What makes a musical improvisation creative?

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First Author

Anna Jordanous, University of Sussex

Second Author

Bill Keller, University of Sussex

Background in Improvisation

What makes a musical improvisation creative? And what exactly is it that justifies one improviser being described as more creative than another?

Not all people accept creativity in musical improvisation can be defined. Bailey (1993) proposes that creativity exists at a level that is inexpressible in words. Pressing (1987), however, advocates making more explicit connections between improvisation and creativity. For a clearer understanding, it is a practical necessity to follow the lead of those such as Berliner (1994) and Gibbs (2010), who make the study of improvisational creativity more tangible by describing it in terms of subprocesses (Berliner) or components (Gibbs).

Background in Computational Linguistics

The log likelihood ratio statistic can be used to compare two sets of texts (corpora) to examine word distribution patterns in each set (Dunning 1993). Using this statistic, we can identify which words are used more in academic papers on a particular topic - creativity - compared to a matched set of papers on other topics.

Lin's similarity measure (Lin 1998) allows us to quantitatively measure how similar a pair of words are in meaning. With this semantic information, words with similar meanings can be clustered together using an algorithm such as Chinese Whispers (Biemann 2006). Clustering highlights semantic themes in a collection of words, helping to summarise large data sets.

Aims

- To identify general components of creativity and develop understanding of creativity.
- To gain a detailed understanding of how creativity is manifested in musical improvisation.

Main contribution

Using the computational linguistics techniques outlined above, 694 words were identified which were used significantly more than expected when discussing creativity. Clustering these words and analysing the clusters, 14 key components of creativity have been identified (Figure 1), forming a set of *building blocks of creativity*:

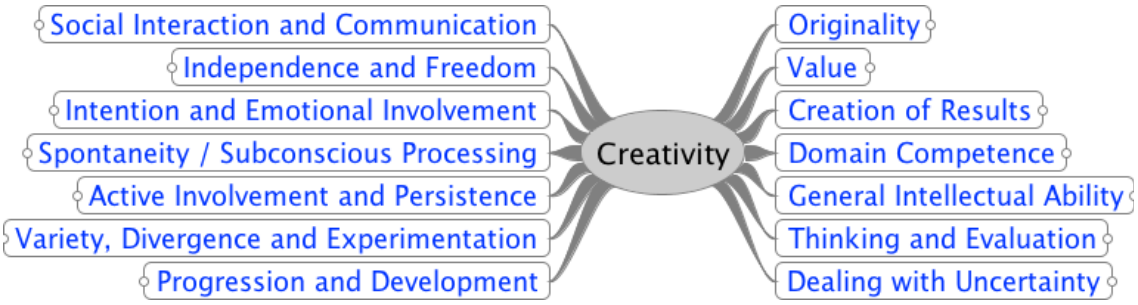

Figure 1: The 14 components / "building blocks" of creativity.

Creativity is often manifested in different ways depending on what is prioritised in a particular domain (Plucker & Beghetto, 2004). To identify important factors in musical improvisational creativity, 34 participants with a range of musical experience were questioned. The participants were asked to describe what creativity meant to them, in the context of musical improvisation. Their answers were tagged according to the 14 components of creativity in Figure 1.

