

FUNDAMENTALS OF SITUATED INTERACTION - 28 SEPTEMBER 2018

MICHEL BEAUDOUIN-LAFON

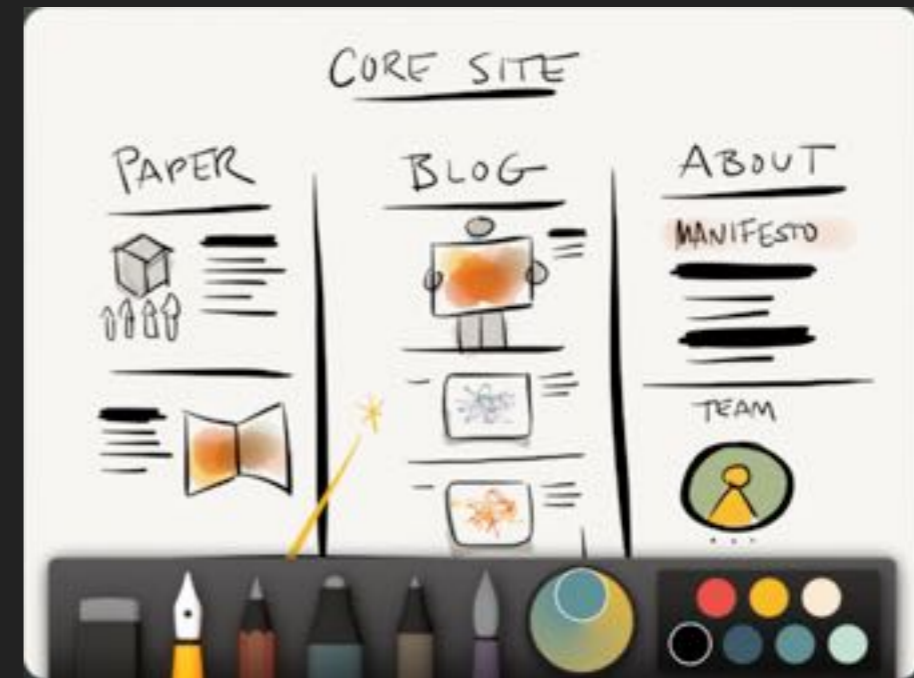
UNIVERSITÉ PARIS-SUD & INSTITUT UNIVERSITAIRE DE FRANCE

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# INFORMATION SUBSTRATES

## INSTRUMENTAL INTERFACES

- ▶ To create and edit content



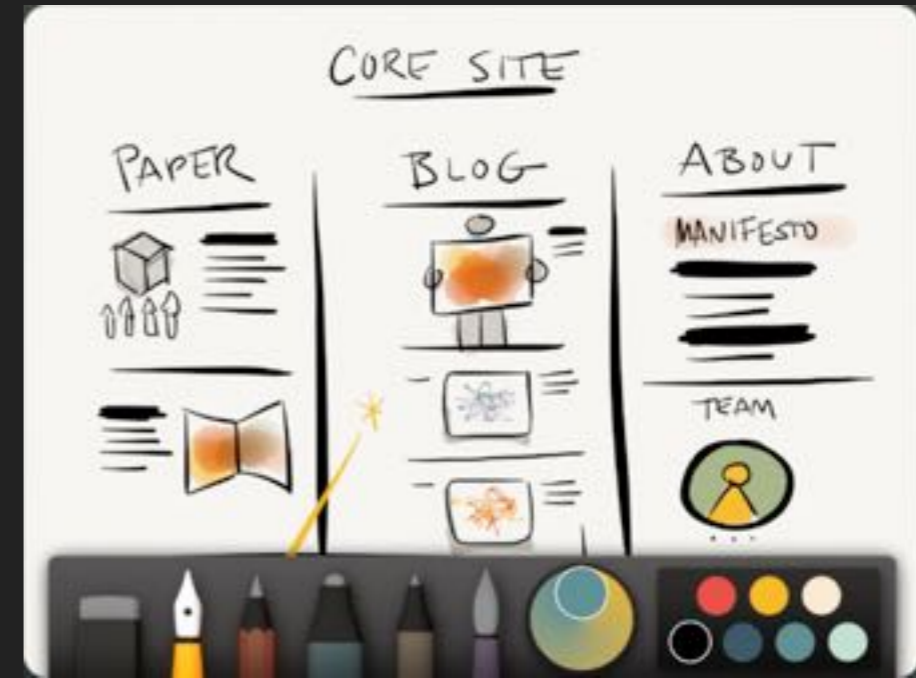
Paper



iPhoto

## INSTRUMENTAL INTERFACES

- ▶ BUT limited:
- ▶ How to use the pen from the "Paper" app to write on a photo in the "iPhoto" app?



Paper



iPhoto

## INFORMATION SUBSTRATES

- ▶ Data does not exist in a vacuum



## INFORMATION SUBSTRATES

- ▶ Data does not exist in a vacuum
- ▶ It is part of a substrate that provides context for interpreting data and constraints for presenting and interacting with it
- ▶ Examples: musical score, spreadsheet, page layout, graph...



# PHYSICAL SUBSTRATES



# INFORMATION SUBSTRATES



24 Diciembre XXIV.

20 noviembre 1935  
21 noviembre 1935  
22 diciembre XXIV

Algunas que hace su casa cuando ya no se le importa un pito que el rocío que le pega la jaca

