# MIDI Scrapyard Challenge Workshops

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## ABSTRACT

In this paper the authors present the MIDI Scrapyard Challenge (MSC) workshop, a one-day hands-on experience which asks participants to create musical controllers out of cast-off electronics, found materials and junk. The workshop experience, principles, and considerations are detailed, along with sample projects which have been created in various MSC workshops. Observations and implications as well as future developments for the workshop are discussed.

## KEYWORDS

Workshop, MIDI, Interaction Design, Creativity, Performance

## 1. INTRODUCTION

The MIDI Scrapyard Challenge (MSC) is one workshop in a series created by the authors (collectively titled Scrapyard Challenge workshops) where participants create interactive objects and artifacts using cast-off electronics, found materials and junk. In the MSC, musical controllers become the focus for this intensive one-day workshop, creating an experience where improvisation and unhindered experimentation are encouraged. This paper describes the history, inspiration, methodology, and selected results from several workshops and points to potential implications and future areas of work.

The first MSC workshop was held in Dublin, Ireland in April 2003. This first workshop was initially envisioned as an accompaniment to a digital arts festival organized around the "Democratization of Technology," a key concept which pervades all aspects of the workshop experience. Since that time the MSC has had extensive exposure to a wide range of participants, with multiple workshops held in ten countries, across three continents. Venues for the workshop range from media arts festivals, sponsoring educational institutions, and artist galleries. At each event a diverse group of individuals are in attendance, usually with differing experience with electronics and musical controller design.

## 2. THE WORKSHOP EXPERIENCE

A typical MSC involves 10-15 participants of varying age ranges and experience with digital technology and hands-on prototyping. Five hours are scheduled for creating controllers with a public presentation and performance at the end of the day. The general public is invited to the presentation and the performance usually incorporates the collaboration of a local sound artist as a "musical guest."



**Figure 1. Typical Workshop Table. (Newcastle, Australia, Electrofringe Festival, 2003.)**

The workshop begins in the morning with introductions in roundtable format to encourage a personable and friendly atmosphere. All "hackable" materials are laid out on a large table in the center of the room. [Figure 1] (These items range from electronic and non-electronic items bought cheaply at local thrift shops, dollar stores, and even found on the streets nearby.) A technical overview of the systems used in the workshop as well as basic electrical concepts and safety procedures are outlined. The workshop leaders presume no formal knowledge of electronics or interactive design in their explanations and present all aspects of the MSC experience as accessible regardless of prior experience. During the remaining hours allotted for building controllers individuals work at their own pace either alone or in informal groups. The workshop leaders are present to answer questions, brainstorm, and provide general assistance. Throughout the workshop participants are encouraged to test their designs, ask each other for help, and share materials. At the end of the five-hour period all projects are rounded up and prepared for presentation and performance. During presentations each

participant is given the opportunity to explain to the public what their controller does, how it was built, and then briefly demonstrate how it functions. After presentations all participants are invited to come up and "jam" with their instruments. If a local musical guest is present, their creative feedback in terms of sequencing or pacing the performance is incorporated.

## 3. WORKSHOP PRINCIPLES

The Scrapyard Challenges were developed along the following principles.

- Limited time frame
- Unpredictable materials
- Simple input/output

### 3.1  Limited Time Frame

The limited time frame of the MSC creates a sense of urgency and encourages a high level of energy. Within a short time frame, participants are forced to improvise and respond creatively to conceptual and material challenges. The pressure to finish is an artificial constraint which works well in this context creating a heightened sense of purpose and shared experience. The presentations and performance at the end of the day serve as an additional focal point.

### 3.2  Unpredictable Materials

All materials used in the MSC are either scavenged or acquired from cheap sources. Materials from a MSC range from old electronics that have been discarded to stuffed animals or toys purchased from dollar stores or charity shops. Both the workshop leaders and the participants do not know beforehand exactly what type of materials will be available beforehand. Some "new" supplies such as wires, tape, and aluminum foil are always provided, as are basic tools such as soldering irons and wire strippers, but each workshop presents with a different mix of materials. Sometimes participants will be inspired to bring their own scavenged "junk."

### 3.3  Simple input/output

The workshop leaders provide two custom built input boards that allow participants to easily connect their built instruments to the computer via a standard MIDI/USB interface. The circuits in the boxes use a BasicX microcontroller and are configured to accept digital and analog input, with output set to MIDI signals via serial. To translate the MIDI data sent out by the electronic boxes we use a MIDI-man USB serial interface to a laptop to test the instruments. Though the technical setup is very simple for the MSC some musical guests have taken the data generated by participants' controllers and used it to trigger more complex processes. This however is not explicitly intended, but is the outcome of specific collaborations.

