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1.Eco-solar transformer architecture, J. Cruz Pinto, S. Sazedj, L. Cavic, M. C. Mantas, 16th Advanced Building Skin Conference & Expo 21-22 October 2021, 2021, Bern, Switzerland, Carl Maywald, Advanced Building Skin Conference, Proceedings 2021, Advanced Building Skins GmbH, pages 440 - 449, ISBN 978-3-9524883-6-2 https://spaces.hightail.com/receive/aq0l4j9OxA.

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Poster 1/2

Architectural Storytelling

CiAUD Centro de Investigação em Arquitetura, Urbanismo e Design

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Advancing Architectural Specialization and Sustainability: Harnessing Rhino and Twinmotion for 3D Visualization Impact

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Keywords
Visual narrative, Visual Storytelling, and Design presentation

Partner Institutions

Expected Future Partner Institutions
To be determined as per submission and acceptance

ABSTRACT + IMAGES

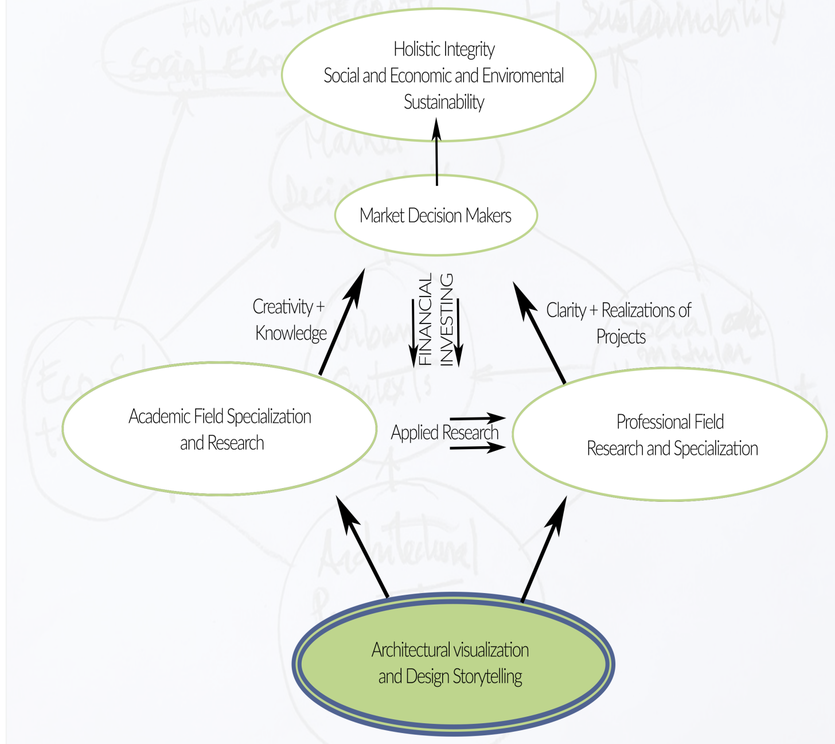
This research proposal aims to investigate the utilization of 3D visualization tools, to enhance architectural education, to promote innovative research methodologies, and to improve knowledge dissemination within academic institutions, and to analyze various aspects within the academic, professional, market, and socio-economic domains of the architectural field. By leveraging these advanced visualization methods, we intend to contribute to the overall improvement of architectural research, decision-making processes, project financing, and sustainability efforts.
The novelty of this research is to create a method and a tool for presentation that associates with story telling. This story telling tool has to facilitate the presentation work of the architect in the professional field and must be pleasant and comprehensive for the recipient. It gives the architect an opportunity to reach out to the society in all professional levels, as decision makers, stakeholders, investors, owners etc. Through an interdisciplinary approach, this study seeks to address the challenges and opportunities associated with architectural visualization and propose innovative solutions to create a positive impact on society. For this purpose a general methodology is developed that is than applied on a specific architectural project to verify its efficiency and the way it can be improved not only scientifically but also in exchange of experience with the society in general. Furthermore, the research intends to reach the following goals:
1. Creation of an experimental specialization course at FAUL in architectural design associated with research into the means of digital representation 3D Models, Animation, Hypertext and Marketing; The specialization course may in the future be converted into a specialization branch of the Master in Architecture
2. Applied research in the professional field of architecture and urban design: Praxis (Architecture offices and studios)
3. Architectural Storytelling aims to be presented to Decision Makers.
4. As an ultimate goal, it seeks to contribute to an integrated Holistic Conception in terms of environmental, social and economic sustainability,

