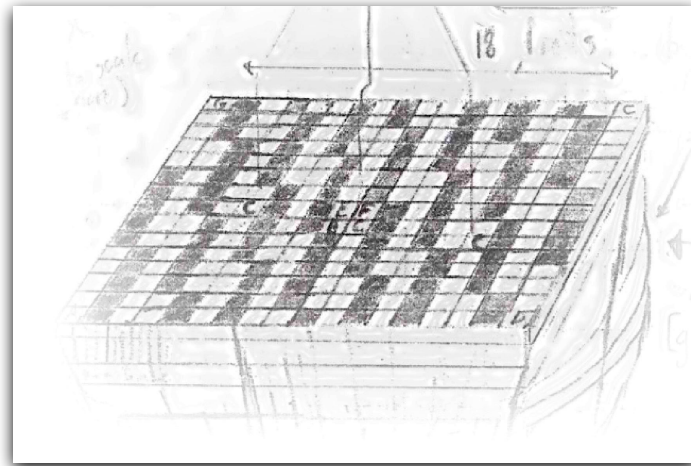


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# KEYGRID MUSICAL INTERFACE

The perfect fourths layout: a superior polyphonic instrument class



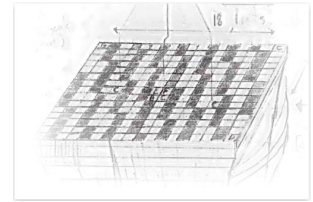
## CONTENTS

1. Jan 2023 // added notes
  2. Summary
  3. Objectives & Advantages
  4. Proposition Model
- (brainstorm towards acoustic prototype)

By Frank Frontera  
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# Keygrid Musical Interface



The perfect fourths layout:  
a superior polyphonic instrument class  
Jan 2023 notes

I get asked from time to time, 'why not just play the piano?'  
And a short answer would be, 'why don't we use steam engines in cars anymore?'

The point is about efficiency. If it makes playing music easier, it makes learning music easier. This is the reason it has so much potential, especially for musical youth. I lay out many of the advantages in the document - but in summary, the congruency of intervals allows simplicity of intervallic relationships, and a multitude of benefits stem from that for the learning process.

A keygrid (as opposed to keyboard) is a polyphonic, contrapuntal instrument class with the notes arranged vertically in perfect fourths, and horizontally as chromatic. It is playable with two hands like a piano [or organ, harpsichord, or any other keyboard instrument], but with a system of notes matching the guitar in perfect 4ths tuning, a bass guitar, double bass, etc.

I indeed hold this conviction -that keygrid instruments will begin to match the piano/ keyboard over time as it is increasingly realized in humanity's musical consciousness. The cool thing to see, since it is so early, is who really will be the first players to actualize this potential? Which companies will develop and manufacture models? The larger corporations or independents? Will the established musical institutions see the potential right away, or wait for it to be proven? To me, it's not a matter of 'if' - but when, and who first.

I am developing educational frameworks for the keygrid class, and will publish updates on my website ([frankfrontera.com](http://frankfrontera.com)) after stages of completion.

//

About dynamics regarding pad/key depression, velocity, + tactility (esp. to instrument manufacturers):

The touch-sensitive pads I currently use are not ideal velocity function. I often limit the velocity on them, because the calibration of velocity touch doesn't feel exactly right.

But this is due to my feel of the pads and tech, not the keygrid layout.

Instrument manufacturers would have to consider the depression of keys and velocity function towards a true standardization of the keygrid (perfect fourths contrapuntal layout) instrument. I would propose a relatively shorter distance from key press to strike than the keyboard. This changes the performance dynamics to a degree, yet accommodates expression for the larger interval range available for each hand (without changing position) respectively.

Also, new models can explore a mild, perhaps convex elevation of the black keys, and possibly an even more mild concave depression in the white keys, though a more distinct elevation shaping should also be tested in similar function as the traditional black keys 'to provide tactile, isomorphic purposes for the keygrid musical interface.'

### SUMMARY

- 1) Understanding the perfect fourths layout, establishing the 'keygrid' as a term.
- 2) Briefly reviewing the current options and availability in the musical instrument market
- 3) Emphasizing the opportunity for pedagogy, and how to be involved

In the course of my musical education I developed a strong interest in the contrapuntal keyboard music of the Baroque and Classical masters, but being a guitarist and not a keyboard player, I was daunted by the difficulties in obtaining a hands-on experience of this music. The finger patterns of the guitar and related string instruments are quite different from those of the keyboard. I wanted to play contrapuntal music, but with a similar note layout as the guitar.