haciendo su arroz con pollo en la sartén le diga la verdura y la saque

y organiza en el amorfa noche con sus cuantos de risas

pero si al rededor de la línea de fuego

más de lo que parece ofendido y tan pálido

de ver como jactón no huele y luego se estreñece

el pájaro que canta rotoreo la cortina

que abanica su cara y la corta

en la nieve

que cuece sus cintas de todos los colores

en la flauta la copa

que cantándole

como si cantar pudiese la calavera

que le guarda la mano

y se la lleva suspendida por el anillo

envuelto en el ruido de las alas de las poscas

que la nota que sostiene el violín no dejó respirar

apretándole el cuello con sus tenazas

roa la puñalada que tiene el tron que sella el primero del pecho del

que hinchan en el globo atado con longanizas extremeñas

la razón perentoria del azul tan gracioso

que sentado en su silla curula

y arreglándose las faldas a cada momentito

cuando pasa la flecha tan veloz

le echa pimienta y sale saltando

y lee el porvenir en el ojo del toro

puchero roto cucharas hechas de boj y rajas de pulsera

origano laurel y aljofaina de plata

Caracoles

Respase sobre respase

si el tiempo no mejora y hace frío

si el viento le trae la lluvia cuando cae el gualle

si el viento le trae la lluvia cuando cae el gualle

si el viento le trae la lluvia cuando cae el gualle

si el viento le trae la lluvia cuando cae el gualle

si el viento le trae la lluvia cuando cae el gualle

improbable

después

de un

de un

de un

de un

de un

de un

de un

de un

de un

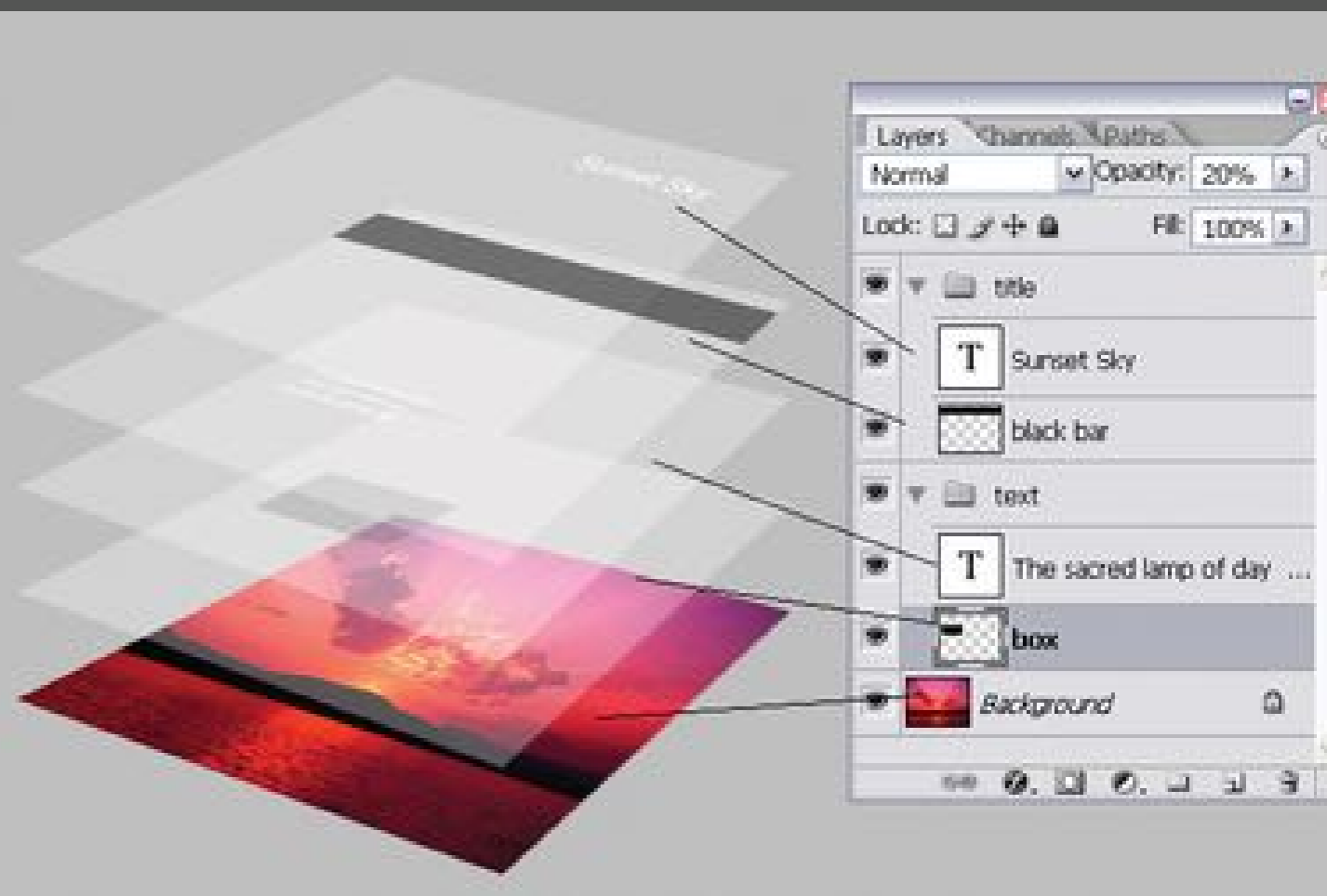
The image shows a page of handwritten musical notation on aged, yellowed paper. It features several staves of music. The notation includes various note values, rests, and clefs. There are several instances of the word "piano" written in the left margin, indicating dynamics. Some staves have markings that look like "pizzicato" or "pizz." The handwriting is somewhat messy and expressive, with some ink bleed-through from the reverse side of the page. The paper shows signs of age, including some staining and uneven coloring.





# INFORMATION SUBSTRATES

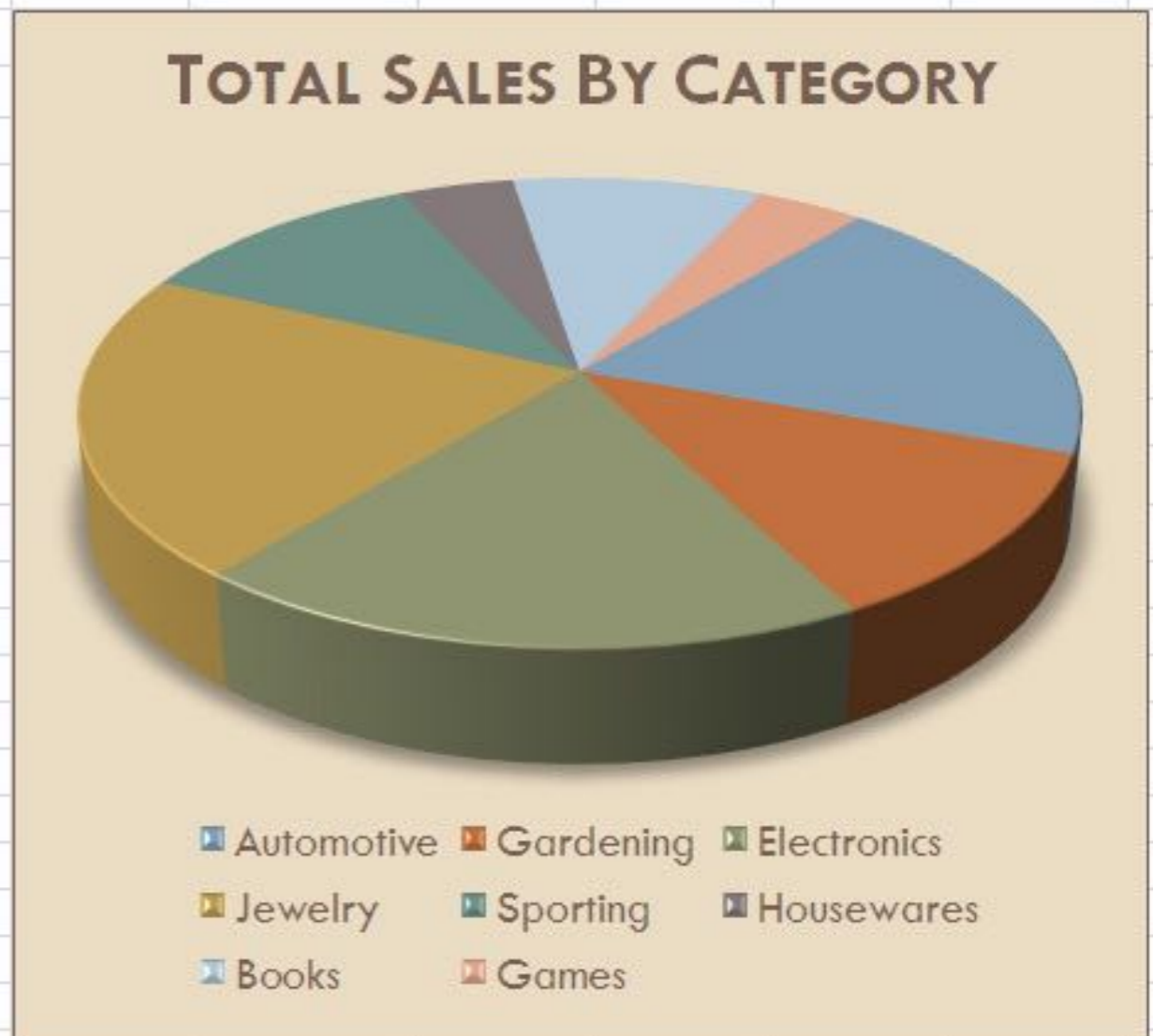
	B	C	D	E	F
2	OTBT Rzpsmr	OTBT N/B	Tsct OTBT NB		
3	11434	64037	200000		
4	ngd cslemistm				
5	Tgtsl bssz yzrsz mntm Oz	BzTgrz 12 O	R/Onth -1	R/O	
6	1412	11.97	1400	0	
7	306	4.36	0	2	
8	272	4.01	0	1	
9	8	#DIV/0!	0	0	
10	34	7.10	0	1	
11					
12					
13	Rzpsmr mssgz	Rzpsmr pgpmlstm			
14	Tgtsl Rzpsmr Rzpsmrzd DOs	Rzpsmrzd Wsrr	NgrOsl Rzpsmr	LgcsRz	
15	306	2	40	264	
16	% cmrrznt mnstllzd bssz s	r Tmtmrz sslz	nd dztgrmstmgn		
17	Argdmct NsOz	ytylz NsOz	Rzvmzw_Dstz	Ognth-sctmvz	mtmrz rmt
18	zhmOmdmTmzr	sB6065903CT	25/06/98	76.8	
19			Ognth/dsy/yzsr		
20	Dy Asrt NmObzr	yzt-mp_Dstz	ytsndsr_dcgst	Ognthly mssgz	Ognth's-r
21	43588136-002	1/02/92	675.92	9.7	



