

Threading the Sound: The Carpet Tufting Gun as an Electroacoustic Performance Interface

Joseph Burgess
University of the Sunshine Coast
joseph.burgess@research.usc.edu.au

Dr. Toby Gifford
University of the Sunshine Coast
tgifford@usc.edu.au

ABSTRACT

This paper explores the carpet tufting gun as a novel electroacoustic performance interface. Leveraging its distinctive acoustic properties and electromechanical kinetics, the tufting gun presents a range of physical affordances that can be creatively repurposed for musical expression. While prior intersections between textile production processes and musical practices exist, the tufting gun remains largely underexplored as a tool for structured musical composition. This work reimagines the gun's mechanical gestures and performative affordances, transforming its utilitarian motions into expressive sonic gestures. By positioning the tufting gun as both an acoustic source and an interactive performance interface, this project works at the intersection of fibre craft and experimental sound art, where both historico-cultural context of textile making, and the ergonomics of the gun, present musical affordances.

Author Keywords

carpet, tufting, electroacoustic, interfaces

1. The Tufting Gun

The carpet tufting gun is a late-industrial invention from Dalton, Georgia, USA, which originated from the bedspread “cottage” industry in the postbellum south [1]. In the broader story of textile industrialisation, tufting offers an interesting counterpoint to the dominant paradigm of automation, offering aspects of mechanisation but retaining an emphasis on manual operation and craftsmanship [2]. The physical configuration of the tufting gun affords various natural gestures, while the inherent constraints of the tufting process directly inform its interface design.

The tufting gun operates through a complex sequence of actions driven by a motor. The motor powers a set of cams, which in turn drive a coarse needle and a reciprocating scissor mechanism for cut-pile carpet or a “U”-shaped needle for producing loop-pile carpet. These components advance as the user compresses the trigger, enabling precise control over the tufting process. A potentiometer facilitates ‘tuning’ the motor to different pitches. The sonic dimension of the motor and interactivity of the tufting process create musical affordances.

2. Historical Entanglement

Textile production, music, and technology are historically entangled: “textiles themselves are very literally the software linings of all technology” [3]. One example is Persian weaving songs; a venerable practice in which digital patterns of warp and weft are encoded in vocal phrases sung as a mnemonic during

weaving [4], demonstrating a relationship between textiles, music and the origins of digital computation.

As another example; in the 18th century, Basile Bouchon, the son of a Lyonnais organ builder, invented a method to control a loom using perforated paper tape, inspired by the programmable music automatons used to control carillon bells [5]. Over the next 75 years, a series of advancements in weaving technology culminated in the Jacquard loom, a foundational innovation that influenced the development of modern computer architecture; specifically Charles Babbage’s Analytical Engine, highlighting an underexplored intersection between the histories of textile production and computer music.

Our exploration of the tufting gun as a musical interface pays homage to this rich historical context, conditioning our aesthetic choices such as the incorporation of vocal samples, and embrace of Ada Lovelace’s speculations about the potential of the Analytic Engine for computer music: “supposing, for instance, that the fundamental relations of pitched sounds in the science of harmony and of musical composition were susceptible of such expression and adaptations, the engine might compose elaborate and scientific pieces of music of any degree of complexity or extent” [6].



Figure 1. Ak-1 tufting gun

3. Performative Carpet Making

An example of our reimagined tufting gun can be seen here: <https://tinyurl.com/CarpetEntanglementSample>. The remainder of this paper discusses design considerations for this interface; musical affordances, embodiment, and mapping strategies.

3.1 Tufting Affordances

The textile creation process has a long cultural history of engagement with materiality, yielding a set of conventions to draw upon in the performative act of carpet making. In identifying the affordances of the tufting gun as a musical instrument, both cultural and mechanical considerations can play a role. Van Dijk and Rietveld [7] suggest that affordances can operate on multiple scales: they may be ‘small-scale’, inviting confined actions with immediate feedback, or ‘large-scale’,



Licensed under a Creative Commons Attribution 4.0 International License (CC BY 4.0). Copyright remains with the author(s).

NIME '25, June 24–27, 2025, Canberra, Australia

unfolding over extended time spans as part of a more complex project. The tufting process itself is inherently longform and durational, and so congruent with this conception of affordances—spanning both micro and macro levels.

When considering the tufting gun’s affordances as a musical instrument, we examined its material and physical properties alongside its cultural context. Considering the intertwined nature of technological development and craft, there is congruence with what Malafouris [8] describes as Material Engagement Theory (MET), which argues that cognition is a dynamic process co-constituted by the brain, body, and material environment. Alongside the labor-intensive nature of textile production, there is a history of entanglement between textile technology and musical praxis that can provide aesthetic context. Adopting this perspective, the tufting gun’s musical affordances emerge from the interplay between its mechanical design and its position in broader historico-cultural contexts. While these are not physical affordances, they provide musical affordances; they shape the intentional relationship between the musical subject (the user) and the object (the tufting gun), thereby influencing what physical affordances are perceived and acted upon. Musical affordances can be considered “propert[ies] of the intentional relationship between musical subjects and objects.” [9]

3.2 Sequentiality of Labour

The action possibilities of tufting are intrinsically related to the labour of the carpet making process. The sequentiality of events involved in this labour provide a script of actions which are both functional and expressive in advancing the carpet. The process alternates between strenuous full body labour and dexterous fine motor control. The constraints of scripting these sequenced events are not rigid and can support improvisation. The elongated act of threading the tufting needle punctuated by bursts of rhythmic tufting come together in a choreographed sequence of performative states.

