

# **Giordano Bruno Lucio:**

## **Detailed work plan**

### **Project title: Emotional walking**

A relevant issue to the study of music performance, and perception, concerns the ability of players to express emotional intentions, and the ability of listeners to recognize them. Several works studied encoding and perception of emotional intentions with musical instruments (e.g., Gabrielsson & Juslin, 1996; Juslin, 1997a, 1997b; Bresin & Friberg, 2000; see Juslin & Laukka, 2003 for a review). Typically the same score was played with different emotional intensions, and listeners recognition capabilities were assessed via either categorization, or rating tasks. Using this methodology, properties of the musical structure associated with different emotional intentions were highlighted, both for performance and perception. Clynes (1977, cit. in Gabrielsson & Juslin 1996) argued that expression of emotions should be based on structures independent of modalities, i.e. should present similar traits independently of whether the medium for their expression is music, voice, facial expression, or a gesture. Consistently, independently of whether an emotional intention is expressed through instrumental music, singing voice, or speech, equal emotions are associated with similar variations in properties such as average tempo, articulation, or loudness (Juslin & Laukka, 2003). The strong similarities in emotions expression highlighted between speech, and music performance, support furthermore Clynes' (1977) hypothesis. Thus one is motivated in expecting that structures similar to those highlighted in speech, and music, might be used to express emotions with one of the most frequently executed gesture: walking.

For obvious reasons the study of musical rendering of emotions was carried with performers trained in music, which thus received implicit and explicit training concerning expressive rendering of performances. The study of emotional intentions in walking, instead, does not require the use of musically trained performers. Thus a study of this issue with musically naïve performers, offers the possibility of testing for the generality of the emotionally meaningful structures highlighted with research on music. From the applicative point of view the study of this issue allows developing control rules for synthesis models of walking sounds (Fontana & Bresin, 2003), with the goal of augmenting their perceptual efficiency, and meaningfulness.

Two previous studies, conducted on walking, and running sounds, are relevant to the current project. Li, Logan & Pastore (1991) studied auditory recognition of walkers gender. Female walking spectra were characterized by a stronger concentration of energy in the higher frequencies. This difference seemed to be related to walkers height, weight, and to the size of the shoes, females being shorter, lighter, and wearing smaller shoes. Given these factors, and the perceptual relevance of timbre on judgment of emotional intentions (Gabrielsson & Juslin, 1996) one should expect brighter walking sounds to be more probably perceived as happy, or angry, duller walking sounds as sad. Bresin and Dahl (2003) highlighted some similarities between articulation in piano playing, and overlap of steps in walking, and running, pointing out that faster walking sounds (i.e., running) are characterized by a staccato—like articulation, slower walking sounds by a legato—like articulation. Variations in articulation have been already found to be associated with different expressive intentions in musical instruments performance (e.g., Bresin & Battel, 2000). Also, articulation have already been found relevant for the recognition of emotional intentions with musical materials (Gabrielsson & Juslin, 1996; Bresin & Friberg, 2000). Consequently, variations in walking articulation are expected to be associated with different emotional intentions both at the performance, and perception levels.

Research will be divided in two phases, the first phase investigating the performance side, the second the perception side.

First, a group of musically naïve participants will be asked to walk along a 20 meters long path on a hardwood floor, using a normal walking style, or one of four basic emotional intentions: fearful, angry, sad, and happy. The central portion of the recordings (central 10 meters) will be used for later analyses, eliminating walking pace modifications associated to the initiation, and stopping of the locomotion, more than to the expressive intention. An equal number of females, and male walkers will be used, in order to have include in the samples variations in timbral properties of the walking sounds associated with variations of the height/weight of the walker, and with shoes size. Performances will be characterized using measures of tempo, loudness, timing, and articulation. Both absolute, and relative measures will be used, these latter adjusting for the interindividual differences in tempo and loudness, as measured on the normal walking style.

Second, two sessions of listening tests will be carried. The first will be based on the original recordings. Classification tasks and/or tasks based on the estimation of the amount of emotional content (e.g., how sad is this sequence) will be used, in order to highlight those walking patterns with the stronger association with given emotional intentions. Covariations among the properties of the patterns are expected. For example, faster patterns are expected to be characterized by a staccato articulation, by higher concentrations of energy in the upper portions of the spectrum, and by a higher overall loudness. In order to provide economical control signals for the synthesis models of walking sounds, and in order to highlight the minimal properties of the walking patterns required for the perception of a given emotional intention, a second experiment will be carried using synthetic signals. These will be generated with synthesis models, manipulating separately the different properties of the emotionally efficient patterns highlighted in the first experiment. A final optional experiment might be carried applying the rules for emotional expression highlighted in the second experiment to musical performances.

## References

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