The Architectural Storytelling will be applied to the following cases Case Studies:
1. ESTAT -Eco-Solar Transformer Architectural Technology
2. Urban-Architectural Contextualizations
3. To other creative and innovative projects with a sustainable reach in social and material terms related to the Green Deal (rammed earth, adobe, timber, bamboo, water cycle, green energies integration and bioclimatic solutions).
By addressing the stated objectives, this study aims to contribute to the academic and professional specialization, influence market and decision-makers, support financing of architectural projects, and promote social and economic environment sustainability through the application of architectural visualizations.
The research plan outlines a comprehensive exploration of the capabilities and potential benefits of using Rhino, Twinmotion, CAD and latests AI tools, along with a budget estimation of 7500 Euros to support the project's execution.

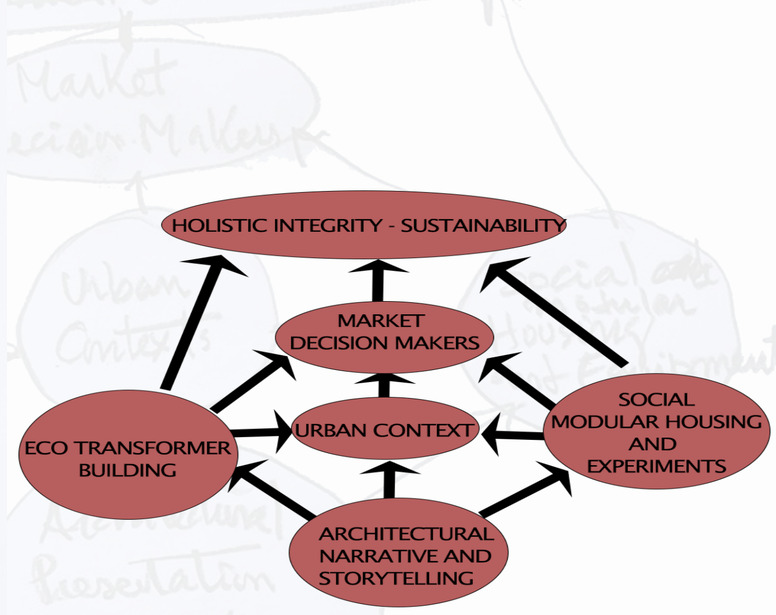
OBJECTIVES

3D visualization tools that can in the

1. Academic field of architectural specialization and research: enhances architectural education, and improves knowledge dissemination.
2. Professional field of research and specialization: have impact on professional architectural practices, and collaboration among stakeholders, to improve efficiency, accuracy, and decision-making processes.
3. Market and with decision-makers: effectively communicate design concepts, facilitate client engagement, and capture the attention of decision-makers within the architectural industry and related sectors.
4. Financing of architectural and design projects: attract funding for architectural and design projects by presenting visually compelling proposals to potential investors, sponsors, and donors.
5. Social and economic environment sustainability: contribute to sustainable development, urban planning, and the creation of socially and environmentally conscious built environments



