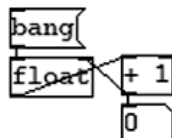
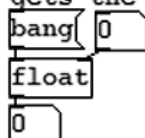


Here's a simple counter. Click repeatedly on the "bang" message to see it:

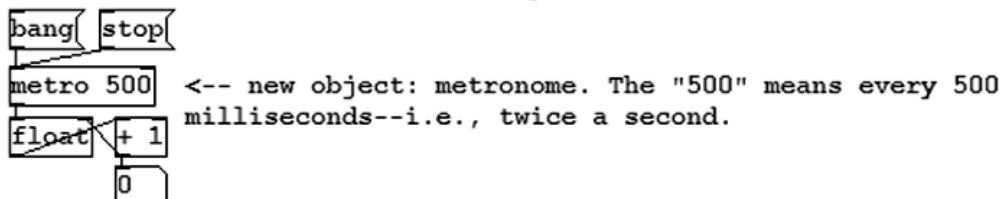


The "float" box is a storage element holding one floating-point number. The cold inlet (i.e., the one on the right) stores numbers. Sending the message "bang" to the hot inlet gets the number back out:



Float's outlet above is connected via `+ 1` to its cold inlet. The incremented value is stored for the next "bang" to spit out.

Here's a timed counter. Hit the "bang" to start it...



updated for Pd version 0.34

## I'm the Operator with the Pocket Calculator Some Reflections on *Pure Data*.

Thomas Musil / Harald A. Wiltsche

1. In the *Tractatus logico-philosophicus*, Ludwig Wittgenstein wrote that the only purpose of philosophy is to contribute to the “logische Klärung der Gedanken” [logical clarification of thoughts] (Wittgenstein 1963, 41). There is much false but also some truth to this sentence. It is true that discussions are often clouded by premises which, when actually spoken, seem completely clear and almost banal, yet which cause great confusion if you forget to explain them. Logic is acquainted with this phenomenon under the term of enthymeme, and not often have highly astute arguments broken down because someone forgot to formalize and include sentences such as “All humans are mortal” in the set of premises. We will not conduct a logical analysis here but will bring to light some enthymemes that have significantly obscured past discussions of the programming language Pd instead, in order to clarify in at least some instances what we are actually talking about when we speak of art and Pd.

The thesis of the following essay can be explained quickly: Pd has grown out of a special scientific culture which has decisively shaped our western understanding of reality and the world. Yet Pd is a tool<sup>1</sup> for the production of artistic artifacts.<sup>2</sup> Out of this Janus-faced character grows a theoretical problematic recognizable in many different aspects, although we can only examine a few facets here.

2. Historically regarded, a close relationship between music<sup>3</sup> and science is in principle nothing new. As part of the classical *artes liberales*, music has always been situated in direct proximity to the mathematical disciplines and had already developed strict musical formalism in the early Middle Ages. A new level of connection between music and science arose from the electrification of music, which had already begun in the eighteenth century,<sup>4</sup> probably not coincidentally at a time when the triumphal march of modern science had already gotten completely

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<sup>1</sup> A note on the terminology: to have to understand Pd as a tool seems to us the only reasonable procedure for describing what Pd performs and can perform: Pd is something that makes it possible for us to generate something else (namely an artistic artifact). We would likewise characterize hammers, chisels, and brushes as tools. Voices which require one not to characterize Pd as a tool may represent an especially advanced concept of a tool which we do not share, or they are supporters of a digital mysticism which is very widespread in certain places, of which we are critical. Pd is still not an instrument per se. An instrument can be programmed in Pd.

<sup>2</sup> We understand Pd here as a tool for the production of art knowing well that in principle, Pd can be used in the most diverse areas. However, such areas of use do not interest us at the moment.

<sup>3</sup> It is in keeping with our theoretical interest to speak principally of music, even if most arguments can be extended to the whole system of art more or less without problems.