I soon began experimenting with the Ableton Push unit - an 8x8 pad electronic musical instrument which can be arranged in such a way that the pads represent the perfect fourths layout of various stringed instruments, with the ability to also play notes on the same row. I perceived the value of utilizing two units to comfortably expand the range for the left and right hand respectively – so, I raced out and purchased a pairing unit. Within a month, I was able to play simple two-part contrapuntal keyboard dances. I have further expanded my skills and repertoire, and am integrating various keyboard practices on this perfect fourths based musical interface arrangement, which is having a large role in assisting my contrapuntal musical development at this time.

The perfect fourths layout, which I am calling the “keygrid” for short, has been proposed within Prior Art. *“Prior art, state of the art, or background art, in patent law, is constituted by all information that has been made available to the public in any form before a given date that might be relevant to a patent's claims of originality.”* - [Wikipedia]. Thus, the perfect fourths layout concept for an instrument cannot be patented again and is open to manufacturing as a mechanical, hybrid, or electronic unit.

The 'keygrid' perfect fourths layout is already in the market in the electronic music instrument field. There are several patents that will influence the development of further instruments in this field, most notably Ableton's patent for the Push unit '*Dynamic diatonic instrument: US8822803B2*', and the LinnStrument '*Polyphonic Multidimensional Controller With Sensor Having Force-Sensing Potentiometers: US 9,779,709*'.

The LinnStrument is one of the most integrated, full scale 'keygrid' instrument available on the market, presented by its creator Roger Linn. Linn's focus in development of the LinnStrument seems to indicate a prioritization for freedom in 'expressive control'; performance dynamics and articulation.

Linn's patent for the LinnStrument reflects these goals: "*LinnStrument's patented touch-sensing technology permits you to slide in pitch directly from one note to another, tilt your finger forward/backward for subtle timbral variation, or vary note loudness with pressure or velocity, all sensitive to very light touches.*" [rogerlinndesign.com]. This places him in a position for when instrument manufacturers, in due time, will possibly seek to cooperate with him to further develop hybrid 'keygrid' instruments – especially once the potential of the perfect fourths 'keygrid' layout is increasingly recognized in the larger music market.

It is easy to conclude that the LinnStrument is designed with performance capacity at the forefront of its goals, due to Linn's extensive and very successful background into electronic instrument design. He is nevertheless still naturally aware of the diatonic capacity of the perfect fourths layout. Roger Linn explains in detail on his website [rogerlinndesign.com] why the perfect fourths layout is superior to other interval alternatives such as major thirds or perfect fifths:

*"Like a stringed instrument, multiple strings/rows of consecutive semitones permit easier chords and scales than a single string/row. So the only question is "What is the best pitch interval between rows?" Fifths tuning (7 semitones as on violins and cellos) is isomorphic and works well for solos, but is too great an interval to finger many common chords in one hand. An interval of 6 semitones provides the advantage of the same pitches on alternate rows, but also makes common chords difficult to finger in one hand. Thirds tuning (4 semitones) is isomorphic and permits playing most chords in one hand, but the total pitch range of the playing surface is too limited. Guitar tuning is very popular, but isn't isomorphic because of the odd third interval between the G and B strings, requiring different fingerings when the same chord is played on different rows. But fourths tuning (5 semitones) permits easy fingering of any chord or scale, provides a very good total pitch range, and is isomorphic."*

In obvious agreement with Linn, I am using 'keygrid' to refer exclusively to the perfect fourths layout over the other interval alternatives. I do this because the concept needs a short, familiar, and accurate designation. It is not a traditional board of keys, not a "keyboard". It is a grid of keys – "keygrid". There are a few other instruments with this layout, such as the Erae Touch (Embodme), the Zboard / ZB6 (Starr Labs), and the Soundplane (Madrona Labs), with the full scale available (enough range for both hands respectively on one unit). There is the utility of paired Ableton Push units where I started. Also available is the Novation Launchpads, Akai Force, ROLI Blocks, Artiphon Instrument 1, and probably others.

As a new standard, electronic and hybrid models, like many of those previously mentioned, will take centre stage in the upcoming musical era. As such, there is potential value in strictly mechanical models built internally like pianos, harpsichords, chamber organs, etc.