General



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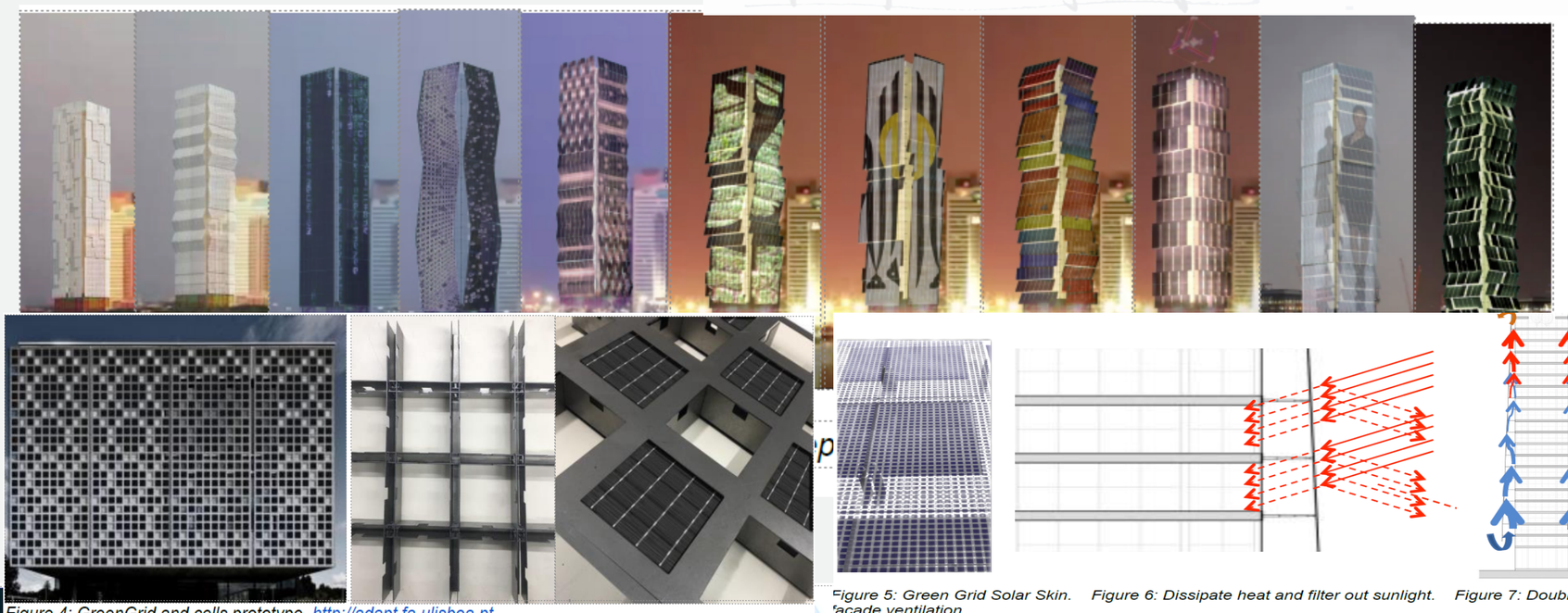

Figure 4: GreenGrid and cells prototype. http://adapt.fa.ulisboa.pt

Figure 5: Green Grid Solar Skin. Figure 6: Dissipate heat and filter out sunlight. Figure 7: Double façade ventilation

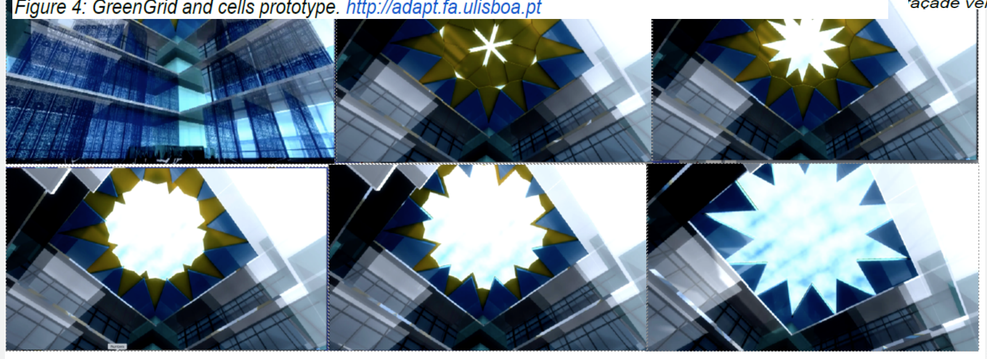

Figure 2: Eco-Solar Transformer, the 5th façade, celling diaphragm opening movement, conceptual visualization. J. Cruz Pinto and L. Cavic.

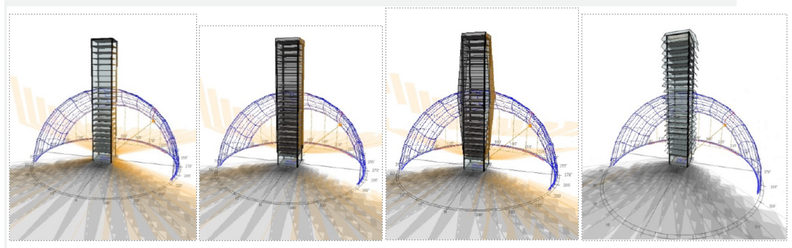

Figure 9: Eco-Solar Transformer: solar geometry diagrams.

