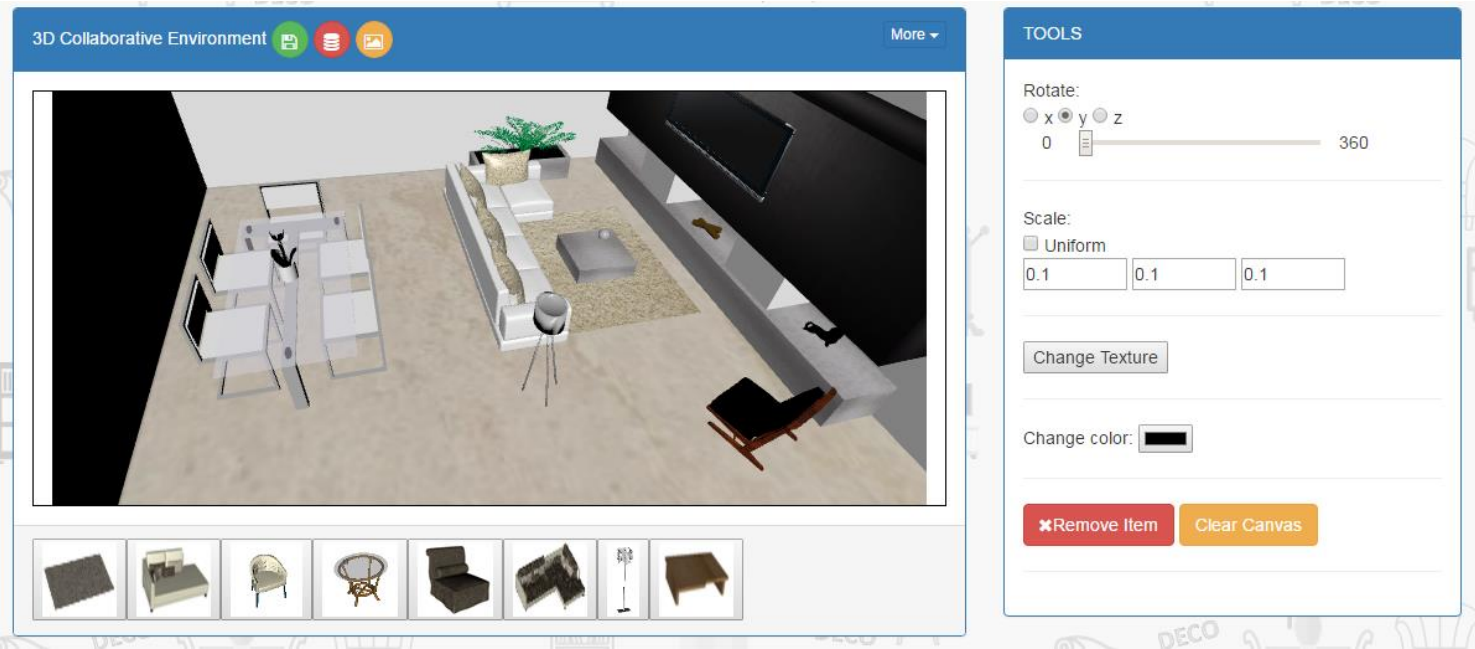
Collaborative environment

Semantic Web capabilities



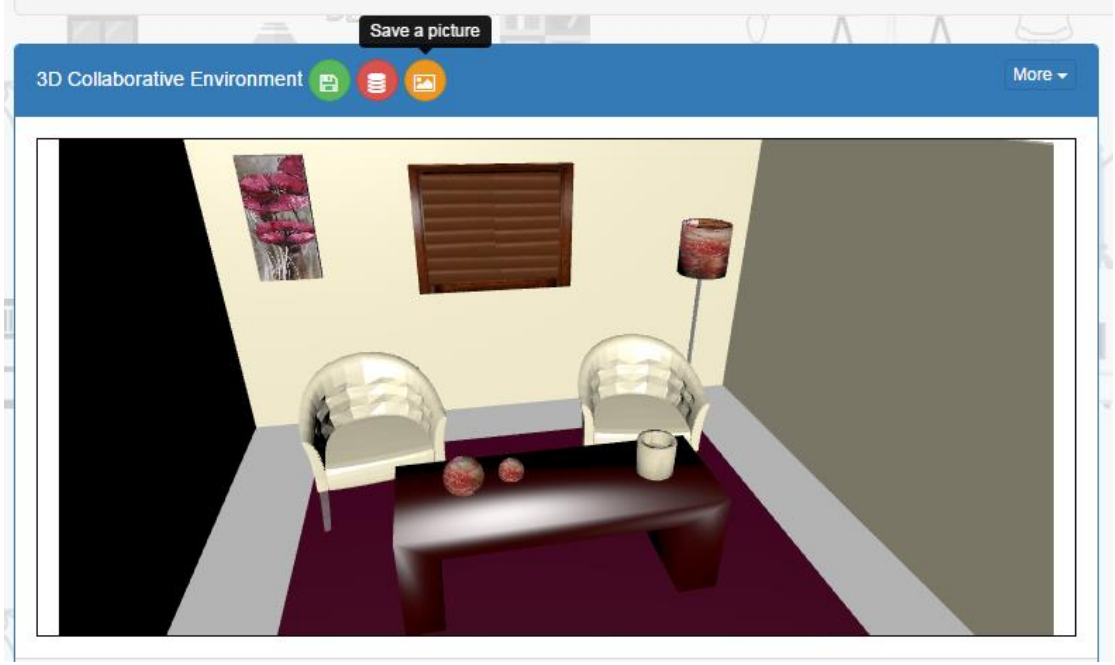
Collaborative environment

X3DOM Environment & Web Editor



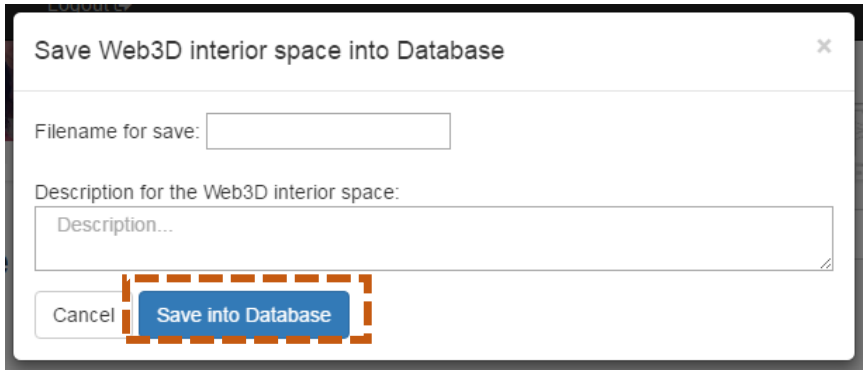
Collaborative environment

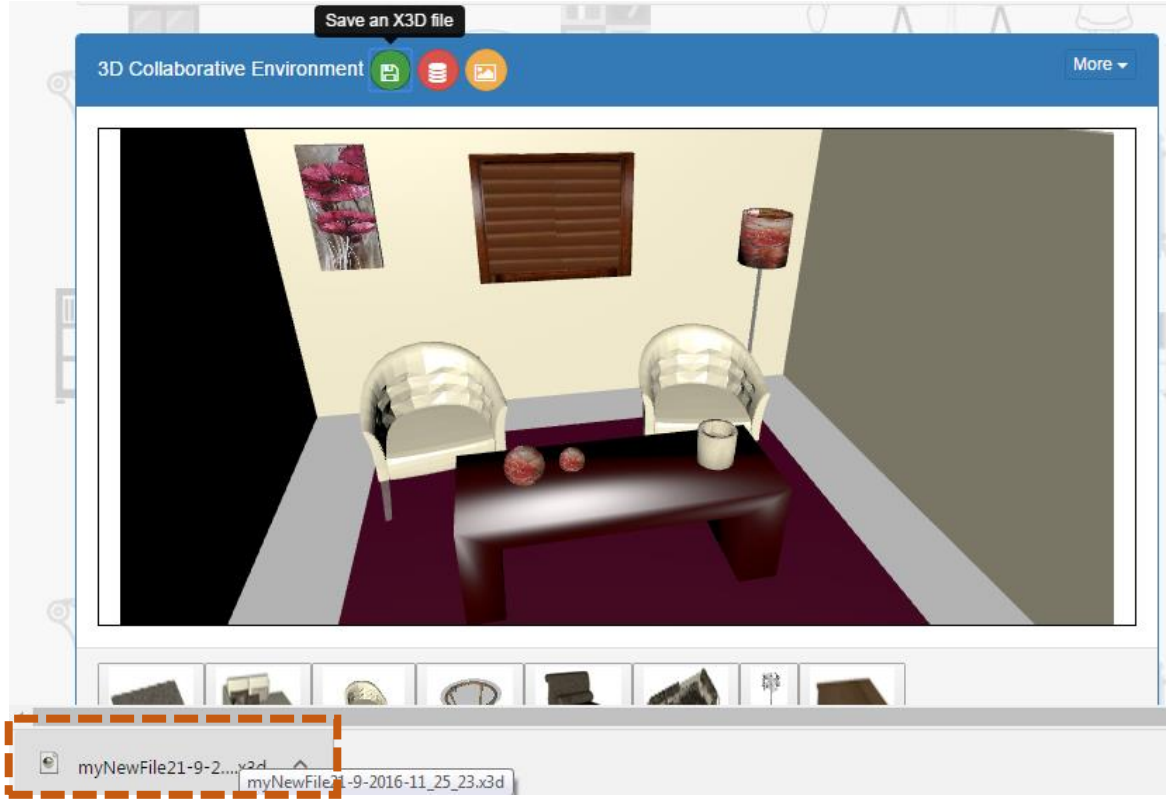
Storing capabilities



Collaborative environment

Storing capabilities





Collaborative environment

Uploading capability

Demo video

Conclusion

Summarizing, we have developed a web-based communication architecture with a 3D modeling environment for the purposes of a collaborative design management tool. The users of the same session share and work together upon the same web page and 3D scene, possessing the ability to change the scene and directly transmit the update to other users. Even though that the implemented application is in its primary steps and can be of use for non-professional customers/users, it can be further enhanced with extra functionalities and real-time recording capabilities for content providers and interior design companies. Our work also involved state-of-the-art technologies that are independent of plugins or additional software.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