Sheet | **Insert** | Page Layout | Formulas | Data | Review | View

PivotTable | Table | Column | Line | Pie | Bar | Area | XY (Scatter) | Other Charts | Picture | IGX Graphic | Shapes | Hyperlink | Text Box | Header & Footer | WordArt | Signature Line | Object | Symbol

Total Sales by Store		Total Sales by Region	
Store	Sales	Region	Sales
Store 1	\$ 313,765	West	✓ \$ 1,718,258
Store 2	\$ 107,160	South	✗ \$ 534,389
Store 3	\$ 351,751	Midwest	⚠ \$ 1,009,268
Store 4	\$ 131,047	East	✗ \$ 900,431
Store 5	\$ 252,136	<b>Total</b>	<b>\$ 4,162,346</b>
Store 6	\$ 167,462		
Store 7	\$ 210,073		
Store 8	\$ 308,092	Total Sales by Category	
Store 9	\$ 97,492	Category	Sales
Store 10	\$ 393,484	Automotive	\$ 86,285
Store 11	\$ 396,891	Gardening	\$ 52,048
Store 12	\$ 151,168	Electronics	\$ 83,026
Store 13	\$ 251,390	Jewelry	\$ 93,035
Store 14	\$ 392,776	Sporting	\$ 50,016
Store 15	\$ 259,654	Houseware	\$ 19,149
Store 16	\$ 225,184	Books	\$ 42,247
Store 17	\$ 335,785	Games	\$ 18,420



# BREATHING CITY

Manhattan's at **Work** and **Home** population by hour

12  
am



Joey Cherdarchuk | @cherdarchuk | www.darkhorseanalytics.com/blog  
Data: US Census Bureau, New York City, US Bureau of Labour Statistics

Microsoft Excel interface showing a spreadsheet with a game log and a character sheet for Cary.

**Game Log:**

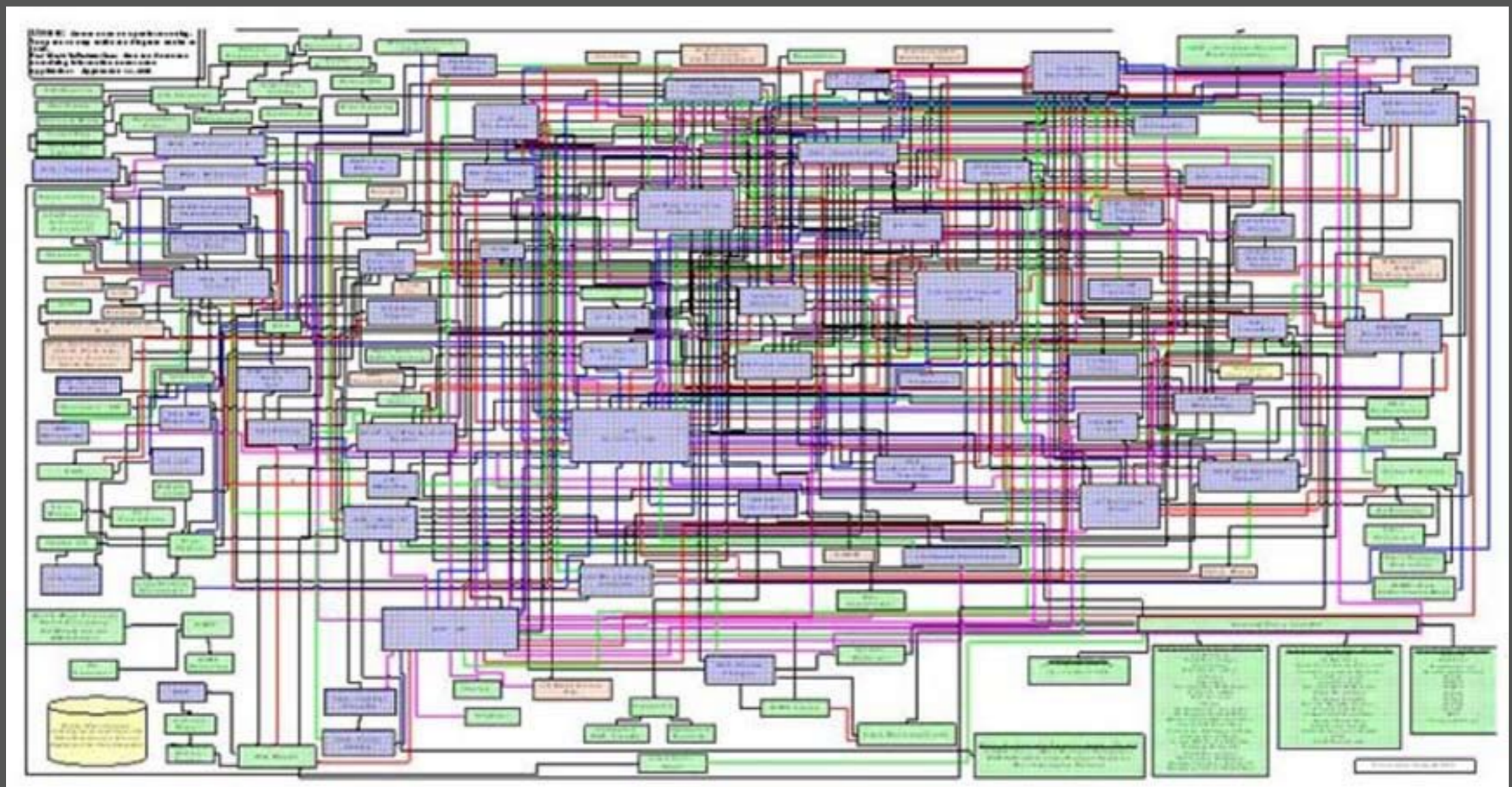
- Cursed Zombie was hit for 278 (+28) damage.
- Cursed Zombie was hit for 278 (+28) damage.
- Cursed Zombie was hit for 278 (+28) damage.
- Cursed Zombie has died!
- Cary has earned 765 (+15) fame!
- Cary has harvested 2 blood from the fallen Cursed Zombie!
- Cary has achieved level 12!

