

# Lecture 2:

# Visual representation

# Overview of the course

- Theory driven approaches to HCI
- **Design of visual displays**
- Goal-oriented interaction
- Designing smart systems
- Designing efficient systems
- Designing meaningful systems (guest lecturer)
- Evaluating interactive system designs
- Designing complex systems

# Why talk about visual design?

Visual design questions are often where discussions about HCI start

“What colour should this be?”

“Should it be 5 pixels or 7?”

“Will this work for colour blind people?”

These conversations are a lot more complicated than they seem...

# Theory of visual representation:

asking new questions about the 'obvious' or familiar

(See: “Visual representation” in “The Encyclopedia of Human Computer Interaction, 2nd Ed for a detailed narrative)

Stream of characters:  
teletype, .txt file, Turing  
machine, chat, speech?

# 1. TYPOGRAPHY AND TEXT

Diagrammatic structure:  
ways of arranging marks  
on a 2D plane.

The Grid System - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://www.thegridsystem.org/ typographic grid

Most Visited Getting Started Latest Headlines

egyptian statue, egyptian god, egyp... The Grid System

# The Grid System

The ultimate resource in grid systems.

*"The grid system is an aid, not a guarantee. It permits a number of possible uses and each designer can look for a solution appropriate to his personal style. But one must learn how to use the grid; it is an art that requires practice."*  
Josef Müller-Brockmann

Show Grid

Join The Forum

Search

## Articles

### 30 Grid-Based WordPress Themes

In this article we have 30 WordPress themes have been developed using a popular CSS Grid Frameworks such as the 960.gs, Blueprint, YUI2 and The Golden Grid.  
23.Aug.2010

### Design & Build a Grid Based Web Design with CSS

Step by step walkthrough of the design and build process of a grid based WordPress theme. From the initial Photoshop concept, through development.  
23.Aug.2010

### Long Live the 12-Column Grid

When I first crossed the great divide from print to web, one of the earliest things I tried to do was introduce a flexible multi-column grid (you know, like a magazine).  
07.May.2010

[View All Articles](#)

## Tools

### 960 Grid System Photoshop Action

These actions will create a Photoshop document ideal for laying websites out in 12, 10, 8, 6 and 4 columns.  
23.Aug.2010

### iPhone Grid System

A 12:8 (480:320) modular grid system for the iPhone, with the unit of 40px and the gutter of 5px.  
23.Aug.2010

### Fluid Grid

A web grid system that allows designers to use the screen real estate on large monitors and retain great design on smaller ones.  
07.May.2010

[View All Tools](#)

## Books

### Universal Principles of Design

Universal Principles of Design is the first comprehensive, cross-disciplinary encyclopedia of design.  
04.Nov.2009

### Designing for the Web

A Practical Guide to Designing for the Web has written explanations of the core principles of graphic design in relation to the web.  
08.Oct.2009

### The Way of Typography

The book also goes into depth on how to create grid systems by hand with only pencil, straightedge and compass.  
18.Sep.2009

[View All Books](#)

## Templates

### The Golden Grid Template

A PSD template based on the CSS framework The Golden Grid by Vladimir Carrer.  
02.Mar.2010

### Photoshop 4 Column Grid

A free 4 Column Photoshop grid template for a 1024x768 screen resolution by Ray Gulick.  
08.Jun.2009

### InDesign 568x792 Grid System (12)

By Dario Galvagno. Adobe InDesign file with a grid system for a 568pts x 792pts page that is divided into 12 columns and rows using the Golden Ratio. Includes a 12pt baseline grid.  
16.Apr.2009

[View All Templates](#)

## Blog

### Forum is back up!

Sorry for the downtime on the forums. They're back up now.  
07.May.2010

### Sushi & Robots

Beautifully personal portfolio by Jina Bolton that reveals the site grid and baseline grid.  
07.May.2010

### Bisgrafic

Lovely grid site design by Barcelona based Bisgrafic.  
07.May.2010

[View All Blog Posts](#)

## Inspiration

Ace Jet 170  
AisleOne  
Athletics  
BBDK  
Blanka  
Build  
Corporate Risk Watch  
Counter Print  
David Airey  
Design Assembly  
Dirty Mouse  
Experimental Jetset  
Form Fifty Five  
Grafik Magazine  
Grain Edit  
Graphic Hug  
I Love Typography  
Lamosca  
Mark Boulton  
Minimal Sites  
Monocle  
Neubau  
NewWork  
OK-RM  
Original Linkage  
Robin Uleman  
SampsonMay  
Schmid Today  
September Industry  
Soulellis  
Subtraction  
Swiss Legacy  
The International Office  
Thinking for a Living  
This Studio  
Toko  
Typographic Posters  
Visuelle  
Xavier Encinas  
Year of the Sheep

Done [zotero](#)

Incipit epistola sancti ieronimi ad  
paulinum presbiterum de omnibus  
huius historie libris capituli primi.

