WOMEN'S LABOR: AN INSTALLATION AND CONCERT OF NEW AND OLD “FEMININE” INSTRUMENTS

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ABSTRACT

This paper describes the creation of a project, Women's Labor, that juxtaposes traditional musical instruments designated for “ladies” with new interfaces for musical expression that repurpose older tools of women’s work. By using embedded technologies, this project questions these archaic traditions and the view that women should be confined to the domestic household. By repurposing domestic tools as musical instruments, they become the very vehicle by which female performers, composers, and instrument builders are brought into the spotlight in concert performance, interactive installation, and workshops.

1. INTRODUCTION

Women’s Labor repurposes old domestic tools, laden with functionalities traditionally pertaining to women, to become new musical instruments. These musical instruments will be featured in installations, public workshops, newly commissioned works by women composers, and concerts featuring these new works with older works on traditionally deemed “feminine” instruments by female composers. At heart, the project is a feminist initiative to revalue traditional women’s work through re-imagining feminine technologies. Often kept away from the public eye, domestic tools belong inside the home where “women belong.” This exclusion from the public speaks to the larger inequality of esteeming art over craftwork, the workforce over housework, and serious “masculine” activity over light “feminine” activity that still exists today. In Women’s Labor, domesticity is recast in a new light through their integration with new technologies, public engagement, and performative spectacle in an attempt to dismantle the split between public and private spheres.

2. THE TRADITION OF FEMALE LABOR

Traditional women’s labor is largely unpaid and unacknowledged: housework and child-rearing are mandated as women’s duty as wife or mother. It is true that the twentieth century has seen a liberation of the role of women by their entering the workforce; the wife or mother. It is true that the twentieth century has seen a liberation of the role of women by their entering the workforce; the validation of traditionally “feminine” skillsets such as domestic tasks and their adoption by men are equally crucial in creating a gender-equal, twenty-first-century culture.

The undervaluing of women’s work is particularly prominent in the writing of history; canonic histories concentrate on significant historical events that are steered almost exclusively by male figures, in a narrative defined by Western patriarchy. Private, domestic technologies in traditionally women’s realm are often overlooked. In the installation of the new musical instruments, a documentation of how the public engages with them, called “A Contemporary Manual of Housekeeping,” alludes to a historian’s archival work, challenging Western patriarchal perspectives of technologies that are noteworthy. The artistic composition around these domestic technologies further empowers them. The inclusion of traditional women’s labor into a ‘history’ acknowledges women’s slighted accomplishments of little perceived “public” value on their own terms.

Moreover, in cities with clear socio-economic divides, domestic activities in affluent households are often exclusively done by female house-workers from poorer families. Women’s Labor democratizes domestic activities through public installations and workshops. By commissioning women composers, Women’s Labor doubly addresses the gender inequality that exists in the musical field today. People from all walks of life—not only women—engage hands-on with these domestic objects, disrupting the audience’s preconceived notions about domestic tasks and beckoning them to reflect upon their own domestic lives.

3. “FEMININE INSTRUMENTS”

The policing of women to certain types of activities extends to musical culture up until the nineteenth century, where only particular musical instruments were permissible for female musicians. Such gendering of instruments greatly hindered women from participating in public musical life; only instruments that were deemed respectable for women such as keyboard instruments, lute, harp, and the pardessus de viole were allowed to be played inside the household, nurturing their marriageability [2].

A notorious example is the frowning upon of women playing the violin, which was seen as a masculine activity. Reviews from the 1800s are telling of the attitudes of the time. Women violinists were described variously as pejoratively masculine, absurd, and even unhealthy:
“At the end of the second part Madame Gautherot, from Paris, performs for the first time in England, a concerto on the violin with great ability. The ear, however, was more gratified than the eye by this lady’s masculine effort [3].”

“[I must] confess that I know nothing more repulsive in the art, as a lady to see playing the violin. A politizing lady is unpleasant, a smoking woman even more uncomfortable, but a lady playing a violin is the absurdity in the superlative. Beautiful white shoulders, a beautiful breast and a violin on it! What caricature ([Ich muss] gestehen, daß iech nichts Widerwärtigeres in der Kunst kenne, als eine Dame Violine spielen zu sehen. Eine politisierende Dame ist unangenehm, eine rauchende noch unangenehm, eine Dame jedoch, welche Violine spielt, ist die Widersinnigkeit im Superlativ. Schöne weiße Schultern, ein herrlicher Busen und eine Violine daran! Welche Karikatur! [4]?”

