ScreenPlay: A Topic-Theory-Inspired Interactive System*

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ABSTRACT

In many ways, topic theory forms the foundation of human perception of emotion through music. Accordingly, it affords great potential for creative exploitation within human-computer interaction (HCI) in music. *ScreenPlay* is an interactive computer music system (ICMS) that implements topic theory as part of its approach to facilitating intuitive and engaging interactive musical experiences with the hope that the emotional manipulation of music results in more meaningful interactions for novice users whilst simultaneously posing an intriguing compositional/performative paradigm for experienced musicians.

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KEYWORDS

Human-computer interaction; interactive computer music system; topic theory.

INTRODUCTION

ScreenPlay is a unique and innovative interactive computer music system (ICMS) designed to captivate users of all levels of musical and technological proficiency. The system encapsulates the fundamental concepts underpinning the three main approaches to ICMS design: *transformative*, *generative*, and *sequenced* [18]. Each of these design frameworks prioritises the affordance of control over a specific aspect of the musical output of the system, ignoring the many other musical parameters over which influence can be exerted, and, as a result, are often limited in terms of the demographics to which they cater. Sequenced systems (*Incredibox* [22], *Patatap* [2, 3]) are usually tailored towards a lone user and allow for the full orchestration and arrangement of system-specific or pre-existing compositions but are often devoid of computer-influence over the musical output of the system. Transformative and generative systems (*NodeBeat* [20], *Bloom* [5], *Bloom 10: Worlds* [6]) rely upon an underlying algorithmic framework to generate appropriate musical responses to user input and are more suited than sequenced systems to facilitating interaction between multiple users but are often melodically and harmonically simplistic, incorporating only a few different parts/lines, and offer limited influence to users over the musical output. Furthermore, all of these system design models are hampered by considerable stylistic constraints.

ScreenPlay seeks to combat this exclusivity of focus through the encapsulation and evolution of the fundamental principles behind the three system design models in what is a novel approach to ICMS design, along with the introduction of new and unique concepts to human-computer interaction (HCI) in music in the form of a bespoke topic-theory-inspired transformative algorithm and its application alongside Markovian generative algorithms in breaking routine in collaborative improvisatory performance and generating new musical ideas in composition through the provision of new and additional dimensions of expressivity. Unlike most sequenced ICMSs, *ScreenPlay* affords the ability to orchestrate originally composed musical works through the recording and combination of loops/phrases, whilst the potential for musical complexity and variety made possible by the precise depth-in-control afforded to users via the graphical user interface (GUI) diverges from the prevailing generative approach, of which the musical results are generally stylistically ambient. Similarly, by supporting musical interaction for non-expert users and musicians, *ScreenPlay*'s design contradicts the predominant approach to transformative ICMS design; most examples of which can be defined as "score-followers", such as *Maritime* [17, 19, 4], *Voyager* [7, 8, 4], *Music for Clarinet and ISPW* [9, 10], and *Pluton* [11, 15].

TOPIC THEORY AS A MEANS OF EMOTIVE MANIPULATION

Topic theory, which was particularly prevalent during the Classical and Romantic periods, is a compositional tool whereby the composer employs specific musical identifiers – known as *topics* – in order to evoke certain emotional responses and cultural/contextual associations within the minds of the audience [12]. *ScreenPlay*'s topic-theory-inspired transformative algorithm serves to transform the musical input of the user either melodically or texturally/timbrally through the application of four "topical oppositions": "joy-lament", "open-close", "light-dark", and "stability-destruction". The impact of both the "joy-lament" and "light-dark" topical opposition

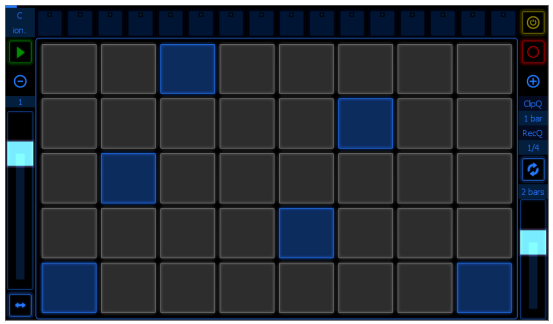

Figure 1: *ScreenPlay* GUI playing surface.

transformations is directly influenced by specific topics, with the basis of "joy" being found in the *fanfare* topic, "lament" in the *pianto*, "light" in the *hunt*, and "dark" in *nocturnal* [12, 13]. The effect of the "open-close" transformation draws upon Denis Smalley's theory of *spectromorphology* and, in particular, his four qualifiers of spectral space: *emptiness-plenitude, diffuseness-concentration*, *streams-interstices*, and *overlap-crossover* [21], and is designed to mimic the effects of increased and decreased proximity to a sound source as well as the size of the space in which it is sounding. A combination of reverb, delay, compression, filtering, and equalisation (EQ) is used to achieve this. The "stability-destruction" transformation is a literal interpretation of the destruction of sound, using real-time granulation to break the sound apart into smaller and smaller grains, and distortion to amplify the effect. In essence, the application of topic theory in *ScreenPlay* is a reversal of roles of music and meaning in the traditional sense, with textual descriptors presented to the user(s) via the GUI describing the audible transformative effects of the various topical oppositions.