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Poster 2/2

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SCIENTIFIC RELEVANCE FOR THE DISCIPLINE

The proposed research is expected to make significant contributions to the field of architectural specialization and research by advancing knowledge in the following areas:

- Enhancement of architectural education through the integration of 3D visualization techniques.
- Development of innovative research methodologies in architectural visualization.
- Understanding the influence of 3D visualization on decision-making processes within the architectural industry.

Expected Economic and Social Impact: The research outcomes have the potential to generate substantial economic and social impacts, including:

- Improved competitiveness of architectural professionals by leveraging advanced visualization technologies.
- Increased market demand for architects proficient in 3D visualization tools.
- Enhanced decision-making processes leading to more efficient and sustainable architectural designs.
- Attracting funding and investment for architectural and design projects through visually compelling proposals.

EXPECTED ECONOMIC AND SOCIAL IMPACT

The research outcomes have the potential to generate substantial economic and social impacts, including:

- Improved competitiveness of architectural professionals by leveraging advanced visualization technologies.
- Increased market demand for architects proficient in 3D visualization tools.
- Enhanced decision-making processes leading to more efficient and sustainable architectural designs.

Attracting funding and investment for architectural and design projects through visually compelling proposals

RESEARCH PLAN AND TASKS

This research proposal aims to investigate the potential of 3D visualization using Rhino and Twinmotion and other effective tools, to enhance various aspects within the academic, professional, market, and socio-economic domains of the architectural field. The objective of this study is to assess the effectiveness and value of these visualization tools in the academic field of architectural specialization and research, the professional field of research and specialization, influencing market and decision-makers, financing architectural and design projects, and promoting social and economic environment sustainability through architectural visualizations.
To achieve this objective, the research plan consists of several key activities. Firstly, an extensive literature review will be conducted to establish a theoretical foundation by exploring existing literature on 3D visualization, architectural specialization, and sustainable design. This review will help identify gaps in the current knowledge and set the stage for further investigation.
Based on the literature review, a comprehensive methodology is developed to evaluate the effectiveness of Rhino and Twinmotion in addressing the stated objectives.
The following **METHODOLOGY** will provide a structured approach to assess the impact of 3D visualization on the academic, professional, market, and socio-economic domains. The visualization and process of this project will give way to the use of visual communications researched and used (ie. Rhino and Twinmotion and other 3D software) to enhance understanding and research of the Ecotransformer building prototype.

In this study the EcoTransformer has been chosen to apply the methodology and conduct the research to a befitting outcome of the 3D visualization and a comprehensive narrative of the architectural EcoTransformer project.

A. Choice of the architectural project concerning the following criteria: The project proposes improving and further developing of the ESTAT technology conceived by the architect Jorge Cruz Pinto. The ESTAT is an innovative design integration of different technologies into a novel movable BIPV (building integrated photovoltaic) system that are already developed so that they can be applied in the field of architecture, specifically to sustainable buildings that can transform their form in order to adapt better to climatic, bioclimatic and aestetical needs of the place and users.

B. Identifying the architectural project regarding style and historical relevance and novelty. Data collection will be conducted using the defined methodology, and the collected data will be analyzed to derive meaningful insights. Surveys and interviews will be administered to gather perspectives from stakeholders in academia, professionals, and decision-makers. Case studies will be conducted to examine real-world applications of 3D visualization in architectural projects. The analysis of the collected data will help identify patterns, trends, and potential benefits of using Rhino and Twinmotion. The research plan also includes experimentation with 3D visualization using Rhino and Twinmotion. A series of visualizations will be developed to showcase the potential applications and benefits of these tools within the identified areas of investigation. These visualizations will be designed to communicate architectural concepts, enhance understanding, and engage stakeholders effectively.