“I would not recommend the violin to the ladies: the flesh of the lower jaw is squeezed up improperly, the arms are almost always crossed in angles, and, although the breast is not crushed, so it is feared for this most vulnerable part of the woman. (“Ich möchte die Violine den Damen nicht empfehlen: das Flehs des Unterkinns wird ungebührlich heraufgequetscht, die Arme sind fast immer in Winkel verschränkt, und, obwohl die Brust nicht gequetscht wird, so füchst man doch für diesen verletzbarsten Theil des Weibes.) [5].”

The last two reviews reveal the explicit policing of women’s bodies: what is admirable and acceptable for the objectified female body within the male gaze. Such notions of delicate beauty contrast the laborious working demands of lower class women. In commissioning works that feature both these feminine musical instruments, which were easier to play, with physically demanding domestic tools, we explore the oppression of women across class differences.

4. INSTRUMENTS AS TECHNOLOGY

Although we are not used to thinking of acoustic instruments as technology, they are tremendous feats of engineering refined over centuries. In Emily Thompson’s seminal work Soundscape of Modernity, she describes how advances in architecture allowed for larger concert halls, which in turn needed louder instruments to fill them with sound [6]. Before the invention of electric amplification, almost all instruments correlated sound to effort; the only instrument that distanced the performers’ labor from sound production was a bellows-driven pipe organ. Women’s instruments were deliberately designed to be quiet, requiring less physical exertion to excite, and requiring a delicate touch for optimal resonance.

With the advent of electric amplification capable of “producing all the frequencies necessary for replicating the full spectrum of audible sound, [7]” it was possible to divorce physical effort from the resultant sound. Beyond simply amplifying acoustic signals musicians and technologists invented instruments that separated physical gesture from the resultant sound. The Rhythmicon, a keyboard-based instrument built by Leon Theremin for Henry Cowell, was one of the first instruments where a single gesture (depressing a key) resulted in a multiplicity of sound (a rhythm) [8]. Bolter and Grusin proposed the term “remediation” to name “the representation of one medium on another [9],” and many of these new electrophones remediated more traditional musical instruments, such as the keyboard interface for the Rhythmicon.

5. NEW INTERFACES FOR MUSICAL EXPRESSION

Most of the progress in technological advancement of traditional musical instruments happened up until the nineteenth century; however the twenty-first century, in tandem with the maker movement, has seen a burgeoning of composers, performers, and sound technologists building novel instruments separate from flagship brands and instrument makers. In fact, experimental instrument-building has become so ubiquitous in the twenty-first century that there is an annual academic conference: New Interfaces for Musical Expression (NIME), and a competition: the Guthman Musical Instrument Competition [11] to bring together these instrument builders. Although it is not required, most of these instruments involve some sort of amplification, circuitry, and software.

While most early experimental instruments were remedies of traditional devices, novel interfaces are flourishing. With affordable miniature computers such as Raspberry Pi’s [12] and Beagle Boards [13], in combination with electronic prototyping platforms such as the Arduino [14], Bela [15], and Micro:Bit [16] which allow builders to interface sensors to measure real-world phenomena, it is possible to create a nearly infinite number of mappings from the physical world to sound that are not constrained by the laws of mechanical motion. By adding machine learning through programming platforms such as Wekinator [17] or Magenta [18], complex mappings can more easily be achieved. As prominent composer music composer/instrument builder Jamie La Rosa Oliver writes, the “dissociation of power, effort, interface, sound, and gesture” is vital to experimental instruments—it liberates mechanical action-sound pairings to make way for unexpected, new configurations [19].

This new technological space is clearly male-dominated [20, 21, 22]; when two male dominated fields, computation and music, combine the fractional representation by women goes down precipitously in the new field. Beyond simple numbers, women’s contributions are often over-looked. By explicitly commissioning women composers, and using augmented tools of traditional women’s work, Women’s Labor brings attention to this disparity. Repurposing household implements as musical controllers is not new; composer and sound designer Diego Stocco has created an entire suite using laundry equipment [23]. Women’s Labor takes Stocco’s work further by curating different public engagements of installations, workshops, concert performance, and panel discussion, spurring a critical reflection of domesticity on many levels. By juxtaposing our new instruments with older “feminine” instruments, and new compositions in conversations with older female composers’ works we create a thought-provoking concert-going experience for our audiences to prompt them to reflect upon the progress of feminism today with respect to the experience of women decades, and even centuries ago.

6. STAGES

Women’s Labor contains several stages of conversation between the artists and the public which shall be explored over the next
two years. The creative team for *Women’s Labor* currently consists of project creative director, composer-performer Jocelyn Ho, who directs its trajectory from instrument creation to performance. Commissioned composer/technologist Margaret Schedel advises on the instruments’ performative-compositional concept, technical implementation, and contributes to the programming of expressive capabilities of the instrument. Technical director Matthew Blessing’s roles include initial programming structure and physical assemblage.

