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► **To cite this version:**

Rodolphe Koehly, Vincent Cusson. Organic vs Synthetic: the Polymers Battle. International Workshop on Haptic and Audio Interaction Design, 2020, Montreal, Canada. hal-02901203

**HAL Id: hal-02901203**

**<https://hal.science/hal-02901203>**

Submitted on 16 Jul 2020

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# Organic vs Synthetic: the Polymers Battle

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*We demonstrate the production of custom interactive environments while comparing the type of resources that can be used for building oneself floor sensing arrays to be used as comparable touch responsive systems for interactive environments made either of organic or of synthetic resources. Who is gonna win the Polymers Battle?*

Electronics has spread into technologies for more than a century. While originally composed of various organic and renewable materials, the massive emergence of oil-based synthetic polymers from the 1940's has led these highly durable materials also called plastics to be the main substrate for the mass production of consumer products until today.

There is however an increasing need for finding alternatives to oil for plastics production, and the use of a variety of renewable organic resources can be used for producing electronics such as functional papers and printed electronics with possibly a new compromise to be found between the product performance and its environmental impact.

## PRINTED AND PAPER-BASED ELECTRONICS

Printed electronics appeared in the 1980's for the mass production of thin Sensing Resistors made by serigraphy. Most printing systems have then been tested for producing nearly any kind of passive or active components, sensors, power-sources, antennas, or displays. Even Printed chips are getting constantly optimised by improved prints resolutions.

Flexible phones are a mass production example of these new electronic technologies with functional elements inserted onto or into the objects matter itself. This industrial revolution will then also require optimised ways to properly recycle or dispose of these new materials. [1].

Originally also made of synthetic polymers, printed electronics helped minimising the resources consumption while increasing the production rates. However, organic materials such as paper or textiles can also be turned into electronic substrates to be used to build interactive interfaces. Musical instruments design using paper sensors has been an early application of such technologies [2]. Custom sensors have regularly been used for mapping the sensors signals into sound, visual feedback and haptic systems [3] [4] at IDMIL and other labs world-wide.

## ORGANIC VS SYNTHETIC: THE BATTLE DEMO

Both resources are compared by producing 2 large custom floor sensitive arrays, one made of cellulose substrate and one made of synthetic polymer substrate implemented through multiplexing DSP on comparable Arduino boards. The type of materials substrates used for each interface are the only variable to be compared by the HAID community.

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‡Thanks to Christian Frisson and Marcelo Wanderley for their support.

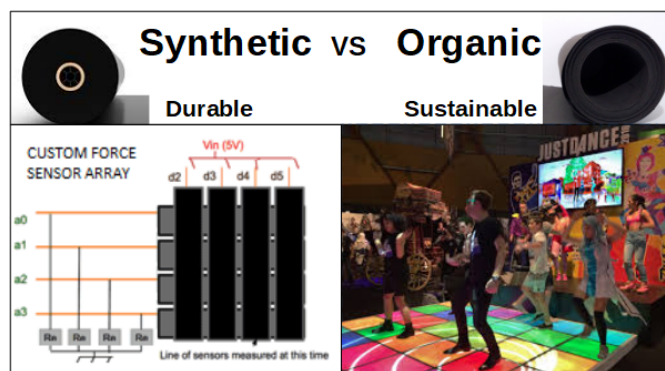


Figure 1: Dance games or augmented dance-floors are fun interfaces to be custom built. But which materials will augment the best our moves? Credits : Philip Terry Graham / CCO

The data from the custom sensors arrays is acquired by Max/MSP to be further processed and mapped in real-time to offers sound and visual feedback relatively to the moves and the load variations generated by a user onto each array. To be able to compare both interfaces force sensitivity in terms of resolution, time-response, repeatability, and drift, a one-to-one mapping strategy is likely to be the more effective. We then hope to provide useful data for Haptic system using such sensors arrays as an input.

When designing a more flexible system, the interfaces can also be turned into an augmented dance floor that can detect a set of known dance steps allowing more complex interactive experiences.

The PapierLogik project has been gathering those developments and access to the resources on-line: <https://papierlogik.com>.

## REFERENCES

- [1] M. Berners-Lee. *How Bad Are Bananas? The Carbon Footprint of Everything*. Greystone Books, 2011.
- [2] A. Freed. *A NIME Reader. Current Research in Systematic Musicology*, chapter The Fingerphone: A Case Study of Sustainable Instrument Redesign. Springer, 2017.
- [3] R. Koehly, M. M. Wanderley, T. van de Ven, and D. Curtail. In-house development of paper force sensors for musical applications. *Computer Music Journal*, 38(2), 2014.
- [4] A. Visell, Y. and Law and J. R. Cooperstock. Touch is everywhere: Floor surfaces as ambient haptic interfaces. *IEEE Transactions on Haptics*, 2(3), 148-159. 2009.