

**Joint drum-dance improvisation in Balinese performing arts: an ethnographic and computational approach to describing, analyzing and modeling *kendang tunggal****Overview of the research*

*Kendang tunggal* or *gupekan* denotes a specific mode of improvisational Balinese solo drumming used to accompany improvised solo dances and the improvised parts of otherwise choreographed dances (Sudirana 2009). To put it differently, *kendang tunggal* accompanies dance performances or parts of dance performances that are not fixed, in which music and dance are not entirely precomposed/choreographed to the last detail, but dancers are given a certain amount of performative freedom to arrange the performance to their liking. In Balinese performances, in general, dance and music are tightly coordinated to such a degree that it is, in my opinion, valid to describe dance as “moved sound” and music as “sounded movement”. This is especially true when looking at dancing in relation to drumming (or vice versa). In order to achieve such a tight interrelation between these two performative realms (dance and drumming) in non-fixed performance situations, the drummer is also given a certain amount of freedom that allows him/her to appropriately render his/her drumming patterns in accordance with the movements of the dancer. According to Hood (2017) from a Balinese perspective the “performative adhering agent” that binds together dance and drumming in these kinds of non-fixed performance situations is the Balinese concept of *bayu* (energy). This Balinese concept proposes a phenomenological explanation stemming from “esoteric Hindu philosophy and practical ethnographic surveys” that describes the interrelation of the two, no such Balinese concept or explanatory model has yet been formulated in regard to what, from a Western point of view, might be called “improvisation”. This idea has also been pointed out by Sudirana (2009), stating that “*Kendang tunggal* incorporates the idea of improvisation, though in Bali we do not have a special term for improvisation,” and who later asks – in his outlook on future research – the question: “What is the philosophy behind the drumming?” In my proposed doctoral dissertation project, I want to tackle this last question posed by Sudirana, and following Hood, engage an ethnographic study of *kendang tunggal* as it is learned, practiced, taught by Balinese expert drummers.

To identify a Balinese explanatory model of drum improvisation and gain insights into what Sudirana (2009) calls “the philosophy behind the drumming”, a methodological approach should be followed. In her 2003 study on music and modernization in the Balinese shadow play, Britta Heimarck employs a methodology that focuses on “a polyphony of local discourse”, taking into account different voices and perspectives on the matter. In my opinion, the two most important groups of people whose ideas need to be considered in my case are drum and dance instructors of local Balinese cultural educational institutions as well as so called *guru alam* – artists who have developed their extraordinary skill by training exclusively in the village context and outside arts institutions, “masters in Balinese arts who have developed their expertise through practical experience and observation, without any formal training” (Heimarck 2003). According to Heimarck (2003), these village-trained masters were the first rank of experts whom the founders of the Balinese arts university, Institut Seni Indonesia (ISI)

Denpasar, hired in order to train their own senior instructors. Today, only the practical knowledge of specific art forms is taught to students, stripped of "the ethical and religious aspects of a traditional education, learned through the stories and moral philosophy of an old-style performer, or through the ceremonial context of performances" (Heimarck 2003). This is done in order to accommodate "students of different faiths, along the Western model that separates church and state" (Heimarck 2003). Because of this, I assume that there will be a significant difference in the ways Balinese "improvisation" is conceptualized and taught between these two groups of artists. It is clear that both need to be considered equally in my research.

Despite their philosophical differences, I assume, in the first instance, that both types of artists follow the same basic ruleset when playing *kendang tunggal*. As pointed out by Sudirana (2018) and explained to me by Sadguna (pers. comm. 2018), a valid *kendang tunggal* pattern can be compared with a sentence of a spoken language, consisting of different elements that can be reused and rearranged according to a grammatical framework to create new valid patterns. Chomsky's (1957:13) definition of a language as "a set (finite or infinite) of sentences, each finite in length and constructed out of a finite set of elements" might therefore also be applied to the musical practice of *kendang tunggal*, allowing it to be analyzed as such a construct. To empirically prove Sudirana's and Sadguna's description of *kendang tunggal* as language, I will design a computer program that is capable of automatically transcribing *kendang tunggal* patterns played by Balinese expert drummers, deriving a grammar of said patterns by subdividing them into their smallest, meaningful units or sub-patterns and generate new patterns on the basis of the derived grammar and identified sub-patterns. Such a computational analysis through synthesis that incorporates techniques developed and applied in the interdisciplinary fields of Music Information Retrieval (MIR) and Algorithmic Composition makes it possible to formalize and implement the principles or rules of *kendang tunggal* in the form of a computer program that allows the researcher to converse on a very sophisticated level with different expert drummers about the inner workings of this musical practice in musical terms that otherwise would take the researcher long years of training of this musical practice to reach.