This will be shown later as a mock archive of how to iron and embroider in jest, called “A Contemporary Manual of Housekeeping.”

**6.1. Instrument Creation**

To highlight the longstanding tradition of “women's work,” tools from both the recent past (1900s onwards) and the present will be used. These include: i. An early-twentieth century wooden ironing board and iron with different types of fabrics (wool, lace, denim) (Fig. 1); ii. an embroidery hoop and needle with smart fabric and conductive thread (Fig. 2, 3); and iii. a mid-twentieth century wooden umbrella style rotary dryer with wooden pegs and hangers (Fig. 4).

**6.2. Installation**

The public will interact with these domestic-tool-turned instruments as installations, with the goal of altering the audience’s perception of domestic activities that they, their family members, or their domestic workers perform in their everyday lives. The public’s interactions with the instruments will be video documented. **6.3. Workshops**

Informed by the public installation, Ho will compose rule-based compositions with these instruments for approximately ten participants per workshop. The participants will learn simple rules to perform the compositions and discuss the experience with respect to their views of domesticity. Inspired by “Sonic Meditations” written for the 2Ensemble by visionary feminist composer Pauline Oliveros (1932-2016), they will be asked to be mindful of both their own and each other’s movements and sounds when performing various gestures. These gestures will be meditations on domestic tasks. The group-oriented participation reminds participants of the traditionally communal and inter-generational nature of some of these tasks, for instance, washerwomen on the riverside, or grandmothers and mothers passing down crafting skills to granddaughters and daughters. Women composers are invited to co-host and participate in these workshops.
6.4. Concert Performance

Informed by the workshop of public attitudes towards domesticity and these new instruments, three woman-identifying composers in addition to Schedel will be commissioned to compose with the instruments, in combination with historical instruments traditionally designated as "feminine" (such as the clavichord, fortepiano, and the pardessus de viole). Performances of commissioned works will be juxtaposed with under-represented works by past women composers to create an evening-length work. At the premiere, a discussion panel with collaborators and experts on feminist technologies will follow.

7. INSTRUMENTS

For Women’s Labor, we choose tools designed for laundry work and repurposed them as interfaces for musical performance. This is achieved in the style of embedded acoustic instruments—embedding the tools with sensors, amplifiers, speakers, and running everything on a Raspberry Pi.

7.1. Charcoal Iron

The first instrument we designed and fabricated consists of the raw materials of a wooden ironing board with a charcoal iron interface (Fig. 5). The antique iron is hollow which traditionally allowed for charcoal briquettes to be placed in the cavity to keep the iron hot. For our instrument, instead of charcoal, we use the cavity to place the electronic circuitry. The iron is powered by a Raspberry Pi and has three main inputs: force-sensitive resistors, piezo contact microphones, and digital cameras. Together, these sensors allow the measuring of performative data such as applied pressure, rotational position, and XY-tracking along the ironing board. These components are connected to an XTPower 12volt battery to allow for unobstructed, wireless performance.

The three force-sensitive resistors are placed on the bottom of the iron in its three corners. The data from these resistors is serialized with an Arduino microcontroller and sent to a Wekinator module which tracks the overall downward pressure, as well as pressure-based gestures such as rolling or rocking. Two contact microphones are placed on the inside of the iron to track how it resonates while in motion over different surfaces; mel-frequency cepstral coefficients and delay times are measured and sent to a second Wekinator module that uses the data to detect different fabrics being ironed. We chose to use a Logitech USB sound card to achieve clearer sound quality over the Pi’s built-in input. Lastly, two PixyCam cameras are placed on the ends of the ironing board, looking for LEDs placed in the corners of the iron. By tracking the relative distance and angle from each LED to each camera, a third Wekinator module can be used to triangulate the iron’s rotation and relative XY-position along the ironing board.

After being processed by Wekinator, this sensor data is then sent via OSC to Pure Data, where it is mapped as control data and prepared for transmission to the synthesis patch. Pressure data is mapped to the overall amplitude and attack of the synthesis. The X and Y positions on the ironing board changes the pitch and timbral character respectively, while rotation dials-in resonant filters and other effects. Finally, the fabric detection effects harmonization and contrapuntal properties.
throughout the entire first half of the recital, unifying the works as a living organism with a skin. This video projection is featured on Ide that is cast onto the body of the piano, reimagining the piano as a cushion.