The primary activity of tufting channels energy of the upper body into directing the tufting needle. In the transitional periods between bursts of tufting, tasks include trimming with scissors, untangling the yarn and repositioning the tufting setup. The natural flow of carpet production yields performance guidelines which play an influential role in the arc of the performance.

3.3 Embodiment in Tufting

The body is central to carpet-making and the tufting gun as a tangible interface mediates between the maker’s intentions and materiality. The tools become an extension of the body, enabling a direct and tactile connection between physicality and artistic expression. “In terms of [the] embodiment relationship, the physical nature of the tufting gun requires us to hold it with both hands and to control its movement by adjusting our posture. After constant practice, the tufting gun is gradually integrated into our bodily experience, in what Heidegger describes as the ‘ready-to-hand’ state. At this point, our physical sensations extend to the surface of the gun, feeling the yarn through vibration and resistance as it penetrates the fabric” [2]. The ‘ready-to-hand’ state positions the tufting gun as an embodiment relation which “implies the incorporation of technology into our perceptual-body experience, such as crutches, glasses, etc., where technology becomes an extension of the body” [2].

4. Interface and Mapping Strategies

The bodily actions and sensorial feedback involved in tufting are opportunities for expression which can be harnessed in a performance setting. Mounting a piezo sensor to the motor housing provides an interface between the performer and software, harnessing the kinetic potential of the gun for

processing with real time audio and audio to MIDI processing. The primary components of this processing are envelope followers tracking input amplitude and audio-to-MIDI Max4Live devices. The primary voices are: vocal chops, an electronic kick drum, and an electronic hi-hat.

These percussive sources operate in a one-gesture-one-sound mode [10] emphasising the immediacy of the performance, with envelope followers modulating the sounds to provide more temporally extended gestural interaction. Further audio processing of the piezo input provides the basis for mapping on/off states within the broader system.

In preliminary experiments a lapel microphone mounted to the gun amplified the acoustic sounds of cutting with scissors and various subtle actions involved in preparing the tufting setup. Through processing these sounds the tufting activity becomes an electroacoustic landscape where the large-scale carpet scissors are the primary instrument.

The third mapping point involves mounting piezo sensors to the carpet-backing material. These audio inputs are routed to a physically modelled ‘sympathetic string’ using the Corpus effect in Ableton Live. When activated these sound sources create a binding drone which bridges between the alternating states of the tufting performance. The intention of this mapping is to reference a common design motif where one “soft” string is mounted to one “hard” frame; a construction style common to lyres and looms.

5. Conclusion

This paper reimagines the carpet tufting gun as a performance interface, merging textile production with experimental sound art. Repurposing the gun’s mechanical gestures and acoustics, its utilitarian functions are transformed into sites for musical expression. Through the integration of piezo sensors and audio processing, the tufting gun becomes a speculative instrument bridging physical labor with real-time sonic creation situated in the historical interplay of textiles, technology, and music.

6. Ethical Standards

No ethical approval was required for this study.

7. REFERENCES

- [1] V. Pratt. *How Dalton, Georgia, Built a Textile Empire on a Myth*. (Master’s thesis, University of West Georgia), 2020
- [2] J. Zhou & D. Zhang. Stimulating Everyday Creativity: Mediating Role of New Tools in DIY Craft. *Ergonomics In Design*, 77, (2023), 383-393.
- [3] S. Plant. *Zeros and ones: Digital women and the new technoculture (Vol. 4)*, London, 1997
- [4] A. Tuck. Singing the Rug: Patterned Textiles and the Origins of Indo-European Metrical Poetry. *American Journal of Archeology*, 110(4), (2023), 539-550.
- [5] T. Koetsier. On the prehistory of programmable machines: Musical automata, looms, calculators. *Mechanism and Machine Theory*, 36(5), (2001), 589-603.
- [6] L. Menabrea & A. Lovelace. Sketch of the analytical engine invented by Charles Babbage. *Bibliothèque Universelle de Geneve*, 82. (1842).
- [7] L. Van Dijk & E. Rietveld, E. Situated imagination. *Phenomenology and the Cognitive Sciences*, (2020), 1-23.
- [8] L. Malafouris. *How things shape the mind: A theory of material engagement*. MIT press, (2013)
- [9] D. Menin & A. Schiavio. Rethinking musical affordances. *Avant* 3(22), (2012), 202-215.
- [10] D. Wessel. Instruments That Learn, Refined Controllers, and Source Model Loudspeakers. *Computer Music Journal*, 15(4), (1991), 82-86.