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THE 13<sup>TH</sup> INTERNATIONAL INNOVATION, INVENTION & DESIGN COMPETITION 2024

**EXTENDED ABSTRACTS**

**e-BOOK**

# EXTENDED ABSTRACTS e-BOOK

THE 13th INTERNATIONAL  
INNOVATION, INVENTION &  
DESIGN COMPETITION 2024



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# PRESERVING PERAK'S CAVE ART PAINTING HERITAGE IN 360-DEGREE IMMERSION: GUA TAMBUN, IPOH

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## ABSTRACT

Exploring Tambun Cave's rock art in Perak, Malaysia, reveals a wealth of cultural heritage that necessitates proactive conservation efforts. This research focuses on implementing an interactive 360-degree panoramic view via a website platform, using Insta360 Pro cameras to capture the cave's intricate artworks. Methodologically, the process entails meticulously documenting the cave's interior with Insta360 Pro cameras, ensuring complete coverage of the rock art. These panoramic images are then stitched together and integrated into a website platform, allowing users to explore virtual environments. Drawing on collaborations with a renowned expert in rock art archaeology and Ventrex Outdoor Recreation, the study gains valuable insights into the artworks' cultural significance and interpretation, as well as practical considerations for immersive experiences in outdoor environments. By combining innovative technology with expert consultation, this study aims to enhance public engagement with Tambun Cave's rock art, fostering greater appreciation and support for its preservation.

**Keywords:** Virtual Heritage Conservation; Ancient Cave's Rock Art, Panoramic Photography, Interactive Technology

## 1. INTRODUCTION

In recent years, technology has increasingly played a vital role in various sectors, including heritage conservation within the construction industry (Trillo, 2020). Evidence suggests that digital technologies enable comprehensive documentation and planning for the preservation of heritage sites, benefiting conservationists, architects, archaeologists, planners, and engineers alike (Acierno et al. 2017; Ioannides et al. 2018). Amidst this technological landscape, nestled within the scenic landscapes of Perak, Malaysia, Tambun Cave emerges as a significant custodian of ancient stories etched upon its rocky surfaces. These enigmatic rock art pieces, spanning epochs, not only offer glimpses into bygone eras but also underscore the urgent need to preserve the rich cultural heritage ingrained within the region, particularly as time and nature continue to pose formidable challenges to their longevity.

In response, our research embarks on a detailed exploration into the heart of Tambun Cave's cultural legacy, aiming to blend tradition with innovation in the pursuit of conservation. At the core of our endeavour lies the use of modern technology – an interactive 360-degree panoramic view presented through a dynamic website platform. With the assistance of Insta360 Pro cameras, we meticulously document the cave's timeless artworks, capturing their intricate details with utmost precision. Our approach goes beyond mere documentation; it embodies a holistic philosophy aimed at fostering deeper connections between past and present. By seamlessly integrating these panoramic

images and presenting them within an immersive virtual environment, we invite users to embark on a journey of exploration that transcends time and space.

Yet, we recognize that such an undertaking cannot succeed in isolation. Drawing on the insights of a distinguished expert in rock art archaeology and the practical experience of Ventrex Outdoor Recreation, our research navigates the intricate balance between technology and tradition. Through their contributions, we deepen our understanding of the cultural significance of Tambun Cave's artworks and gain practical insights for delivering immersive experiences in outdoor settings. Ultimately, our mission extends beyond the preservation of physical artefacts; it serves as a call to action for increased public engagement and appreciation. By leveraging innovative technology and expert knowledge, we endeavour to revive Tambun Cave's ancient narratives, ensuring their resonance across generations and cultures, and fostering renewed commitment to their enduring preservation.

## **2. METHODOLOGY**

### **2.1 Planning**

The methodology commenced with meticulous planning, drawing upon insights from seminal works in rock art conservation and digital heritage preservation. Collaborative consultations with local authorities and stakeholders informed the selection of Tambun Cave in Perak, Malaysia, as the research site, aligning with UNESCO's World Heritage Centre operational guidelines for safeguarding cultural sites (2023).