**E**cce ambrosius  
tua michi munus-  
cula pfecto-deridit  
sit et suauissimas  
lras- q̄ a principio  
amici- dat- hic pbe-

re iam hda et utris amicis noua:  
pfectant. Et tu illa necessitudo e-  
et xpi glorio copulata- qm non vali-  
tas et familiaris- no pda tantum  
corpor- no libola et palpas adulato-  
sed dei amor- et diuina- scripturarū  
studia conciliant. legim⁹ in utrobz  
historijs- quosdā lustrasse puia- a-  
nouos adisse plos- maria tēisse-  
ut eos quos et libris nouerant- corā  
q̄ videret. Sicur piragoras manphi-  
nicos viros- sic plato egipci- et archimē-  
tarentinū- tantūq; oram ralis- que  
quondā magna grecia dicebat- labo-  
riossime peraguit- et ut qui athenis  
npt erat- et potius- nullq; doctrinas  
achadenis gignasū psonabat- hec  
pignus atq; discipulus- malis aliena  
utroq; discere- qm sua spūm ingat.  
Deniq; nī lras quasi com ore fugien-  
tes psequit- capr⁹ a picatis et umida-  
tus- orāno crudissimo panis- dud⁹  
capimus vint⁹ et ferus. Tamen quia  
plius maior auerit se hūe- ad orum  
linū- ladeo eloquēcie fonte manantē-  
et vltimis hispanie galliarūq; finibz-  
quosdā vntisse nobiles legimus- et  
quos ad complacitū sui roma nō  
reerat- vnt⁹ hōse fama pduit. Ha-  
buit illa etas inauditi omibz seculis-  
celebrandūq; miraculū- ut urbē tantā

ingress- aliud terra urbem querebat.  
Appolloni⁹ fuit ille mag⁹ ut vulgus  
loquitur- fuit pphus- ut piragora tra-  
dunt- intrauit plas- pssunt caucasi-  
albanos- sithas- mallagras- opulē-  
tissima indie regna puerat- et ad  
germania lanissimo phryon ampie  
nūmillo puenit ad braguanas- ut  
braccam in throno sedet- autē et de  
naturalī fonte potant- inter paucos  
discipulos- de natura- et moribz- ac de  
sensu dies et fides- audire docent.  
Iude p damias- babilonios- chalde-  
os- medos- althios- parthos- hicos-  
pharicos- arabes- palestinos- rasis  
ad alexandriā- pergit ad ethiopiā-  
ut gignosophistas et famosissimam  
solis mensam videret in sabulo. Iu-  
uenit ille vir ubiq; q̄ discere- et semp  
proficiens- semp se melior fieret. Scrip-  
sit super hoc planissime octo volumi-  
nibus- phryosteanis.

**Q**uid loquar de seculi hominibz-  
cū aplos paulus- vas decōm-  
et magister gentiū- qui de consensu  
nā i se hospitis loquebat- diceo. An  
examinari queas eius qui in me  
loquit xpc. Post damascū arabisq;  
lustrat- ascendit iherosolimā ut videret  
petrū et māsū apud tū diebz quindē.  
Hic aut nūctio sabbatis et ogdo-  
abis- hinc⁹ gentiū p̄dicator instru-  
tus erat. Eclūq; post ānos quior-  
decim assumpto barnaba et oro- pro-  
fuit cū aplis cōāgetū- ut fore in va-  
cūm curaret aut curatū. Habet  
nūctio qd latius mergit- vnt vnt⁹  
adus- et in aures discipuli de auctoris  
ore manifestā foreius sonat. Et inde et  
ethiopus cū rodi regulat- et legatur

$$i\hbar \frac{\partial}{\partial t} \Psi = -\frac{\hbar^2}{2m} \nabla^2 \Psi + V \Psi$$

IEEE Software: Behavioural Scier

nook-experimental - Database

console.firebase.google.com/u/1/project/nook-experimental/dat...