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## KEYGRID MUSICAL INTERFACE

Mechanical models, if seeking velocity functions in parallel to the piano, will have to address this in design modifications due to the different size, shape, and layout of the keygrid. Hybrid, electric, or acoustic; these model variations function in parallel to the numerous keyboard instruments and will largely resemble their demographic markets.

The traditional elements of piano technique and other keyboard instruments are transplanted directly onto keygrid instruments: diatonic and chromatic intervals, scales, chords, arpeggios, techniques, sight-reading, figured bass, repertoire, etc. I am actively developing such a curriculum for myself, and for forthcoming pedagogical purposes. There are aspects to playing this instrument to be explored that will extend the performance capacity beyond what is possible on the keyboard. I discuss advantages of the keygrid over the keyboard in a following section.

If you're a musician interested in the perfect fourths 'keygrid' layout, obtain one of the full scale instrument models listed above, or dual units; initiate an online presence on the subject. I plan to further develop on the keygrid and publish videos and other information online in due time. If you're involved in a musical institution, seek any internal activity of a pedagogical system with faculty and students, or start the discussion.

Frank Frontera

October 17, 2019  
Toronto

# **Keygrid Concept**

**July 2019**

by Frank Frontera  
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**1. Field** - Musical instrument which is within Prior Art, yet not fully realized by the mass musical market.

## **2. Broad Description**

The “Keygrid” - A keygrid instrument (as opposed to keyboard) which is laid out in perfect fourths (musical intervals) and built like a piano [or organ, harpsichord, or any other keyboard instrument].

## **3. Objectives**

1. A full scale electronic, hybridized version (similar electronic piano/synth pad instrument) to be the primary model - smaller models available (similar to market for 61, 49, 25 keyboard variations)
2. Full scale acoustic model - highly valuable for specific segments of the market (i.e. grand pianos)
3. System of pedagogy development & with institutional integration (Yamaha, RCM, U of T, etc.)

## **4. Main Advantages**

*Congruency of Intervals*

- the intervallic patterns are entirely congruent across the keygrid  
players build mental relationships of intervals in a horizontal, vertical, and diagonal capacity
- contrapuntal ease of keyboard is maintained, expanded range of motion for both hands;
- single hand can reach over two octaves, especially with pivoting
- musical concepts can be learned, explained in ease with congruency that facilitates process
- guitar/bass/ select string instrument players can transition with familiarity of grid layout of fourths
- [E, A, D, G] patterns; keygrid layout mirrors the perfect fourths [E, A, D, G, C, F] layout
- Virtually entire repertoire of piano, keyboard instruments can transition to the keygrid
- music students, especially youth, will master musical elements at an accelerated rate

## **Secondary Advantages**

- Repeated notes are part of layout design, will add compositional and performance dynamics
- Unbiased keys: Playability of all keys (C major, D major, Bb major, etc) is virtually identical
- Thumb is less limited than on keyboard and has additional range, pivoting/ position switch capacity

## **5. Preferred Practice, Features**

Musical performance, composition, pedagogy, study. Identical to other musical instruments, especially keyboard instruments. Includes additional dimensions to what the piano, or other keyboard instruments do for musical purposes.

## **6. Market Inception**

Main ‘prototype’ versions available on the market, electronic based (this is not exhaustive):

Linnstrument- <http://www.rogerlinndesign.com/linnstrument.html>

Zboard / ZB6 – Starr Labs

Deluge - <https://synthstrom.com/product/deluge/>

Soundplane – Madrona Labs

Jan 2019

The 'Keygrid' | → main working title

Sava Kathoto

by Francesco Frontera

Concept Version 1

Torname: description/meaning

Sound, altar

Sound, way/path

Perpendic (greek)

desc.

diagonal tilt

40° approx

(not to scale)

middle Cs [3ft approx.]

18 frets

keygrid options

- ★ Black & white keyboard layout
- color per key
- Symbols
- elevated texture (for visually impaired)

Action frame

Pins, Tuning Pins

Hammers (through)

Resonators circular pipe resonators

Interior (Steel) strings connect to base cast iron plate

→ Soundboard unit(s) possible

resonators design more elegant than this

pedal / connectors [removable]

pedal sleeve [Keyboard or ~~Steel board~~ Mini Keygrid]

66% of resonance (or more) pointed OUTWARD (somewhat)

1/4 section placed side could be indented [with resonators removed]

entirely, for leg room

★ [18x15 = 270 keys = 88 unique keys]

[tall stool / standing basic stance]

may use less "bars" depending on resonators design & material