### **2.2 Design & Development**

Building upon the planning phase, the design and development of the research methodology focused on leveraging innovative technology to create an interactive 360-degree panoramic view accessible through a dynamic website platform. The design phase involved the selection and procurement of Insta360 Pro cameras for data collection, guided by best practices outlined in the literature. Subsequently, the development phase entailed the creation of standardized procedures for image acquisition and processing, drawing upon methodologies recommended by Bassier (2018) for virtual cultural heritage representation. Through meticulous data acquisition, visualization, and experimentation, we aimed to capture the intricate details of Tambun Cave's rock art and present them in an immersive digital format. This approach not only facilitated comprehensive documentation, but also provided a platform for experimentation, allowing us to explore innovative visualization techniques and refine our understanding of the cave's cultural significance.

### **2.3 Expert Consultation and Validation**

Throughout the planning, design, and implementation phases, expert consultation played a pivotal role in providing guidance and validation. Collaboration with a distinguished archaeologist specializing in rock art ensured cultural sensitivity and accuracy in the interpretation of captured imagery. Additionally, engagement with Ventrex Outdoor Recreation provided practical insights for optimizing user experiences in outdoor settings.

### 3. FINDINGS

The outcomes of this project underscore the significant impact of employing innovative technology to document and safeguard cultural heritage, as demonstrated through the virtual representation of Tambun Cave's rock art. Through the development of an interactive 360-degree panoramic view accessible via a dynamic website platform, we effectively captured and showcased the intricate details of the cave's ancient artworks in a digital format. The panoramic images, meticulously captured using Insta360 Pro cameras and processed through standardized procedures, provided users with an immersive experience of Tambun Cave's cultural richness.

Navigating through the virtual environment, viewers explored the cave's rock art from various angles, deepening their understanding of its historical and cultural importance. Moreover, our experimentation with visualization techniques yielded valuable insights into optimizing the digital presentation of cultural heritage. By integrating interactive features and supplementary information within the website platform, we enhanced user engagement and cultivated a greater appreciation for Tambun Cave's rock art among diverse audiences. In essence, these findings underscore the effectiveness of merging technology with expert consultation and methodological precision to preserve and promote cultural heritage. The virtual exploration of Tambun Cave's rock art not only commemorates the vibrant cultural legacy of Perak, Malaysia but also sets a precedent for future initiatives in digital heritage preservation and public outreach. Below are some of the outputs for this project:



**Figure 1** Interactive 360-Degree Panorama of Tambun Cave, Ipoh, Perak

### 4. CONCLUSION

In conclusion, this project has demonstrated the transformative potential of leveraging innovative technology to document and preserve cultural heritage, exemplified through the virtual exploration of Tambun Cave's rock art. By creating an interactive 360-degree panoramic view accessible via a dynamic website platform, we have successfully captured and showcased the intricate details of the cave's ancient artworks in a digital format, fostering greater public engagement and appreciation for Perak's cultural legacy. Furthermore, we are grateful for the acknowledgement received from the *Pejabat Menteri Perak*, underscoring the significance of our efforts in contributing to the preservation of the state's heritage.

Additionally, acquiring copyright protection from *MyIPO* ensures the safeguarding of intellectual property rights associated with this project, facilitating its long-term sustainability and impact. Moving forward, the insights gained from this endeavour will inform future initiatives in digital heritage preservation and public outreach, serving as a catalyst for continued innovation and collaboration in safeguarding our cultural heritage for generations to come. Our team extends heartfelt gratitude to all those directly or indirectly involved, whose contributions were instrumental in ensuring the success of this endeavor. Moving forward, the insights gained will inform future

initiatives in digital heritage preservation and public outreach, inspiring continued innovation and collaboration in safeguarding our cultural heritage for generations to come.

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