AppsOffline GmailAVF sustainabilityPRsLuke LarkOther Bookmarks

Firestore

Project Overview

Develop

Quality

Analytics

Blaze

Authentication

Database

Storage

Hosting

Functions

ML Kit

Crashlytics

Performance

Test Lab

App Distribution

Dashboard

Events

Conversions

Audiences

Funnels

User Properties

Extensions

Pay as you go

Modify

nook-experimental

Go to docs

L

Database

Cloud Firestore

Data

Rules

Indexes

Usage

conversationTa... > tag-0aa8b45a

nook-experimental	conversationTags	tag-0aa8b45a
+ Start collection	+ Add document	+ Start collection
conversationTags >	tag-0aa8b45a >	+ Add field
messageTags	tag-12be10d3	shortcut: "a"
nook_conversati...	tag-14ea0e13	text: "active case"
sms_raw_msgmap	tag-acc357d0	type: "TagType.normal"
suggestedReplies		
systemMessages		
tables		
translation_cac...		

Cloud Firestore location: eur3 (europe-west)





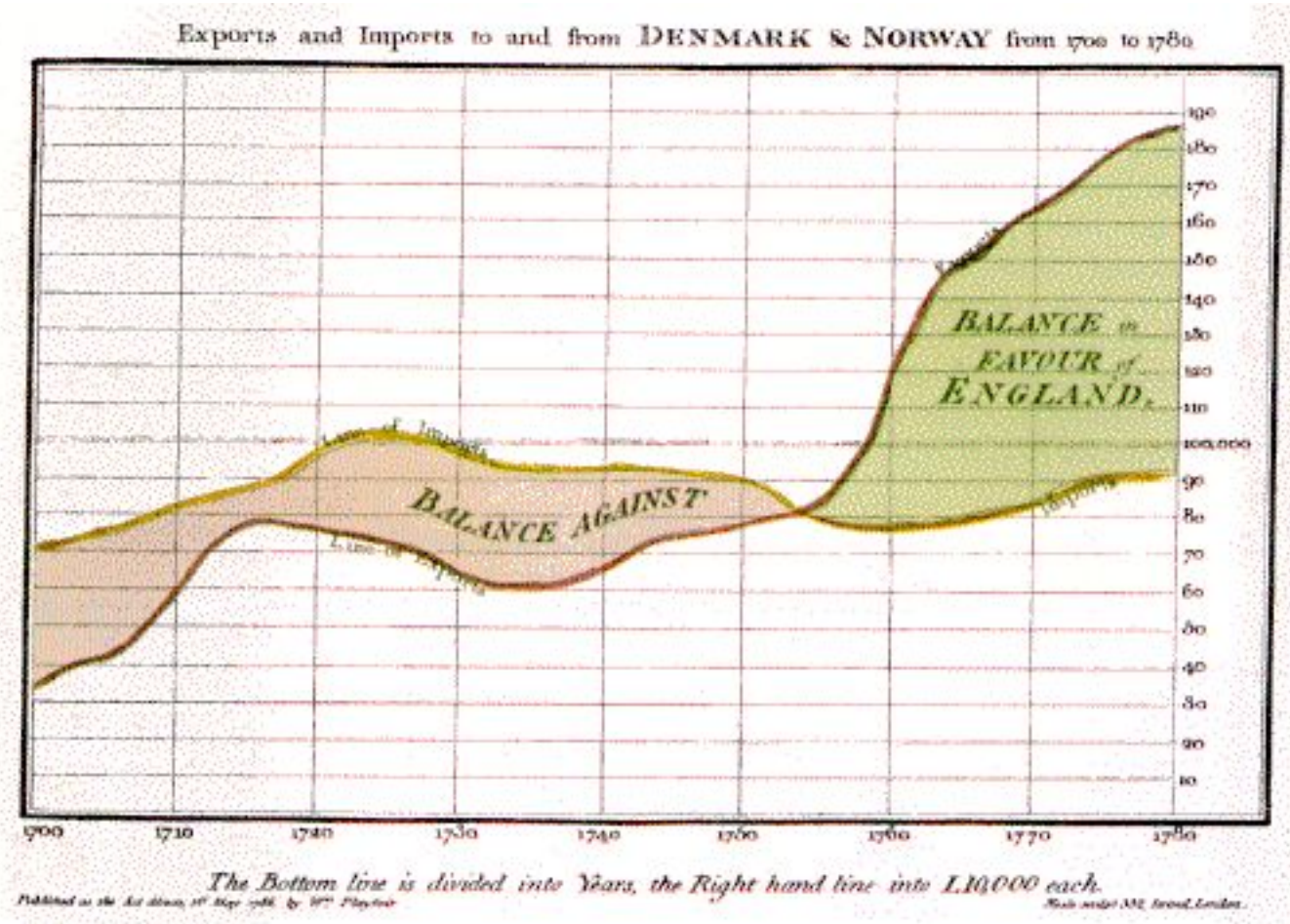
## **2. MAPS AND GRAPHS**

# The EDSAC UI (1950s)





# William Playfair (1795)



## SAGE air defense (1960s)





Mappa Mundi (1300s)