**Character Sheet for Cary:**

<b>Title:</b>	Duelist	<b>Name:</b>	Vampire
<b>Name:</b>	Cary	<b>Level:</b>	13
<b>Level:</b>	12	<b>Health:</b>	407 / 407
<b>Health:</b>	370 / 370	<b>Energy:</b>	49 / 49
<b>Fame:</b>	17230 / 18910	<b>Abilities:</b>	Life Leech Flaming Corpse None
<b>Attack:</b>	21	<b>Melee:</b>	Bite
<b>Defense:</b>	28	<b>Ranged:</b>	None
<b>Accuracy:</b>	21	<b>Condition:</b>	None
<b>Luck:</b>	34		
<b>Available Points:</b>	2		
<b>Melee:</b>	Shovel of Experience		
<b>Ranged:</b>	Pistol for Dentistry		
<b>Condition:</b>	None		

© 2012-2013 Cary Walkin, CPA, CA, MBA

# HOW TO DEFINE INFORMATION SUBSTRATES?



**THIS IS NOT A PENCIL**



---

ATOMS  
MOLECULES  
MATERIAL  
OBJECT  
TOOL  
USE  
CULTURE

**THIS IS NOT  
(JUST) A PENCIL**

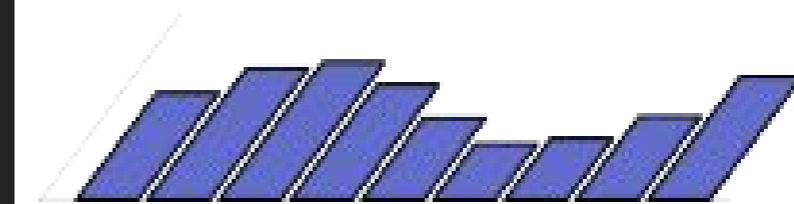


## LAYERING SUBSTRATES

- ▶ A substrate can represent data in another substrate



Pixels



Shapes



Graph

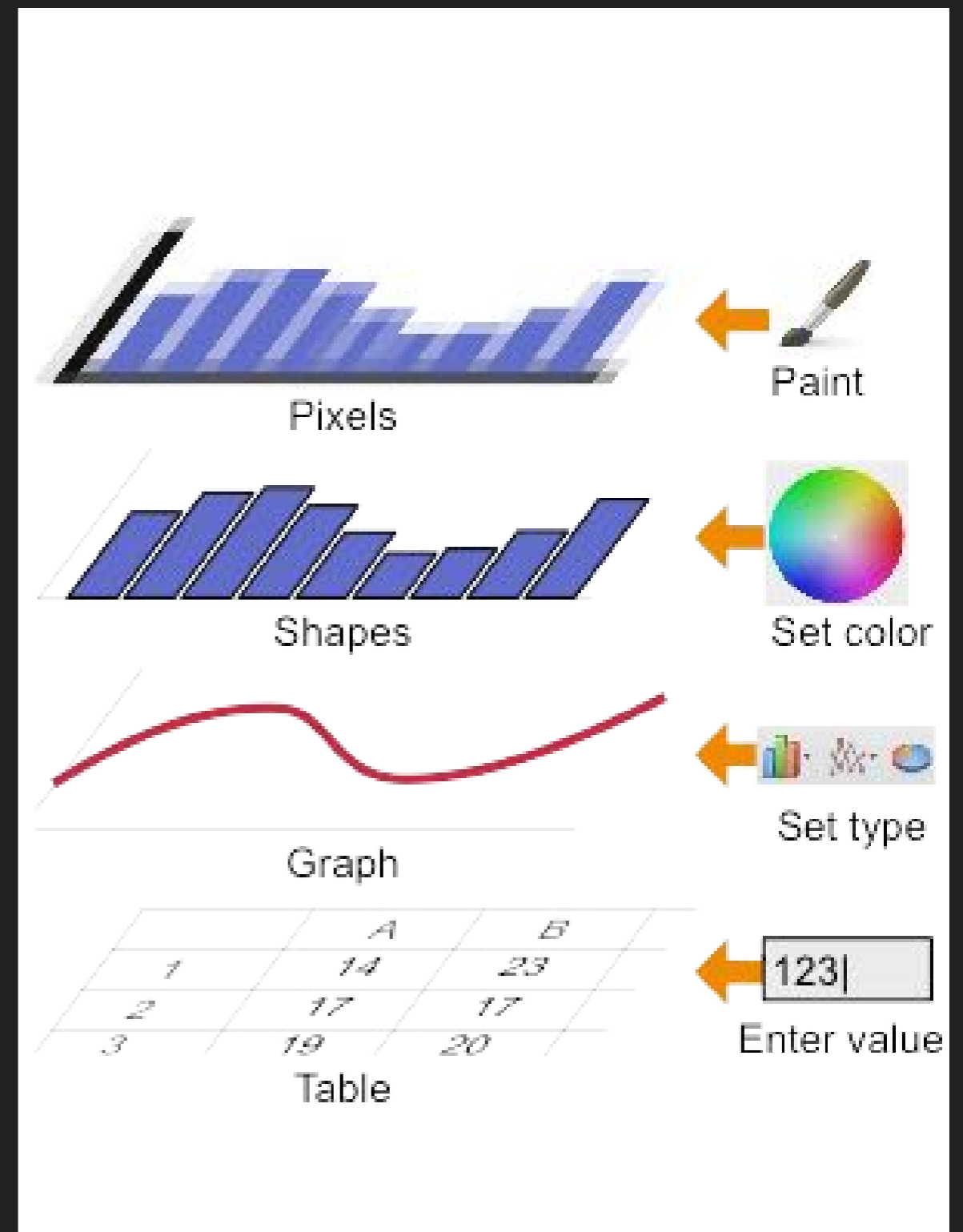
	A	B
1	14	23
2	17	17
3	19	20

Table



## LAYERING SUBSTRATES

- ▶ A substrate can represent data in another substrate
- ▶ Instruments can modify the different substrates in the stack
- ▶ Example:
  - A table substrate - edit a value
  - A graph substrate - set its type
  - A histogram - set its color
  - An image - paint on it