While previous studies on *kendang tunggal* (Tenzer 2000; Sudirana 2009, 2018) have mainly been music-analytical in nature, discussing the structure of *kendang tunggal* patterns and their relation to the colotomic structure and melody of certain compositions that allow this mode of drumming to be performed, the influence of dance movements on the structure and configuration of such patterns was mentioned but not considered in those analyses. Based on my knowledge of the interrelation of Balinese drumming and dancing in not-fixed performance situations, gained through one year of drum and dance training in Bali (2017–2018) and summarized in my Master's thesis (Schatz 2020), I can say that a dancer's movements must be considered as equally important to the musical parameters mentioned above. As outlined in my master's thesis, one factor to consider is what I called the intensity of a dancer's movement, an aspect that seems to dictate the kind of strokes or timbres

predominantly used in the configuration of *kendang tunggal* drumming patterns. Furthermore, every not-fixed dance performance contains a couple of obligatory movement motifs that must be executed by the dancer at some point during a performance to “progress” it structurally – initiating upcoming performance parts that are accompanied by a different composition or its overall end –, which also strongly influence the musical accompaniment of such situations. If such obligatory movement motifs are executed, the drummer needs to react in a certain way by playing specific drumming patterns that, on the one hand, appropriately accompany such a motif and also orchestrate musical change as anticipated by the dancer. In my experience, the patterns that are played to accompany such motifs are not arranged in the moment but entirely precomposed and learned in advance. Because of the strong influence of a dancer's movement on a drummer's decision regarding which patterns to play in a performance, I suspect that drummers subconsciously categorize their patterns and sub-patterns along parameters of movement.

### *Positioning of the research*

My proposed doctoral dissertation project positions itself in the ethnomusicological discourse on improvisation in general and Balinese improvisation in particular, investigating Balinese musical practice of *kendang tunggal* from an ethnographic-philosophic as well as a music and dance analytical perspective. It builds up on previous studies of improvisation in Balinese performing arts (Dibia 2013; Gray 2011; Hood 2013, 2017; Mashino 2013; Sudirana 2009, 2018; Tenzer 2000; Tilley 2019) that show what improvisation encompasses in different types of Balinese music and dance theatre. While most of these studies describe and analyze the process of improvisation in the primary performative domain of each discussed performative art, to investigate *kendang tunggal* a different approach must be followed. Inspired by Hood (2017) and based on my own experiences, I approach *kendang tunggal* not as a purely musical phenomenon but as joint drum-dance improvisation, a phenomenon that cuts across performance media. To take this into account, I propose a multidisciplinary approach that necessarily combines methods and theories from anthropology, ethnomusicology, ethnochoreology, sound and music computing (MIR, algorithmic composition) and linguistics.

Because I intend to grammatically analyze and model *kendang tunggal* as a construct comparable to language, my research project also falls into the category of ethnomusicological works that apply grammars in describing a musical practice. As summarized by Hughes (1992), starting in the 1970s different researchers such as Blacking (1970, 1982), Becker and Becker (1979), Pelinski (1984), Hughes himself (1985), Baily (1989), Kippen and Bel (1989) applied such an approach, comprising the formulation of a set of rules that combined constitute a grammatical framework describing certain aspects of a musical tradition. Hughes (1992) comes to the sobering conclusion that the grammatical models presented in the before mentioned case studies are for the most part internally inconsistent, are "based crucially on questionable assumptions or analytical decisions", "are unnecessarily obscure in their use of specialist terminology and formalism", "are much too closely bound to the original corpus, so that the rules are clearly *ad hoc*" and too often apply concepts and

terminology from linguistics "rigidly, inaccurately or misleadingly", important points of critic I will be considering when carrying out my proposed research project. One of the studies that withstands all of Hughes points of critic is the one by Kippen and Bel (1989) which also happens to be the most important case study for my research project. Their computational approach in analyzing the oral mnemonics or *bols* used by musicians to represent sequences of drum strokes in North Indian *tabla* playing by designing a computer program which, according to Hughes (1992), "allows for an ongoing dialogue between the computer (as programmed by the analyst) and a native musician such that the musician's judgements lead to modifications in the grammar" strongly influenced the way I want to approach *kendang tunggal* and can therefore be seen as one of the intellectual ancestors of my research approach. Differing from the approach applied by Kippen and Bel, the instance with which Balinese expert drummers will be entering into conversation will still be me and not the computer program I intend to design, since I am convinced that, although Hughes (1992) pointed that "the computer-informant dialogue is no different from that between any field worker and informant", a deeper understanding of the choices made by musicians when improvising and the concepts connected to this mode of performance is gained by actively discussing them in person and not through dialogical exchange with a machine which only asks yes-or-no questions. Because of this, I intend to follow an approach applied by Gerhard Nierhaus et al. (2015) in their research project "Patterns of Intuition", in which the computer programs they implemented to formalize a certain compositional process of different composers only served as a tool, generating musical material which's validity was then discussed with the composer in question.