C. Identifying the construction solutions applied and their relevance and novelty.ESTAT (Eco Solar Transformer Architecture Technology) is an modular panelling system that can be used as a facade system for new buildings, second facade for existing buildings, urban separation walls, roof and shading solution. It enhances the existing photovoltaic facade solutions by addressing their aesthetic, formal and functional aspects proposing a solution which is adaptable to its environment and its users. The technology is made of mechanical motion system and modular grid-panels that through movement allow for bioclimatic active and passive performance and produce architectural metamorphosis. The modular gridpanels are designed as mashrabiya patterns and contain photovoltaic cells, sun tracking sensors and advertising led display which formally and functionally improve common photovoltaic solutions. The mechanical principles of movement of panels allow for numerous building formal transformations, the passive and active bioclimatic gains, capturing of solar energy and regulation of thermal comfort. This integrated system goes beyond conventional static architecture, creating a transformer building - aesthetically appealing, energetically self-sufficient and user-guided. It allows for new morphotipology, one that is transformative, multifuncional and adaptable to both the environment and its users. By addressing the aesthetic and comfort criteria, the project proposes the technology, not as its final aim but as a vehicle for reaching better living conditions. The ESTAT technology is developed as a holistic solution that integrates several systems and components that can be used as a whole, partially or individually. The components can be used separately, partially or all together, and can be added as necessities of users change. In short, the technology enhances the existing photovoltaic membrane solutions by providing a flexible alternative which is concerned with formal and functional, but also aesthetic aspects.

D. Identifying the technologies implied in the project and their relevance and novelty. In conclusion, this research plan outlines a comprehensive approach to investigate the utilization of 3D visualization using Rhino and Twinmotion in the architectural field. The expected scientific relevance, economic and social impacts of this research are significant and hold the potential to advance the field of architecture. Furthermore, the generated visualizations will be evaluated and validated. Stakeholders from academia, professionals, and decision-makers will be invited to participate in the evaluation process. Their feedback and assessments will be used to validate the effectiveness, accuracy, and overall impact of the visualizations. This validation process will help ensure the relevance and reliability of the research outcomes**.** The technology integrates: 1.Paneling system 2. Modular grid-frame 3.Photovoltaic components 4.Shading components 5. LED components e. Sensor components 6.Mechanical motion system 7.Controlling Software

E. Criteria of Presentation Focus. The focus will be on the shape changing envelope of the facades that demonstrates the motion system and the ornamental furnished photovoltaic panels that decorate the facade contrary to the ordinary photovoltaic panels.

F. According to the above taken decisions which presentation method is appropriate. Through data collection methods such as surveys and interviews, case studies, visualization techniques and evaluation criteria the presentation method will be sorted out and the visualization techniques determined that will serve for all future projects.

EXPECTED SCIENTIFIC RESULTS

1. Creation of an experimental specialization course at FAUL in architectural design associated with research into the means of digital representation 3D Models, Animation, Hypertext and Marketing; The specialization course may in the future be converted into a specialization branch of the Master in Architecture
2. Applied research in the professional field of architecture and urban design: Praxis (Architecture offices and studios)
3. Architectural Storytelling aims to be presented to Decision Makers.
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BUDGET: € 7500

1.Data collection (2000 Euros):
   1. Surveys and interviews: This includes expenses related to survey administration, participant incentives, and interview transcription services if required.
   2. Case studies: Funding for site visits, data collection, and documentation.

2.Visualization development (3000 Euros):
   1. Software and licenses: Procurement of Rhino and Twinmotion licenses for the research team.
   2. Hardware upgrades: Enhancements to computing systems, graphics cards, or storage devices, if necessary, to handle the visualization demands.
   3. Rendering and animation: Funding for rendering services or cloud rendering resources to ensure high-quality visual outputs.

3.Stakeholder engagement (1000 Euros):
   1. Workshops and presentations: Organizing workshops or presentations to engage stakeholders from academia, professionals, and decision-makers.

4.Contingency (2500 Euros):
   1. Miscellaneous expenses: Miscellaneous costs that may arise during the research project, such as unforeseen expenses or additional software/plugins required.

It is important to note that the budget breakdown provided above is indicative and may vary based on specific project requirements and cost estimates. Adjustments can be made based on the availability of resources, local pricing, and specific needs of the research project. Additionally, seeking external funding sources or collaborations with institutions or industry partners may further support the project and expand the available budget