Topic Theory in 21st Century Electronic Music

Contrary to Agawu and Ratner's assertion [1, 16], highlighted by Monelle [13], that topics 'work best' in Classical music it could be argued that topics are best suited to application in contemporary electronic music, due to the vast array of potential spectromorphologies capable of emulating the sonic characteristics of traditional/acoustic instruments as well as evoking imagery of otherworldly environments, creatures, machines, and mechanisms. Aside from resonating (in part) with Denis Smalley's idea of *technological listening* (perception by the listener of the technology or technique behind a sound/piece of music as opposed to the music itself [21]), there are also similarities in this regard with Latin authors of the Middle Ages:

> [who] learned their craft by studying rhetoric and poetry of the ancient Roman world … [resulting in the] literary topoi adopt[ing] significations from elsewhere and from other times[;] they did not refer to any aspect of the real social world of their time, but rather to an imaginative world. [13]

Monelle drew two conclusions from this, both of which reflect favourably on the application of topic theory in electronic music. 'First, in the case of topics, the signifier and signified are not necessarily contemporary or local to each other … Second, the topical signified may be wholly imaginary, a reflection of cultural fantasies' [13]. He continues: 'Theorists of the literary and musical topic, therefore, must take care not to assume that signifier and signified are necessarily contemporaneous, or even that the signified was ever part of the social and material world' [13].

Furthermore, many topics are still significant in contemporary popular music. The *pianto*, which 'signifies distress, sorrow and lament' [12] and forms the basis of the "lament" transformation, is on example. 'the motive of a falling minor second' [12], the *pianto* '[overarches] our entire history[,] from the sixteenth to the twenty-first centuries' [13]. Despite originally signifying the specific act of weeping, and then later (around the time of the eighteenth century)

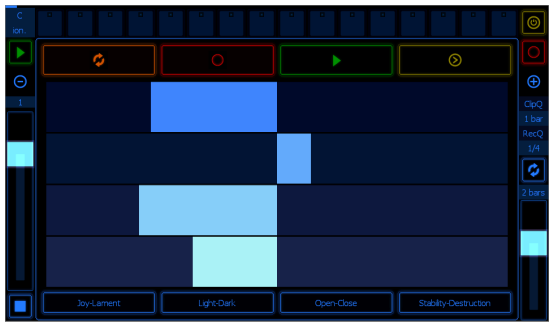

Figure 2: Topic-theory-inspired transformative algorithm controls.

sighing, the *pianto* has come merely to represent the emotions of 'grief, pain, regret[, and] loss' associated with such actions [13]. In other words, 'the sighing appoggiatura no longer means "sigh" ... it has become a "system-bound expression", a lexical unit, its signification limited to the indexicality or associations of the sigh' [13]. Monelle goes on to say:

> It is very doubtful that modern listeners recall the association of the *pianto* with actual weeping; indeed, the later assumption that this figure signified sighing, not weeping, suggests that its origin was forgotten. It is now heard with all the force of an arbitrary symbol, which in culture is the greatest force of all. [13]

The same is true of the *fanfare* topic; a rising triadic figure [12] that inspires the "joy" transformation:

> the military fanfare may function associatively for a modern audience, who are sensitive [to] the slightly strutting pomp of the figure's character without realizing that it is conveyed by its origin as a military trumpet call. In this case, the topic is functioning, in the first place, through the indexicality of its original signification; the latter has been forgotten, and the signification has become arbitrary [12]

SYSTEM AND GUI DESIGN

A key aspect of *ScreenPlay*'s design is its capability of operating as both a multi-user-and-computer collaborative, improvisatory interactive performance system capable of hosting up to sixteen users, each of which is afforded control via a dedicated touchscreen-based GUI over a single instrument/sound in the musical output of the system, and a single-user-and-computer studio compositional tool for Ableton Live that affords the user direct control over up to sixteen individual elements from a single instance of the GUI. This flexibility of application is made possible by the implementation of carefully refined perceived affordances [14] in the touchscreen-based GUI, which result in a seamlessly intuitive interactive experience regardless of the manner in which *ScreenPlay* is being used. Two-way communication between interfaces is exhibited when *ScreenPlay* is running in multi-mode, so that changes made to global parameters by one user are reflected in the interfaces of the others. When running in single-mode, the GUI updates to reflect the status of the currently selected part. This two-way communication between Ableton Live and the touchscreen GUI when in single-mode extends further still through the inclusion in the suite of Max for Live MIDI Devices that constitute *ScreenPlay*'s underlying computational framework of parameter controls that reflect those displayed on the touchscreen GUI, which serves to better support the integration of *ScreenPlay* into existing compositional/performative setups of practising electronic/computer musicians by affording the user the choice of controlling the transformative/generative algorithms either via the touchscreen GUI or directly from Ableton Live.

CONCLUSIONS

While the rejuvenation and appropriation of topic theory within contemporary electronic/computer music is *ScreenPlay*'s most significant achievement, it is the combination of all novel aspects of its design that result is an ICMS that affords users of any level of musical/technological proficiency the ability to easily and efficiently create electronic/computer music of any style/genre in symbiosis with other users and/or the computer.

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