<sup>4</sup> The first electronic instrument in the broadest sense was constructed around 1730. (Ruschkowski 1998)

under way. When we speak of the triumphal march of science in the eighteenth and nineteenth centuries, the fundamental changes which were actually occurring then are slightly hidden from our present gaze. At this time, science emerged from the salons of the European elite, where it had served up until this point for aristocratic amusement, and changed the *Lebenswelt* of the masses to an extent not yet known: the changes in the area of the communication technology has had a fundamental impact on the general perception of time and space. The incipient industrial revolution changed the social situation of the masses and scientific discoveries, such as that of infrared and ultraviolet light, confronted people with phenomena for which there is no natural sense organ. In a word, science spilled into people's daily lives and with it a certain way of thinking, in the center of which "method" seems to stand.

Why method? When dealing with questions of concept formation and the construction of theory, you very soon come to the conclusion that theoretical activity always means reduction. The concept of method describes this precisely: "The term 'method', strictly speaking, 'following a way' (from the Greek *meta*, 'along', and *odos*, 'way'), refers to the specification of steps which must be taken, in a given order, to achieve a given end." (Caws 1967, 339) With Descartes, Galileo, and several others, a method was established in a strictly literal sense, a method whose innovation can be seen in the linking of an empirical approach with mathematics. Although thinking in its entirety was still very much shaped by magic and alchemical motives at this time, and researchers like Kepler were still adamantly convinced that horoscopes could be accepted as an inherent part of science,<sup>5</sup> on the side of method, it was clear that only that which had a place within the narrow constraints of mathematics could be a part of science. Thus it is also not astonishing that the significant distinction between primary and secondary qualities was formulated precisely at this time: extension, figure, motion, rest, solidity or impenetrability, and number are to be viewed as primary qualities, while the secondary sense qualities are color, smell, sounds, taste, etc. It is striking that the area of primary qualities is virtually defined as being able to be expressed in mathematics while this does not hold true for the secondary qualities. If the Cartesian concept of the duality of the world is added to the realm of the subjective and to that of objects in nature which have extension, as well as the notion that the book of nature is written in the language of mathematics, an image arises of a world which is able to be subjectified, expressed in mathematics and experimentally and scientifically analyzed through and through. A successful but nevertheless artificial method, namely that of empirical research and the reliance on mathematics, was stressed in such a strict sense that it mutated gradually from a *possible world view* to *the only possible world view*. Empiricism, early, middle and neopositivism, psychologism, biologism, AI research which has been promising results for decades, current trends in brain research which are on the point of scientifically arresting the soul and free will (cf. e.g. Monyer et. al. 2004), as well as countless contemporary opinions of individuals (e.g. Sellars 1963, 1-40) confirm in an impressive manner our cursory remarks on the history of science.

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<sup>5</sup> In addition, Kepler's *harmonices mundi* can serve as further evidence for the close connection of music and science.

The scientific way of thinking – with the strong support of some philosophical currents – has become a monopoly in questions of the observation of the world, while possible gaps are filled by esoteric obscurantism of the most varied provenance. Niklas Luhmann spoke of *symbolisch generalisierte Kommunikationsmedien* (symbolically generalized communication media) and thought of those cases in which scientists are interviewed on television about subjects which are not in their area of research, and they are believed because they participate in the medium of scientific truth and not because their arguments are so convincing. Only sluggishly has the philosophy of the twentieth and twenty-first centuries rediscovered what this perspective hides if it is made absolute.

