THE PERCEPTION OF SYMMETRY IN THE MOVING IMAGE

Multi-Level Computational Analysis of Cinematographic Scene Structure and its Visual Reception

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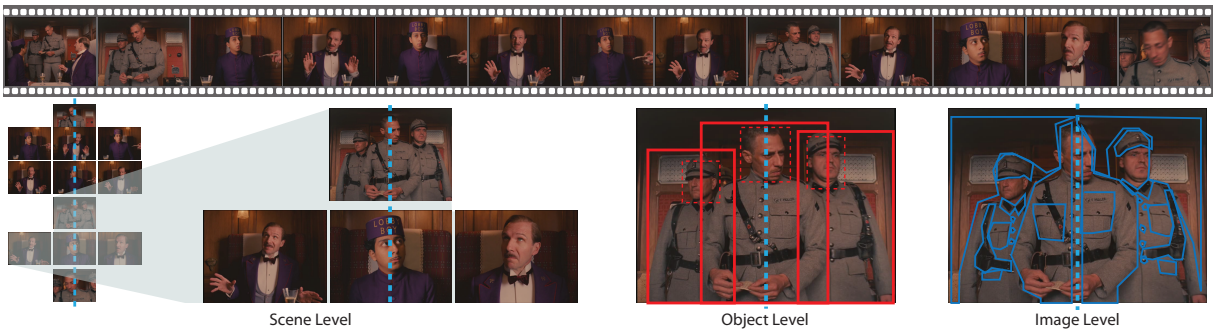

Figure 1: Multi-level analysis of symmetry in the composition of the moving image. (GRAND BUDAPEST HOTEL, WES ANDERSON, 2014)

1 INTRODUCTION

This research is driven by visuo-spatial perception focussed cognitive film studies, where the key emphasis is on the systematic study and generation of evidence that can characterise and establish correlates between principles for the synthesis of the moving image, and its cognitive (e.g., embodied visuo-auditory, emotional) recipient effects on observers [Suchan and Bhatt 2016b; Suchan and Bhatt 2016a]. Within this context, we focus on the case of "*symmetry*" in the cinematographic structure of the moving image, and propose a multi-level model of interpreting symmetric patterns therefrom. This provides the foundation for integrating scene analysis with the analysis of its visuo-spatial perception based on eye-tracking data. This is achieved by the integration of: computational semantic interpretation of the scene [Suchan and Bhatt 2016b] —involving *scene objects* (people, objects in the scene), *cinematographic aids* (camera movement, shot types, cuts and scene structure)— and *perceptual artefacts* (fixations, saccades, scan-path, areas of attention).

2 SYMMETRY IN SPACE AND TIME: A MULTI-LEVEL MODEL

Symmetry is represented within our computational framework as a multi-level model allowing formal analysis at different layers of abstraction; we look at symmetry on three levels (L1–L3):

(L1). SCENE LEVEL Symmetry in the editing of a scene is defined by symmetric use of cinematographic aids, e.g. intercutting between characters, symmetric camera movements.

(L2). OBJECT LEVEL Symmetry on the object level is defined based on the placement of objects and people in the frame. E.g. placing characters in the symmetry axis of the frame.

(L3). IMAGE LEVEL Image level symmetry is defined based on low-level features that support a symmetry axis, i.e., contrast edges, textures, etc. On this level symmetry can occur in multiple places and objects can be symmetric within them selves.

Our multi-level model of symmetry provides a comprehensive characterisation of the symmetric structure of a scene, connecting high-level conceptual categories to low-level visual features in the image.

3 VISUAL PERCEPTION OF SYMMETRY

The reception of symmetry is studied by analysing eye-movement behaviour of spectators, and correlating them to the multi-level symmetry model of the scene (Sec. 2). Perceptual data encompasses individual eye-movements, and aggregated gaze data of multiple spectators.

EXPERIMENTAL DATASET We investigate the perception of symmetry in the context of an eye-tracking dataset.[1] We particularly focus on select films of director *Wes Anderson*, whose use of symmetry in scene structuring / character placement as well as in editing & camera movement is well-known.

SYMMETRY, EYE-MOVEMENT PATTERNS, AND GAZE TRANSITIONS Founded on [Yu 2010], our experiment focusses on analysing the relationship between spatio-temporal symmetry and resulting gaze transitions vis-a-vis low-level features & corresponding high-level objects. Our preliminary results suggest that symmetry in the composition of frames and the editing reduces the gaze transitions on the object level and that symmetric editing and camera movement reduces eye-movements after a cut.

References

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[1] The eye-tracking dataset is generated from experiments involving a total of 31 subjects involving 16 scenes (per subject) from 14 films. We conducted the experiment with the stationary Tobii X2-60 Eye Tracker, collecting eye movement data with a rate of 60 Hz.

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