group list duplicate ungroup count

Constraint Options

name: constraint 4

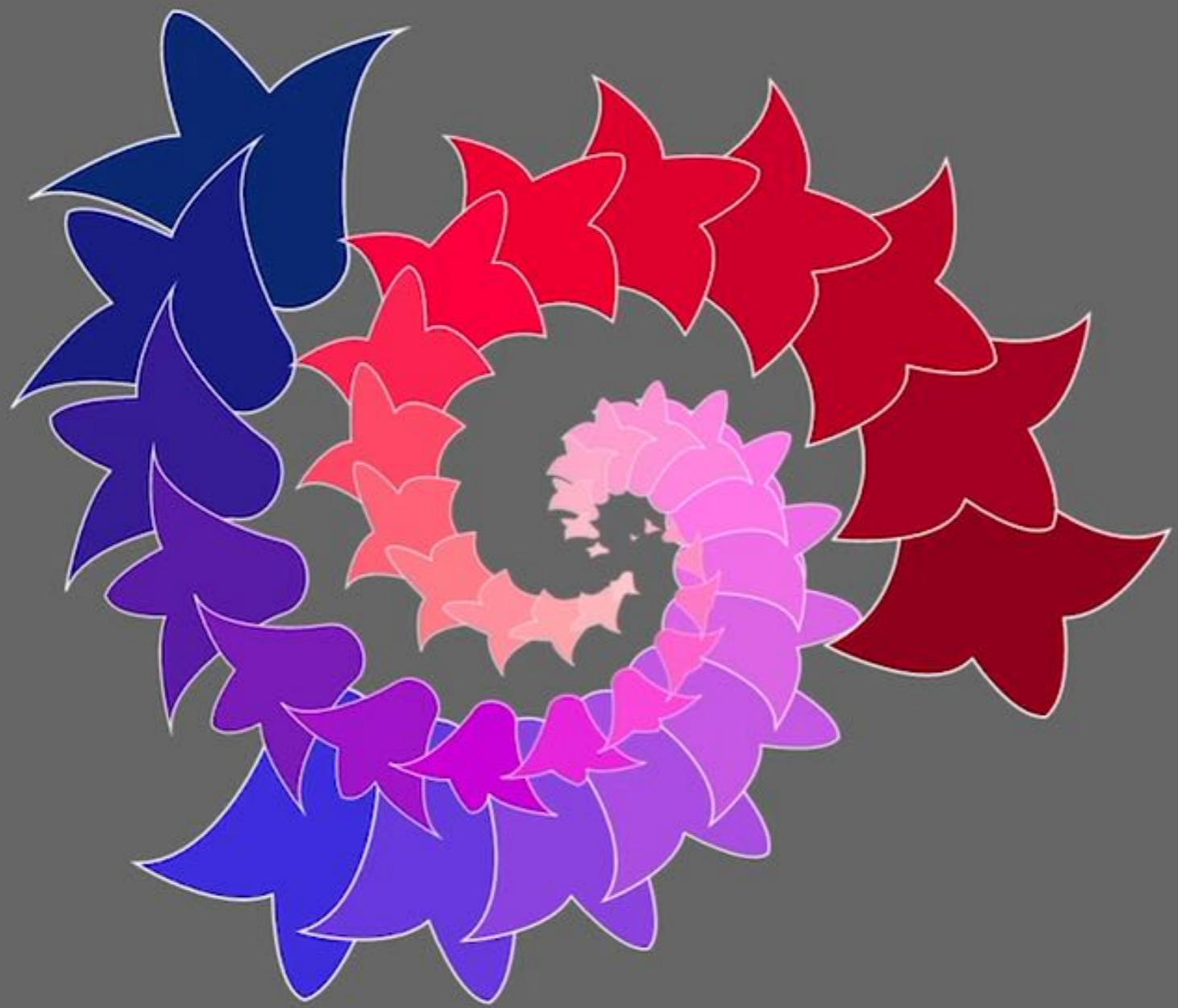
+ - [ ] [ ] [ ] [ ]

x: y:

relative index: 1

relative offset: -530

interpolate: [ ]



Layers

Constraints

- constraint
- constraint
- constraint
- constraint

Lists

Shapes

- duplicator
- group
- group
- group
- group
- group
- group
- group
- group
- group

Style

Fill: #3e0506

Stroke: #ffff

Stroke Weight: [ ]

Parameters

Save or Load a file

save save as

download file to desktop

upload file from desktop

upload a file No file chosen

Import or Export an SVG

export svg

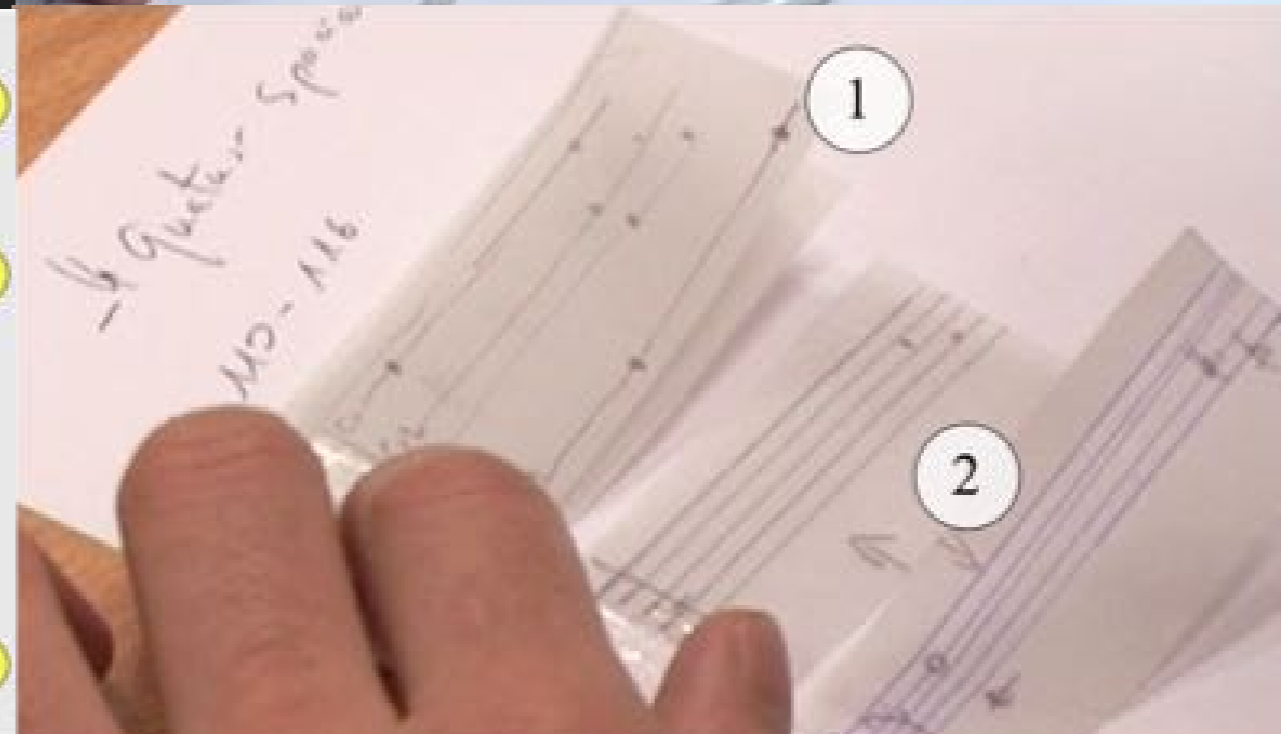
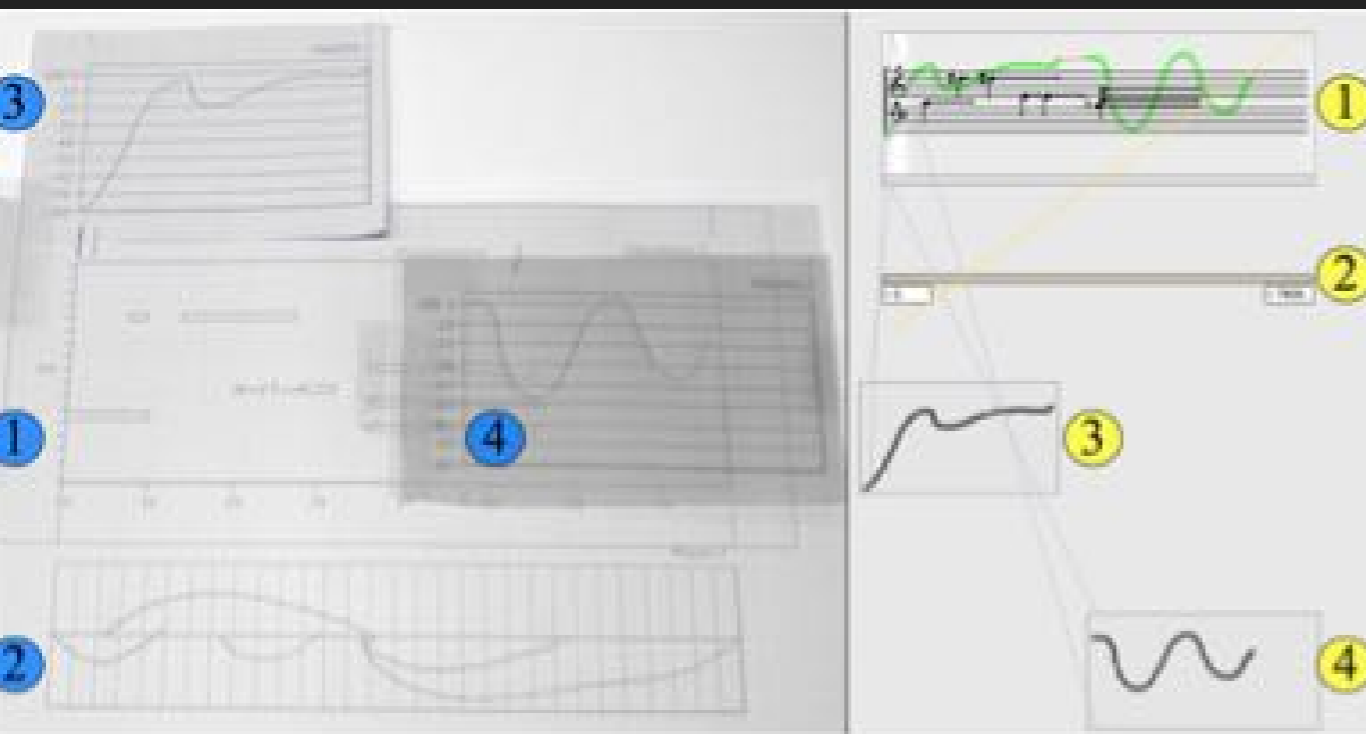
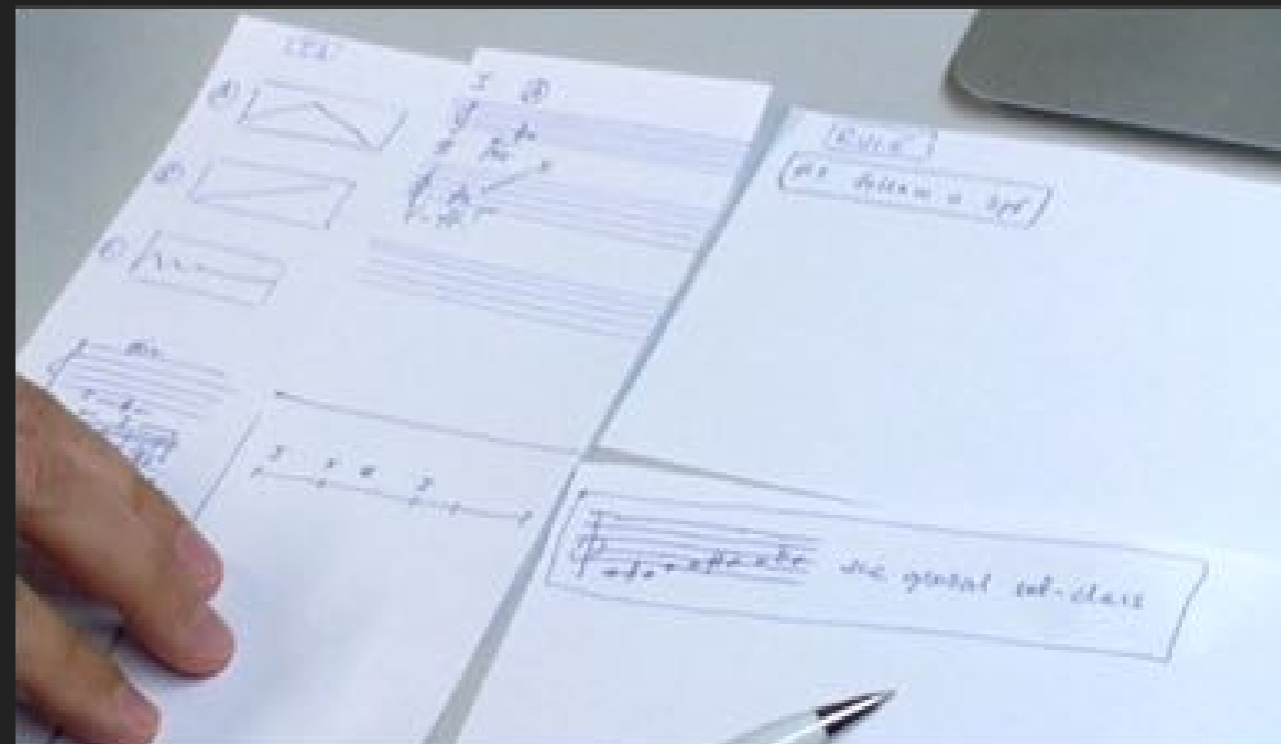
import SVG desktop

