Sounds dangerous: emotion, geovisual analytics, and music

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Finding appropriate and useable ways to represent vast arrays of geographic information of heterogeneous types is a central problem of geovisual analytics (GVA). Often, this information is not "data" in the traditional quantitative sense; relevant information about a problem appropriate for GVA may be highly uncertain, qualitative, emotional, or geo-referenced in only a loose way. With respect to incorporating these sorts of information sources into analysis, traditional forms of digital representation, including GIS, thematic maps, and geo-databases, are *limited* through their abstractions of information and thus *limiting* in the insight possible from their use. For example, it is well documented that traditional visual forms of mapping tend to imply certainty and confidence in otherwise uncertain data, and that new ways of making uncertain information more usable – so that analysts can incorporate, rather than discount, uncertainty into analysis – are needed.

I'd like to suggest one possible way to represent important (but, at this time, challenging) information to an analyst studying a GVA problem: the use of <u>sound</u>, and specifically <u>music</u>, to convey emotional contexts of geo-data, such as tension, confidence, or safety. In previous papers, I have laid out some possibilities for representing such information using musical concepts; for example, a soldier (whose eyes and hands are busy) may need to "hear" the present danger level of his location and the direction of safety, and this could be represented aurally with music-theoretic concepts such as tonality, dissonance, tension and release, or timbre. Composers have long understood the power of music on emotion, and social scientists are increasingly aware that decision making can be enhanced through utilizing an analyst's emotional responses to stimuli (e.g., representations of relevant information). Maps used in decision making are not often considered satisfactory to convey mood and emotion; is the mapped area scary, delightful, depressing, invigorating? In analysis of intelligence data, it may be very useful to consider the underlying, or background, tension of a situation – has the intensity of the rhetoric, for example, of a terrorist leader's speeches increased in recent weeks? Quantitative information in such a scenario may still be analyzed using visual representations but analysts may also wish to incorporate such qualitative, affective information; I submit that there is a role for music and sound in this context. The adjectives above – scary, delightful, etc. – are frequently used to describe music, which - like cartography - has conventions that are used to predictable effect. It seems the time is ripe (or has already passed) to connect conventions of music to the existing body of cartographic conventions.

At the University of Minnesota, we are conducting experiments on the use of sound and music in geographic representation, attempting to discover these "conventional" connections between music and cartography. I will build upon the extant theoretical work on representing data using abstract sounds (both in cartography and in other quantitative data representation research areas), and on eliciting/manipulating emotions using music (from diverse artistic fields such as cinema, music theory, and neuroscience, as well as limited studies in cartography). I will then present an initial study in decision making using "accompanied" maps – decision making environments supplemented with audio loops of various types – that investigates the role that music plays in the decision making process. I am giving a poster presentation in Paris where I will present results from this study; in this workshop, I look forward to discussing further the implications of these results for future experiments in this area, and the other important ways that sound and music could become a vital part of the future of cartography and geographic representation.