3. What does this have to do with Pd? It must first be stated that Pd stems from precisely this mathematical and scientific line of thought and for good reason. Making instruments (and in the most general sense Pd fits into this category) has largely been dependent on science since the time of electrification at the latest. Science “lives” to an extent on omitting the subjective meaning, i.e. those structures which are attached to the secondary qualities in order to attain a mathematical and empirical reduction. Art, however, is perhaps one of the last peepholes into the aforementioned world of *Sinn* (meaning), into a world *before* scientific reduction.<sup>6</sup> If naively asked now what Pd actually is, a tool for the production of art, thus a tool for the pure formation of meaning or a scientific artifact, at the same time the obvious response (“Both!”) is heard; with a trivial question, one has come to the crux of the problem. Work in Pd runs the risk of getting caught up in an infinite loop between the area of *the exclusion of meaning* and that of *the formation of meaning*. Work in Pd – expressed differently – very easily becomes a scientific experiment where the depths of what Pd can provide – and not what *meaning* (and thus *art*) can provide – are plumbed.

Let us pause for a moment and envision what we don't mean by this: technical innovations naturally play a role in the history of art, but they do not play a role in art. The following is meant: Nam June Paik could never have created his installations if the technical equipment he used hadn't existed. The technical equipment doesn't make a difference; the point of this art: Nam June Paik reflected a slice of the world, tinkered with the meaning inherent to this facet of the world, and used equipment that was on hand and seemed fitting to him. For art as such (for the essence of art),<sup>7</sup> the singling out of Nam June Paik's works is irrelevant, equally as irrelevant as nearly triangular objects that actually exist are for the geometrical idea of the triangle.<sup>8</sup> In this regard, it also does not change anything that Nam June Paik explicitly picked

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<sup>6</sup> Is it a coincidence that Kant begins his heavily invested project of creating a base for pure science with *transcendental aesthetics*?

<sup>7</sup> To say it once again with all clarity: in no case do we claim to have the power to define what art is when actual works are concerned. Reflecting upon what art is according to its intention, the area of individual works is not at all restricted. However, let us admit that religion and science are in essence different, even though there are single scientific or religious manifestations where the border is difficult to draw.

<sup>8</sup> This can be approximated by making oneself aware that saying the Pythagorean theorem twice does not double its truth.

out technology as a central theme, for in his art, this is only considered a slice of the meaning of the world among other things.

For Pd, this means that the question of whether a piece was composed with *MAX* or with Pd is not only difficult to decide; it is extrinsic to the essence of art. It can naturally be the case that Peter would rather listen to electronic music, while Berta favors the sound of the violin, just as Fritz realizes his artistic ideas on the computer, while Anna prefers the recorder; however, individual works and producers, like individual recipients, change nothing of the essence of art.

The impression could now arise that we are speaking of abstractions removed from the world, the essence of art, that we are blind to the actual development of works and represent a more or less hidden Platonism. We do not dispute that the technical, social, technological, and historical contexts of the production of art represent an important area of analysis; however, these factors act on another level. In Pd, however, we see the danger of losing sight of the essence of art precisely because it is a part of applied mathematics and logic similar to the early years of media art when the content of an installation sometimes seemed to lie in sending data packets from Linz to Tokyo, Sydney, New York, London and Paris and back again to Linz. In these cases, it is doubtlessly a matter of scientific experiments, and those who enjoyed this took pleasure in the excitement of scientific and technical achievements. This is not meant to be derogatory, since pushing the technical limits is of great importance; in the majority of cases, however, it has nothing to do with art: virtuosity (a great knowledge of programming) alone does not touch art as such, like urinals in galleries and four minutes and thirty-three seconds of silence show. Urinals and silence alone do not make art, also the essence of this seems to lie somewhere else: we think in the structure of meaning. That the method of sensory exclusion which lies behind Pd holds certain dangers for dealing with structures of meaning is obvious, even when it is a matter of a method that largely shapes our everyday life and our everyday perception.

The following is to be said of Pd: Pd is not an empty canvas per se, for behind Pd stands centuries of history of scientific ideas. Pd can become an empty canvas just as hammers, chisels, brushes, violins, and jackhammers can. Pd is not an art. Pd can be used for the production of art, just as hammers, chisels, brushes, violins, and jackhammers can.

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