



GRIVAPP 2026

21st International Conference on Computer Graphics,
Interaction and Visualization Theory and Applications

Final Program and Book of Abstracts

Marbella, Spain

9 - 11 March, 2026

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Session 4A **GRIVAPP**
09:30 - 10:45 **Room Andalucia 7**
Information Visualization & Visual Analytics

Complete Paper #59

Eye-Tracking Support for Adaptive Document Exploration: Design Space Model and Application Examples

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Keywords: Eye Tracking, Visual Analytics, Adaptive Interfaces, Information Visualization.

Abstract: Adaptive visualization systems often rely on user interaction data to personalize content presentation as well as improve user experience. We introduce a gaze-driven design space linking interface components (e.g., full text, word clouds, infographics), gaze metrics (fixations, dwell time, level of detail), and usage scenarios (history reconstruction, attention summarization, recommendation). We present two gaze-based visualizations as a part of our Gaze-Adaptive Dashboard as both data capture tools and as reflective interfaces: (1) a fixation timeline for the reconstruction of exploration histories, (2) a hierarchical bar chart illustrating attention across interface segments, and furthermore, we provide a recommender system, presenting adaptive recommendations based on gaze-based preferences. While our example is based on a Consumer Health Information System, the proposed approach is domain-independent and can aid any adaptive web application that benefits from visual analytics of user attention. We lay out the design trade-offs that emerge in visualizing noisy gaze data, handling incidental versus meaningful fixations, and integrating summarization approaches through Large Language Models (LLMs). Our paper highlights the potential of attention-aware visualizations to support more fine-grained user modeling and adaptive interface design, and reveals open challenges for future work at the intersection of interaction, visual analytics, and personalization.

Complete Paper #14

Towards Interpretable Multimodal Embeddings: A QR-Based Prototype Projection Approach

João Leal, Artur Oliveira, Mateus Espadoto, Roberto Cesar Jr. and Roberto Hirata Jr.

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Keywords: Multimodal Learning, Zero-Shot Classification, QR Decomposition, Subspace Projection, Semantic Alignment, Unsupervised Clustering.

Abstract: Multimodal embedding models trained on paired image-text data have enabled powerful zero-shot classification and cross-modal retrieval by learning a shared representation space. However, in high-dimensional embedding spaces, cosine similarity often fails to reflect true semantic relationships, producing unreliable similarity scores across semantically distinct instances. In this work, we propose a simple and model-agnostic method to improve the structure and interpretability of such embedding spaces. Given any text-image aligned embedder, we define class prototype embeddings based on textual descriptions, and compute a QR decomposition of these prototypes to obtain

an orthonormal basis aligned with the class semantics. Image embeddings are then projected into this subspace, producing representations with improved alignment to class prototypes. Our experiments demonstrate that this transformation enhances clustering quality and embedding structure, with classification performance remaining effectively unchanged, and requires no retraining of the original model. The method is applicable to any pretrained multimodal embedder, providing a simple geometric enhancement that supports better structured downstream tasks such as classification, clustering, and outlier detection.

Poster Session 2
10:45 - 11:45

GRIVAPP
Foyer

Complete Paper #65

Effects of Music Tempo on Vection Perception in Virtual Reality Environments

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Keywords: Vection, Virtual Reality, Music Tempo, BPM, Multisensory Integration.

Abstract: Vection, the illusion of self-motion induced by sensory stimulation, is one of the critical phenomena that enhance presence in virtual reality (VR) environments. While previous studies have examined the effects of spatial characteristics of visual and auditory stimuli on vection, research focusing on music tempo (beats per minute, BPM) remains extremely limited. In this study, we empirically investigated how music stimuli with different tempos (nine levels from 40 to 200 BPM) affect vection perception in a VR environment using a head-mounted display (HMD). Experimental results with 15 participants revealed a significant positive correlation between BPM and vection intensity ($r = 0.255$, $p < 0.000001$), indicating that faster tempos enhance vection intensity. Furthermore, a significant negative correlation was found between BPM and vection onset time ($r = -0.158$, $p = 0.0003$), demonstrating that faster tempos induce vection more rapidly. Comprehensive evaluation identified 140-160 BPM as the most effective tempo range for inducing vection. This optimal range is significantly faster than the natural tempo range (85-120 BPM) reported in music cognition research, suggesting unique temporal characteristics in audiovisual integration. These findings indicate that appropriate music tempo configuration in VR content design can effectively enhance presence and immersion.

Complete Paper #74

A Survey of Roughness-Based Applications Intended for Characterising, Controlling or Generating Real or Synthetic Non-Smooth Surfaces

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Keywords: Roughness, Surface Texture, 3D Mesh, Terrain, Statistical Characterisations, Quality Control, Simulation, Surface Metrology, Manufactured Object, Machining Process, Standards.

Abstract: Surface roughness is an inherently complex notion for which no unique definition exists, as its meaning depends on the