

GETTING STARTED TOWARDS ALGEBRAIC ANALYSIS (+)

R. Guitart

1. The purpose of Algebraic Analysis will be to consider concrete phenomenons usually studied by Numerical Analysis and to attack them with the help of Homological Algebra extended in a convenient way. Phenomenons are antagonisms or dialectics and their study is the construction of the calculus describing their rules of modifications or fluxions. In this talk I have expressed how each mathematical theory (and each space) can be described in a precise way as a dialectic (it was the notion of figuration) and I have introduced the calculus of fluxions "along spaces" as an extension of the classical calculus of satellites and derived functors (so, finally, derived functors had been well christened). Of course, in the future it will be necessary to show how the classical differential calculus is embedded in this new kind of analysis.

2. A figuration is a datum $\underline{F} \begin{array}{c} \xrightarrow{D} \\ \downarrow u \\ \xrightarrow{P} \end{array} \underline{S}$ where \underline{F}

is the category of figures (or ideal datas, or arities, or "points"), \underline{S} is the category of supports (or real world, or

(+) Summary of a conference at the Categorical Meeting at the Isle of Thorns, 11-16 July 1982.

primitive domains, or "opens"), D is the bimodule of drawings, P is the bimodule of potential drawings and $u: D \longrightarrow P$ says that the drawings are potential drawings. Often we start with D and with $L: \underline{F} \longrightarrow \underline{F}$ a bimodule of composition laws and we take $P = D \boxtimes L$. Then an algebra is a (S, A) with $S \in \underline{S}_0$ and A a co-section of

$$[S]^\circ \boxtimes u : [S]^\circ \boxtimes D \longrightarrow [S]^\circ \boxtimes P$$

(where $[S] : \underline{\Pi} \longrightarrow \underline{S}$ and $[S] \rightarrow [S]^\circ$ as bimodules). By analysis of contacts between figures and description of paradoxes it is possible to prove that figurative algebras are the same that models of (mixed) sketches. This imply that we have as examples: models of first order theories, partial and relational algebras, fuzzy algebras, elementary geometries, theories of equations, infinitesimal calculus, etc ...

3. A bimodule or a figuration where $u = Id_D$ (i. e. without laws) is seen as a space, following the fact that an ordinary topological space determines a discrete set \underline{P} of points, an ordered set \underline{O} of opens and a bimodule $E: \underline{P} \longrightarrow \underline{O}$ given by $E(x, U) = 1$, if $x \in U$, 0 otherwise.

A (bi)presentation of a bimodule (or a space) E is an exact

$$\text{square } \begin{array}{ccc} \underline{K} & \xrightarrow{T} & \underline{P} \\ \downarrow S & \nearrow \varphi & \downarrow V \\ \underline{O} & \xrightarrow{U} & \underline{L} \end{array} \quad (\text{i. e. } S \boxtimes T^\circ \cong U^\circ \boxtimes V \text{ with}$$

$U \rightarrow U^\circ$ and $T \rightarrow T^\circ$ as bimodules) such that $S \boxtimes T^\circ \cong E$.

If a presentation of E and a functor $H: \underline{O} \longrightarrow \underline{W}$ are given, then the germ of H along E (or at the points of E) is the extension of $H.S$ along T . In fact it is the satellite $\text{Sat } H$ of H with respect to E , i. e. their exists an \longrightarrow_E

$h: H \boxtimes E \longrightarrow \text{Sat } H$ such that every $f: H \boxtimes E \longrightarrow F$, with F a functor, factors uniquely through h .

The computation of n^{th} -satellites by iterations is just to

play dominoes with the exact squares presenting the data.
 If \underline{A} is an abelian category then to take the satellite of
 $H: \underline{A} \longrightarrow \underline{B}$ along $\text{EXT}: \underline{A} \dashrightarrow \underline{A}$ produces the (right)
 classical satellites. It is possible to prove syntactically
 by using convenient bipresentations of EXT and playing at
 dominoes the long exact sequence for $(\text{EXT}^n)_{Q \ll \mathfrak{A}}$ and the
 equality between satellites and derived functors.
 It is also possible to construct a bimodule of exact squares
 (as elements) $\underline{\text{CAT}} \dashrightarrow \underline{\text{CAT}}$ which produces an "achieved"
 cohomology theory for categories.

1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that proper record-keeping is essential for ensuring transparency and accountability in financial reporting.

2. The second part of the document outlines the various methods and techniques used to collect and analyze data. It highlights the need for consistent and reliable data collection processes to ensure the validity of the results.

3. The third part of the document describes the different types of data that are collected and analyzed. It includes information on both quantitative and qualitative data, as well as the specific variables being measured.

4. The fourth part of the document discusses the various statistical methods used to analyze the data. It covers topics such as descriptive statistics, inferential statistics, and regression analysis.

5. The fifth part of the document discusses the importance of interpreting the results of the analysis. It emphasizes that the results should be presented in a clear and concise manner, and that the conclusions should be based on the evidence provided by the data.