upload a file group\_design.svg

## PAPER SUBSTRATES

Garcia, Tsandilas, Agon & Mackay, 2012

- ▶ Support the music composition process by combining and interpreting notations in various ways



A handwritten musical score on three staves. The top staff has a blue arrow pointing to the first measure and a blue squiggle over the second measure. The middle staff has a blue squiggle over the first measure and a blue box around the second measure. The bottom staff has a blue box around the first measure, a blue squiggle over the second measure, and a blue box around the third measure. A blue line connects the blue box on the bottom staff to the blue box on the middle staff. A green shaded area covers the bottom staff from the second measure to the end, with a blue box containing the number '2' and a blue circle containing the letter 'r' inside it. The text '(viol...)' is written in blue below the green area. The dynamic markings 'mp' and 'mf' are visible on the staves.

textual & numerical elements

TSANDILAS, LETONDAL, MACH

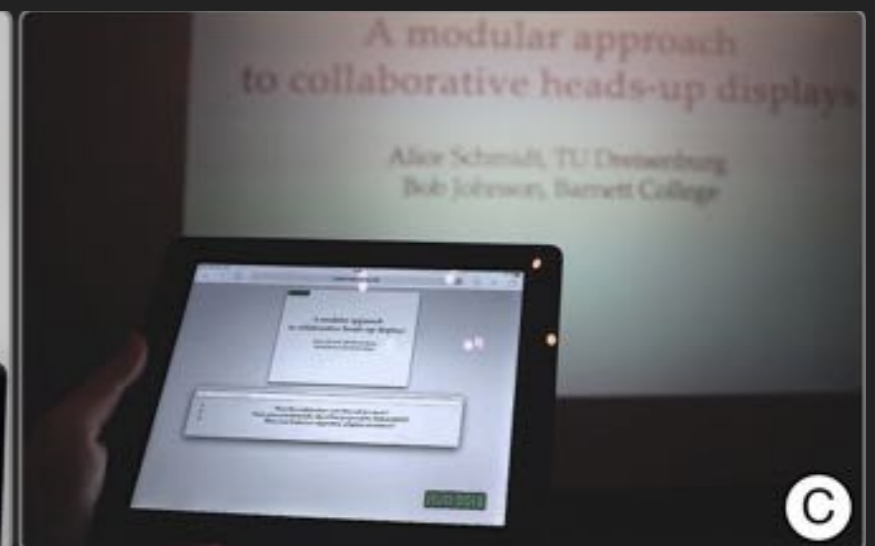
Prototype demonstrating a simple scenario:  
Working on a piece for piano and electronics