7.2. Future Instruments

Keeping in the laundry theme, two additional instruments are currently being designed. A rotary drying rack will be our next build, followed by an embroidery hoop. Like the iron, these instruments will be standalone, embedded instruments running on Raspberry Pi.

For the drying rack, performers will interact with the instrument by hanging clothing on the rack’s strings. Sensors measuring the displacement of the strings will be mapped to envelope and amplitude controls. Each string will have an associated pitch and timbre, creating chords as multiple items are placed on the rack. A rotary encoder will track the speed and angle of rotation, allowing for the chord to be pitch-shifted as the rack is spun.

The embroidery hoop will have piezos in contact with the fabric, amplifying the sounds of the needle penetrating the fabric and the thread scratching through. This sound will be accompanied by an ever-changing loop as thread is added to the canvas. A camera focused on the embroidery will track the XY-position and color of the thread and map the data to parameters such as pitch, timbre, and stereo-panning.

8. PREVIOUS WORK

This work builds on the authors’ previous work commissioning composers to write for novel instruments, using machine learning to understand musical gesture, and creating novel interfaces for performance and installation.

8.1. Synaesthesia Playground and Sheng

Ho’s existing artistic research focuses on the relationship between the body, gestures, and sound; Women’s Labor further explores this by adding a socio-political dimension by examining women’s bodies. In 2016, Ho directed a multimedia piano recital Synaesthe-sia Playground [25], where she led a team of six composers, two visual artists, five software developers, and two fashion designers to create six multimedia piano solo works (performed by Ho). As suggested by the project’s title, the theme of inter-sensoriality is explored. There are two visual installations in the project, each of which examines the concept of the body and the dichotomy between its interiority and exteriority. The first installation, “Piano Epidermis” is a video projection by Celeste Oram and Takefumi Ide that is cast onto the body of the piano, reimagining the piano as a living organism with a skin. This video projection is featured throughout the entire first half of the recital, unifying the works with a connected visual element. In contrast, the installation in the second half of the recital is not on the body of the piano, but on that of the pianist, with a luminescent performance attire made of optical fibers, called “Bio Lux” by Nobuho Nagasawa, Bopha Hul, and Troy Arnold (Fig. 8). Changing colors and pulsating to Ho’s heartbeat, breathing, and movements, the attire renders the inner workings of her body visible, virtually flipping her viscera inside-out. Thus, the epidermis of the piano is featured in the first half while the viscera of the pianist is made visible in the second half.

8.2. K-Bow, Ammo Boxes, Installformances

In 2011 Schedel worked with Rebecca Fiebrink on identifying cello bow articulations using Wekinator [26] and used it to control complex artistic systems including audio and visual processing in concert. Inspired by the power of machine learning, she also worked with Matthew Blessing on a work influenced by Pauline Oliveros’s Apple Box Orchestra. Using wooden ammunition boxes that belonged to her father, as an interface for laptop orchestra she and Blessing developed a system of contact microphones, low-pass filters, and Wekinator modules to know how and where performers were hitting the boxes. Some sides simply triggered sounds, while other sides controlled granular synthesis parameters including grain density, length and envelope shape. The sound of the box itself was also incorporated into one section. After — Apple Box premiered at The Kitchen with Composers Inside Electronics in March of 2018. In 2006, Schedel also held an evening-length concert of her installations that also had expert performances (so-called Installformances), allowing the audience to understand the interactive system before seeing/hearing a virtuosic display.

8.3. Musical Furniture

The Raspberry Pi in this project runs on a customized build of Raspbian. This build was originally organized during Matthew’s previous work on the JoyStyx instrument [27] and is currently being used in his musical furniture pieces.

The Arduino controlled pressure-sensor circuit is also derived from the location-sensitive cushions developed for Matthew’s musical furniture. The design was inspired by the Analog Fabric Joypad by Plusea [28] and combines multiple of these joypads into a grid. The data from this grid is sent to a Wekinator module to calculate an accurate detection of where the person is sitting on the cushion.
9. CONCLUSION

An instrument can be seen as a tool for artistic expression; in Lambrkos Malafouris’s words, it could be regarded as a “prototypical exemplar of material engagement [that] provides a unique way of understanding how mental events relate to matter and project to the world [29].” Using the concepts of critical organology which “provide an understanding of musical instruments not only in context, but as culture, and as sites of social and cultural exchange, [30]” the musical instruments made from traditional women’s tools in Women’s Labor provide the public and artists a way of questioning existing gender biases through culturally-embedded gestures and their sound world. We invite potential collaborators to contact us in exploring this intersection of gender studies, performance, and technology.

10. REFERENCES