## 4. CONSIDERATIONS

When developing the Midi Scrapyard Challenge inspiration from DIY and Hacker communities, as well as depictions of inventors in popular culture played a large part in forming the aesthetics and implementation of the workshop. Two primary concerns were:

- A high ceiling of technical knowledge that must be reached before making a project "work"

- Cost and accessibility

### 4.1  Technical Knowledge

Electronics classes designed for artists as well as conventional musical controller classes [2],[6],[8] often require a significant investment in time and knowledge to begin making a "working" project. The MSC does not attempt to provide a complete educational course on controller or interactive design, nor does it attempt to alter the functioning of electronic circuitry as can be seen in the practice of "circuit bending." [5] Instead the MSC provides a low-barrier point of entry for individuals to design interactive objects regardless of affiliation or experience. The ability for musical creation to attract and sustain both the novice and expert [9] resonates with the authors' interest in opening up the process of interactive design, but takes the Cook's principle of "instant music, subtlety later" to heart. [1]

Through MSC participants do not make a fully functioning independent musical controller the experience has the potential to empower novices with tangible accomplishment and surprise experts with fresh perspective.
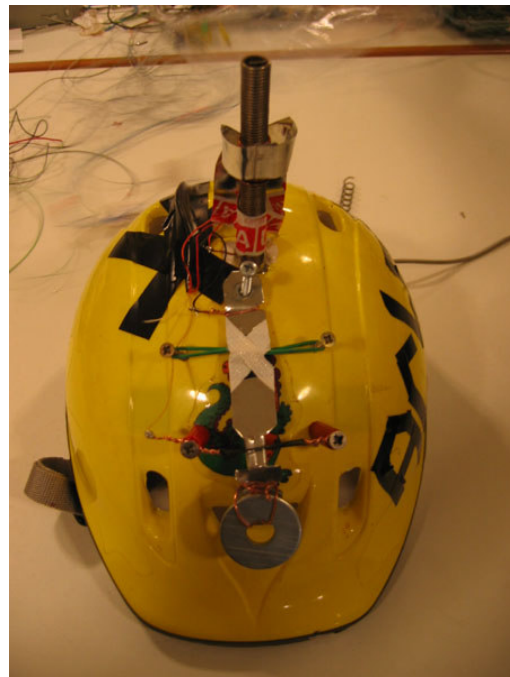


Figure 2. Yes/No Shaker Helmet (Berlin, Germany, Transmediale, 2004.)

### 4.2  Cost and Accessibility

Many ready-made controller systems and electronics development boards are expensive and cost prohibitive to those without institutional subsidy. The MSC workshops are run with very low material cost and require little financial investment from participants. The use of cast-off and cheap materials demystifies the idealized "clean" aesthetic associated with technology. The explicit reference to the DIY and Hacker communities as well as pop-cultural phenomenon couch design practice in familiar layman terms.

Popular television shows from the past such "McGyver" and "the A-team" as well as contemporary reality programs such as "Junkyard Wars" and the British counterpart "Scrapheap

Challenge" feature offbeat and resourceful specialists who repurpose everyday materials into fascinating objects. The DIY enthusiast and hacker execute their work with the same irreverence and sense of adventure. MSC captures this sensibility, encouraging participants to engage in creative discovery for its own sake.

It is to the author's surprise that often people with no electronics experience tend to make the most interesting projects since they are not inhibited by what the technology is "supposed" to do and thus try novel approaches which would normally be discounted.

## 5. RESULTS

Over the past 4 years, MSC has yielded some a wide array of novel projects created by workshop participants. Below are some examples of finished instruments from several MSC workshops.

### 5.1 Yes / No Shaker Helmet

This modified construction worker helmet was augmented with metal joints which swung back and forth. Depending on which direction the wearer's head was moving (forward/backward or left/right) one of two switches are completed, causing alternating tones to play. [Figure 2]

### 5.2 Bottle Violin

The bottle violin was constructed out of two wires. One wire contains five fixed resistors placed in series. The other wire was unmodified. A long piece of plastic encloses the unmodified wire, and keeps the two wires separated. When the wires are immersed into a bottle containing a liquid (water) the wires short at different points, creating a change in resistance. This was one of our most interesting results as the participant who built this had no prior experience with electronics or MIDI controllers and came across this result through repeated experimentation and trial and error.

### 5.3 Printer Drum Machine

This device [Figure 3] consisted of an old printer with exposed wires that interfaced to our input boxes. Using some aluminum foil and glue, the participant created a pattern on a piece of construction paper that allowed for the wires to complete a circuit when the paper passed underneath them through the working printer mechanism. The result was a synchronized output of tones that resembled a low-tech drum machine or wind-up music box.
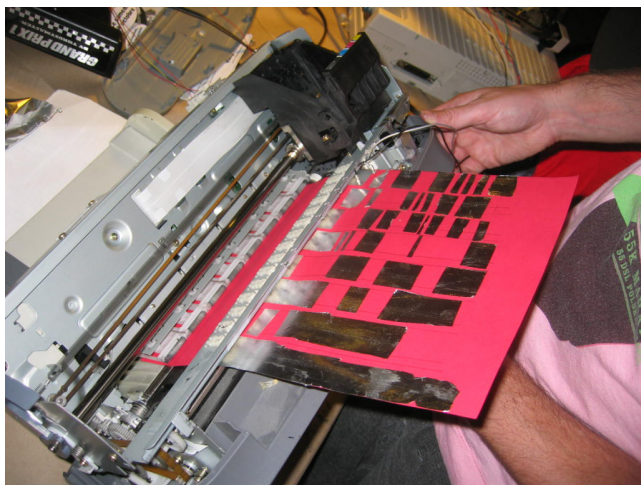
### 5.4 VHS Tape Slider