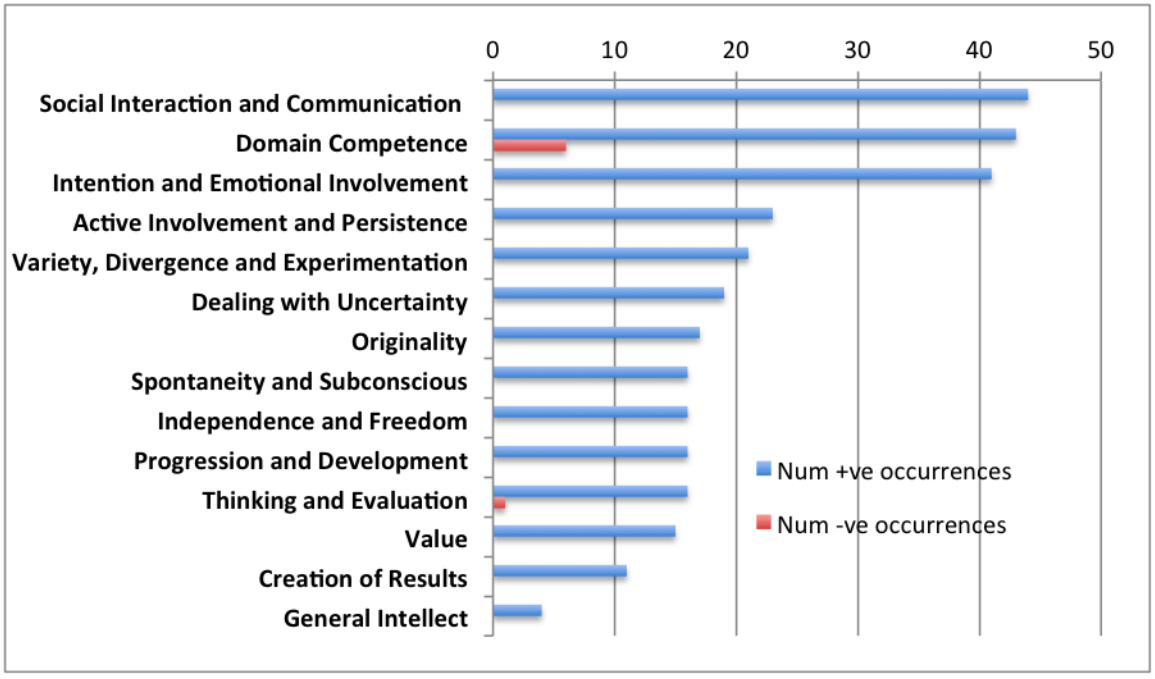

Figure 2: How many times each component was mentioned positively (or negatively) by survey participants, in relation to creativity in musical improvisation.

Although all 14 components were mentioned by participants to some degree (see Figure 2), those mentioned most often were: *Social Interaction and Communication*; *Domain Competence*; *Intention and Emotional Involvement*.

Key aspects of creativity in musical improvisation have therefore been identified: the ability to communicate and interact socially; the possession of relevant musical and improvisational skills and knowledge; and the emotional engagement and intention to be creative. Conversely, the actual musical results produced during improvisation are relatively less important for creativity when compared with the process of improvising. Also, general intelligence is considered less important than having specific expertise and knowledge.

Implications

With a detailed understanding of what makes musical improvisation creative, improvisers and their teachers can identify what they should work on to improve their creativity (Gibbs 2010).

The aim of the project encompassing this work is an evaluation methodology for computational creativity. A rigorous, comparative evaluation process for creativity needs clear standards to use as guidelines or benchmarks (Torrance, 1988). This list of components has been used to evaluate computational musical improvisers in terms of how creative they are and identify why one system is perceived as more creative than another (Jordanous, 2011a, 2011b).

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Biography of Anna Jordanous

Anna Jordanous has conducted doctoral research on the question: How should we evaluate the creativity of computational systems? In September 2011 she will submit her DPhil thesis on *Evaluating Computational Creativity: A Standardised Procedure for Evaluating Creative Systems and its Application*. With a background in Artificial Intelligence and Computer Science, she has published work on musical improvisation systems and other computational music systems, including work with Alan Smaill presented at CIM08 and in the resulting special issue of the Journal of New Music Research, on automated accompaniment systems. As a musician, Anna plays and performs regularly, including occasional small-group jazz improvisation with her co-author Bill and other Sussex colleagues.

Biography of Bill Keller

Bill Keller is a Senior lecturer in Computer Science. He has an MA in Cognitive Science and a PhD in computational linguistics from the University of Sussex and has published widely on topics in natural language processing. He developed an influential approach to the semantics of quantification in noun phrases and his work has led to a better understanding of grammar formalism design and made significant contributions to work on lexical knowledge-representation. More recently he has investigated statistical language modelling, automated grammar acquisition and lexical distributional similarity. Current PhD supervision includes graph-based methods for word sense discovery and automated acquisition of arabic morphology.