Ultimately, the results of my project should not only be valuable in regard to understanding Balinese improvisation but also contribute to the ethnomusicological discourse on improvisation in general, leading to broader cross-cultural and comparative understandings of this ubiquitous mode of performance as intended by the edited collections published by Bohlmann and Nettl (1998) and Solis and Nettl (2009). While Nettl (2009) maintains, in the preface to his *Musical Improvisation: Art, Education, and Society*, that "we haven't found ways to study improvised music as efficiently as we do music composed and recorded in writing or memory", I anticipate that my ethnographically informed computational approach to describing, analyzing and modeling the Balinese improvisational practice of *kendang tunggal* could also be used for investigations of other forms of joint music-dance improvisation in other cultures, proposing a new and in my opinion efficient and systematic way in researching this mode of improvisation.

### *Research design & methodology*

The way I plan to carry out my research project is inspired by the ethnographic approaches applied by Hood (2017) and Heimarck (2003), as well as Kippen and Bel's (1989) computational analysis of North Indian *tabla* playing and the recursive research design used by Nierhaus et al. (2015) in their project "Patterns of Intuition". During the first phase of my proposed research project, I will conduct fieldwork in Bali with the following goals:

- 1) Gain insight into the Balinese concepts of improvisation that are connected with/explain *kendang tunggal* from a drummer's and dancer's perspective, allowing me to identify a local explanatory model of this concept.
- 2) Get a deeper practical understanding of *kendang tunggal* and the dances that are accompanied by this mode of drumming and discuss the rules guiding these forms of improvisation with experts based on my knowledge gained during the fieldwork for my master's thesis and other studies investigating *kendang tunggal*.
- 3) Create a comprehensive (enough) corpus of *kendang tunggal* patterns for creating an algorithm that is able to automatically dissect the patterns into sub-patterns and derive a grammar from said patterns.
- 4) Record improvised dance performances for later analysis and comparison.

In my opinion, the best way to accomplish these four goals is to take lessons with different expert performers (academics and *guru alam*), allowing me as their student to repeatedly converse with them about their theoretical and practical understanding of improvisation, question them about the way they learned and mastered to improvise, experience myself how improvisation is taught and record them performing.

In the second phase, I intend to design a computer program that, by means of automatic music transcription (onset detection), converts a live recording of a drummer playing *kendang tunggal* into a string of characters that symbolically represents a pattern's different strokes/timbres by employing symbols that are used by Balinese drummers to notate their patterns. Based on my knowledge gained in the first phase of my research project, I intend to develop an algorithm that allows the computer program to derive a grammar from the resulting character strings by dividing them into their smallest, meaningful units or sub-patterns and generate new patterns on the basis of the derived grammar and identified sub-patterns. The program should also be able to play back the newly generated patterns by using sound samples of the different strokes/timbres producible with a Balinese drum, because Balinese music is up until today predominantly taught and practiced without notation.

In the third phase, I plan to revisit the expert drummers who taught me during the first phase of my research project with the implemented software to check the validity of the algorithm I created. This will be done as follows:

- 1) The drummer is asked to play several of his/her *kendang tunggal* patterns which will be recorded and analyzed by the computer program.
- 2) The computer program generates new patterns on the basis of the played patterns and plays them back to the drummer.
- 3) The drummer critically evaluates the correctness or playability or likelihood for each of the generated patterns, pointing out mistakes made by the program.
- 4) The computer program will be adjusted in regard to the feedback given by the drummer.

This procedure will be repeated until the drummer is satisfied with the computer-generated patterns, so that in the end an algorithmic model of a drummer's improvisational rules is formalized.

To see how specific movements and movements motifs of an improvised dance performance influence the drummer's choice in what to play, I intend to play recordings of different parts of not-fixed dance performances to drummers whom I would then ask to accompany said recordings with *kendang tunggal* drumming patterns as they see fit. By then comparing the musical response of the different drummers with each other and discussing their decisions in choosing what to play, further generalizations about the categorization of drumming patterns along movement parameters can be made, which maybe will prove my assumption that drumming patterns are subconsciously categorized along parameters of movement.

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