One inventive participant created an analog controller by taking the tape from a VHS cassette and scratching away some of the carbon of the tape and running it between two motors in front of a photo resistor connected to our analog input board. [Figure 4] They then placed a small night light in front of the resistor so that when the tape passed in front of the resistor it would only let varying amounts of light through. When connected to the synthesizer, this ultimately created a varying pitch bend effect on the digital tones created by other instruments.
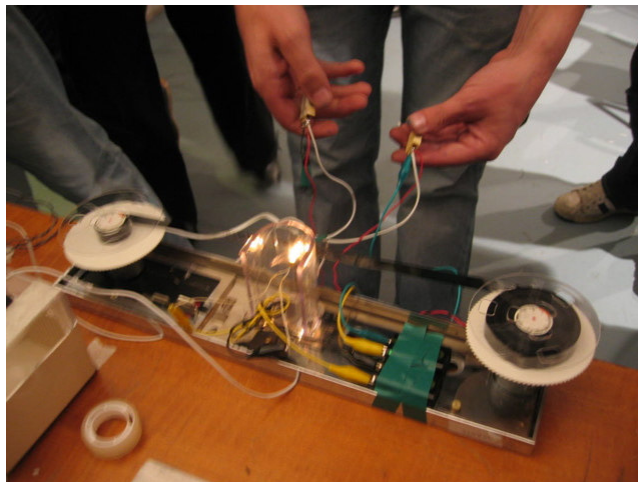


Figure 4. VHS Tape Slider (Amsterdam, The Netherlands, STEIM, 2006.)

### 5.5 Head Butt Hats

Some of the participants in the first MSC we held decided to create a shared instrument that could only be played when two people worked together to produce some form of digital input. The "Head Butt Hats" [Figure 5] were headbands constructed of discarded cardboard that was covered with aluminum foil. Two separate wires connected each hat to the digital input boards so that when the participants "head butted" each other, they produced a note. This type of collaborative instrument was one of several instruments built in subsequent workshops that encouraged multiple people to engage with the creative process at once. This was evident in the need for both participants building one half of the instrument and needing another person to make it function.

## 6. DISCUSSION & FUTURE WORK

Since the first MSC workshop in 2003, the authors have been pleasantly surprised and inspired by the multitude of creations by participants throughout the 20 workshops currently conducted.

Many projects initiated in the MSC have developed into long-term projects for participants, with some continuing their work independently after the end of the workshop. This suggests ways in which a MSC workshop might be incorporated into a more traditional design curriculum. In the author's own experience incorporating the MSC into the syllabus of a graduate level class titled "Electronics Playground" at Trinity College Dublin revealed advantages when used as a "warm-up" to get students thinking about "quick and dirty" design practices. In the same way that

speculative methods proposed by Djajadiningrat et al [3] encourage idea generation and creative thinking, MSC also proved useful for stimulating ideas and encouraging experimentation. When the MSC has been held in educational institutions this "springboard" effect seems to have the most impact due to an institutional infrastructure which can support students in their future endeavors.



**Figure 5. Head Butt Hats (Dublin, Ireland, DATA:BASE, 2003.)**

Although the authors would purposefully like to keep the workshops more focused on the creative process of building instruments rather than the hardware itself, future versions of the MSC workshop may include furnishing a custom built hardware kit or device that participants can "take home" to interface with their own computers or sound output devices. This would allow for more advanced designs to emerge after the workshop has taken its course and participants can finish these on their own time and possibly integrate them into their own practice.

Expansion of the workshops, to include lengthier terms of engagement as well as incorporation of a Scrapyard approach to other classes, is also a possible direction. Musically speaking, the authors have engaged in spirited discussions with participants regarding the perceived qualities of the instruments they've created and the way in which the those objects should sound. An extended MSC would allow for the deeper exploration of this relationship between constructed artifact and perceived sonic characteristics.

The appropriation of found materials ties into contemporary concerns about "hackability" in design [4] as well as resonance with publications such as MAKE [7] magazine, which have since invigorated new interest the "do it yourself" approach. The Midi Scrapyard Challenge presents an example of a workshop which incorporates interaction design, musical controllers, and public performance with compelling results.

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