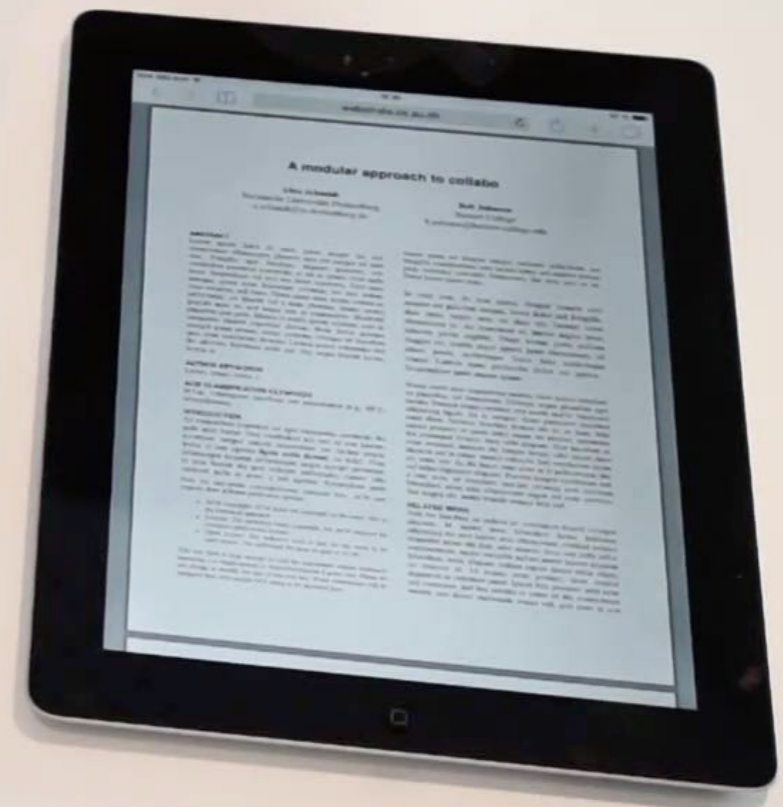
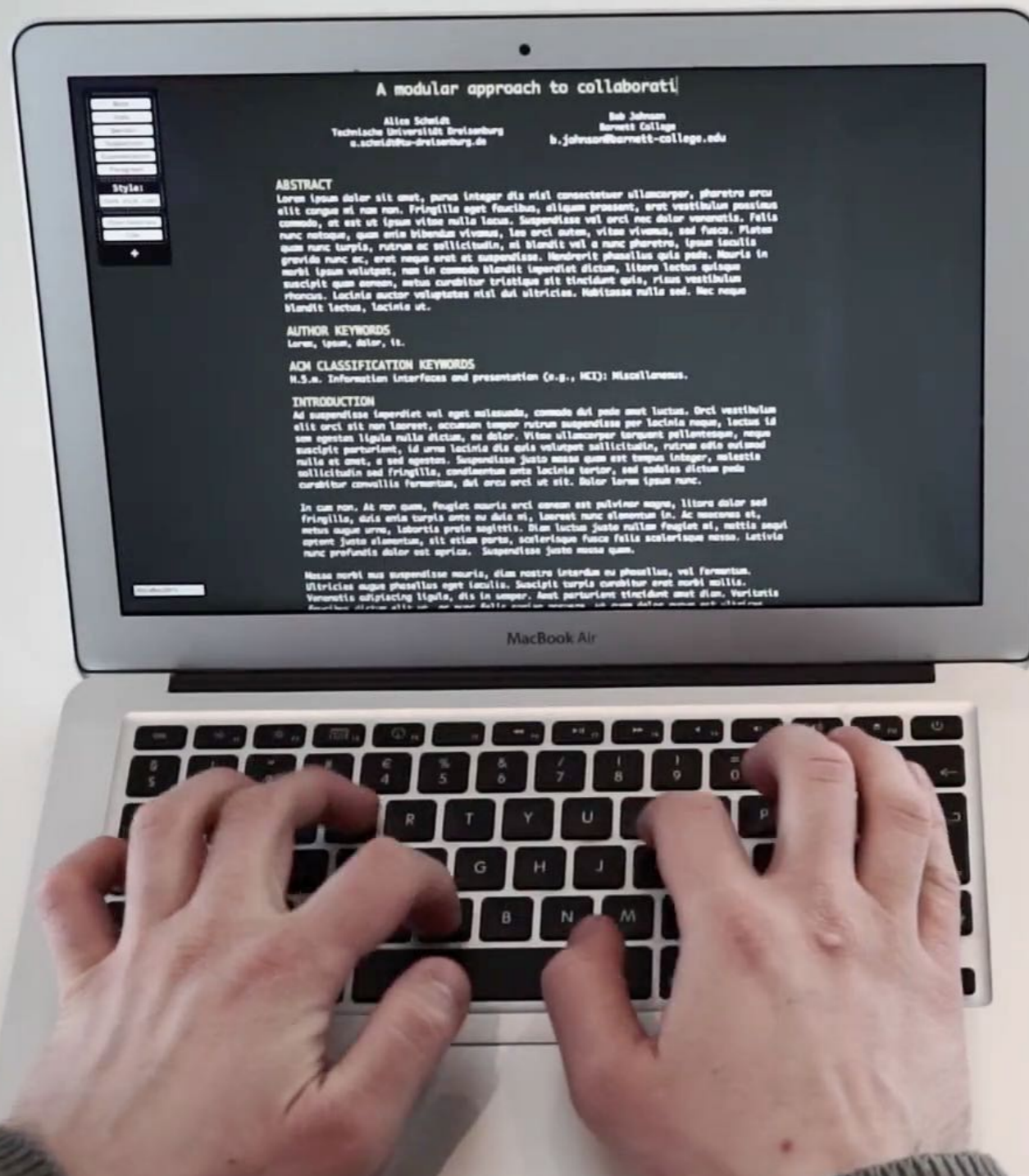
GARCIA, TSANDILAS, AGON, M

***QUID SIT MUSICUS?***  
**BY PHILIPPE LEROUX**

## INSTRUMENTS & SUBSTRATES

- ▶ Instruments can manipulate substrates
- ▶ Instruments probe the substrate for specific properties or protocols to decide if they can operate
- ▶ Instruments are themselves substrates
- ▶ Instruments can be embedded in substrates







## TEXTLETS

H. Han, M. Renom, W. Mackay, M. Beaudouin-Lafon  
[https://www.youtube.com/watch?v=kYwHmJ\\_6inM](https://www.youtube.com/watch?v=kYwHmJ_6inM)

### Introducing Textlets



#### ABSTRACT

Writing technical documents frequently requires following constraints and consistently using domain-specific terms. We interviewed **12 legal professionals** and found that they all use a standard word processor, but must rely on their memory to manage dependencies and maintain consistent vocabulary within their documents.

We introduce **Textlets**, interactive objects that reify text selections into persistent items. We show how Textlets help manage consistency and constraints within the document, including selective search and replace, word count, and alternative wording.

Eight participants tested a search-and-replace Textlet as a **technology probe**. All successfully interacted directly with the Textlet to perform advanced tasks; and most (6/8) spontaneously generated a novel replace-all-then-correct strategy. Participants suggested additional ideas, such as supporting collaborative editing over time by embedding a Textlet into the document to flag forbidden words.

We argue that Textlets serve as a generative concept for creating powerful new tools for document editing.

### Textlets

Create Basic Textlet

12 legal professionals

Textlets

technology probe

## TEXTLETS

- ▶ Reification of text selection
- ▶ Add behavior
  - ▶ Countlet: counting words
  - ▶ Variantlet: local variants
  - ▶ Numberlet: references
  - ▶ Searchlet: search and replace

### ABSTRACT

A current - interrupter device ( 1 ) comprising a circuit breaker **12**

A current - interrupter devic... **12**

### Tripout Apparatus Integrating a Circuit-breaker and an Isolator

x <> Tripout Device Integ...

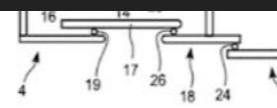


Figure 1

[0025] The current - interrupter device of the invention (see Figure 1) has a body of revolution about an axis AX that corresponds to its longitudinal axis . It includes

+ New Figure #

x +ref Figure 1 [0025] The curr...

x invention (see Figure 1)

x +ref Figure 2 [0026] This dev...

x support 4 (see Figure 2)

A current - interrupter device ( 1 ) comprising a circuit breaker ( 2 ) including a first stationary conductive support ( 4 ) carrying both a stationary arcing contact ( 14 ) and a movable arcing contact ( 16 ) , carrying permanent contact ( 17 ) , the movable arcing contact ( 16 ) and the movable persistent contact ( 17 ) being electrically connected to the first stationary support ( 4 ) , and a disconnecter ( 3 ) including a second stationary conductive support ( 6 ) carrying a disconnecter contact ( 18 ) , and wherein : the movable disconnecter contact ( 18 ) is in contact with the stationary arcing contact ( 14 ) when it is closed and spaced apart from the stationary arcing contact ( 14 ) when it is open ; and the movable disconnecter contact ( 18 ) and the permanent contact ( 17 ) are connected to each other when they are both in the closed position ,

permanent **3**

persistent ✓ x

t(-16)-, carrying- permanent ...  
-contact (-17)-, th ...

6) and the movable persistent contact

tact ( 18 ) and the permanent contact (

stationary **6**

disconnecter **4**

## INTERACTIVE INTERMEDIATE REPRESENTATIONS

C. Gobert,  
M. Beaudouin-Lafon

TeX sample-sigconf.tex X

```

acm-template > TeX sample-sigconf.tex
530 \begin{displaymath}
539 \quad \sum_{i=0}^{\infty} x + 1
540 \end{displaymath}
541 and follow it with another numbered equation:
542 \begin{equation}
543 \quad \sum_{i=0}^{\infty} x_i = \int_0^{\pi+2} f
544 \end{equation}
545 just to demonstrate \LaTeX's able handling of numbering.
546
547 \section{Figures}
548
549 The ``\verb|figure|'' environment should be used for figures. One or
550 more images can be placed within a figure. If your figure contains
551 third-party material, you must clearly identify it as such, as shown
552 in the example below.
553
554 \begin{figure}[h]
555 \centering
556 \ilatex{\includegraphics[width=207px, height=36px, trim=7px 49px
557 7px 47px, clip]{../img/instruction.png}}
558 \caption{The four parts of a MIPS instruction.}
559 \Description{A MIPS instruction can be split into four successive
560 parts: OP code, Address 1, Address 2, and Immediate value.}
561 \end{figure}
562
563 Your figures should contain a caption which describes the figure to
564 the reader.
565
566 Figure captions are placed {\itshape below} the figure.
567
568 Every figure should also have a figure description unless it is purely
569 decorative. These descriptions convey what's in the image to someone
570 who cannot see it. They are also used by search engine crawlers for
571 indexing images, and when images cannot be loaded.
572
573 A figure description must be unformatted plain text less than 2000
574 characters long (including spaces). {\bfseries Figure descriptions
575 should not repeat the figure caption – their purpose is to capture
576 important information that is not already provided in the caption or
577 the main text of the paper.} For figures that convey important and

```

...

iLatex — sample-sigconf.tex X

□ ...

Woodstock '18, June 03–05, 2018, Woodstock, NY

Trovato and Tobin, et al.

Table 2: Some Typical Commands

Command	A Number	Comments
\author	100	Author
\table	300	For tables
\table*	400	For wider tables

Notice how it is formatted somewhat differently in the `display-math` environment. Now, we'll enter an unnumbered equation:

$$\sum_{i=0}^{\infty} x + 1$$

and follow it with another numbered equation:

$$\sum_{i=0}^{\infty} x_i = \int_0^{\pi+2} f \quad (2)$$

just to demonstrate  $\LaTeX$ 's able handling of numbering.

## 12 FIGURES

The “figure” environment should be used for figures. One or more images can be placed within a figure. If your figure contains third-party material, you must clearly identify it as such, as shown in the example below.

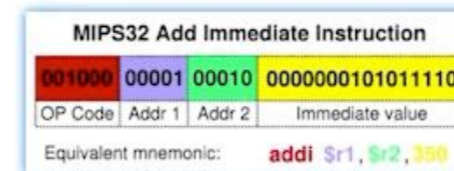


Figure 2: The four parts of a MIPS instruction.

Your figures should contain a caption which describes the figure to the reader.

Figure captions are placed *below* the figure.

Every figure should also have a figure description unless it is purely decorative. These descriptions convey what's in the image to someone who cannot see it. They are also used by search engine crawlers for indexing images, and when images cannot be loaded.

A figure description must be unformatted plain text less than 2000 characters long (including spaces). **Figure descriptions should not repeat the figure caption – their purpose is to capture important information that is not already provided in the caption or the main text of the paper.** For figures that convey important and complex new information, a short text description may not be adequate. More complex alternative descriptions can be placed in an appendix and referenced in a short figure description. For example, provide a data table capturing the information in a bar chart, or a structured list representing a graph. For additional information regarding how best to write figure descriptions and why doing this is so important, please see <https://www.acm.org/publications/taps/describing-figures/>.

### 12.1 The “Teaser Figure”

## 13 CITATIONS AND BIBLIOGRAPHIES

The use of  $\LaTeX$  for the preparation and formatting of one's references is strongly recommended. Authors' names should be complete – use full first names (“Donald E. Knuth”) not initials (“D. E. Knuth”) – and the salient identifying features of a reference should be included: title, year, volume, number, pages, article DOI, etc.

The bibliography is included in your source document with these two commands, placed just before the `\end{document}` command: `\bibliographystyle{ACM-Reference-Format}` and `\bibliography{bibfile}` where “bibfile” is the name, without the “.bib” suffix, of the  $\LaTeX$  file.

Citations and references are numbered by default. A small number of ACM publications have citations and references formatted in the “author year” style; for these exceptions, please include this command in the `preamble` (before the command `\begin{document}`) of your  $\LaTeX$  source:

```
\citestyle{acmauthoryear}
```

Some examples. A paginated journal article [2], an enumerated journal article [10], a reference to an entire issue [9], a monograph (whole book) [23], a monograph/whole book in a series (see 2a in spec. document) [17], a divisible-book such as an anthology or compilation [12] followed by the same example, however we only output the series if the volume number is given [13] (so Editor00a's series should NOT be present since it has no vol. no.), a chapter in a divisible book [35], a chapter in a divisible book in a series [11], a multi-volume work as book [22], a couple of articles in a proceedings (of a conference, symposium, workshop for example) (paginated proceedings article) [3, 15], a proceedings article with all possible elements [34], an example of an enumerated proceedings article [14], an informally published work [16], a couple of preprints [6, 7], a doctoral dissertation [8], a master's thesis: [4], an online document / world wide web resource [1, 28, 36], a video game (Case 1) [27] and (Case 2) [26] and [25] and (Case 3) a patent [33], work accepted for publication [30], 'YYYYb'-test for prolific author [31] and [32]. Other cites might contain 'duplicate' DOI and URLs (some SIAM articles) [21]. Boris / Barbara Beeton: multi-volume works as books [19] and [18]. A couple of citations with DOIs: [20, 21]. Online citations: [36–38]. Artifacts: [29] and [5].

## 14 ACKNOWLEDGMENTS

Identification of funding sources and other support, and thanks to individuals and groups that assisted in the research and the preparation of the work should be included in an acknowledgment section, which is placed just before the reference section in your document.

# WHAT'S IN A SUBSTRATE?

- ▶ Content
  - ▶ Numbers, text, images, ... and other substrates
- ▶ Structure
  - ▶ Record, Sequence, Tree, DAG, Graph, Table, ...
- ▶ Relationships / Constraints / Rules
  - ▶ "spreadsheet formulas"...