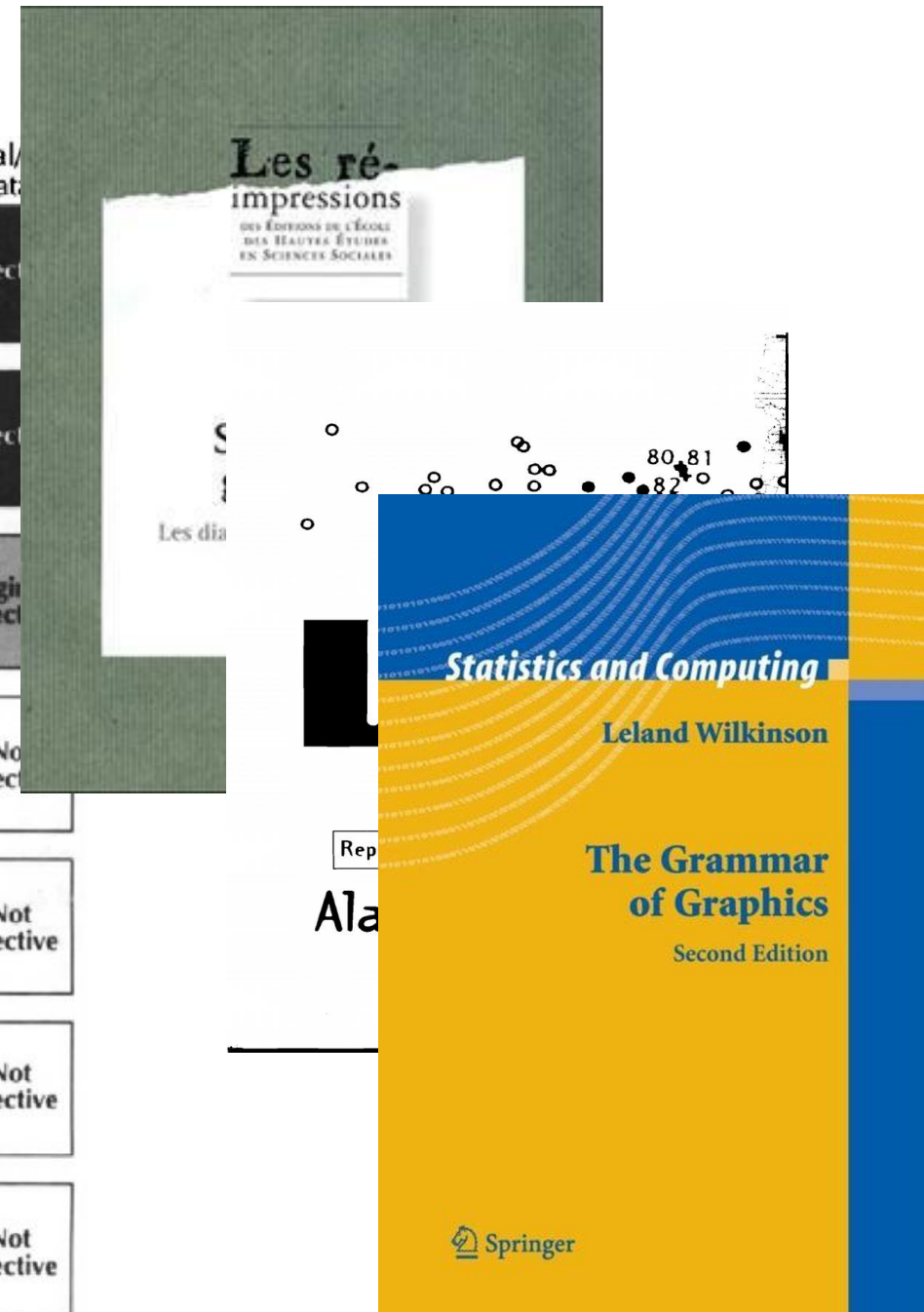




# Bertin's *Semiologie Graphique* (1969)

	Point features	Line features	Area features	Nominal data	Ordinal data	Interval data
POSITION				Effective	Effective	Effective
SIZE				Not Effective	Effective	Effective
VALUE				Not Effective	Effective	Marginally Effective
TEXTURE				Effective	Marginally Effective	Not Effective
HUE				Effective	Marginally Effective	Not Effective
ORIENTATION				Effective	Not Effective	Not Effective
SHAPE				Marginally Effective	Not Effective	Not Effective

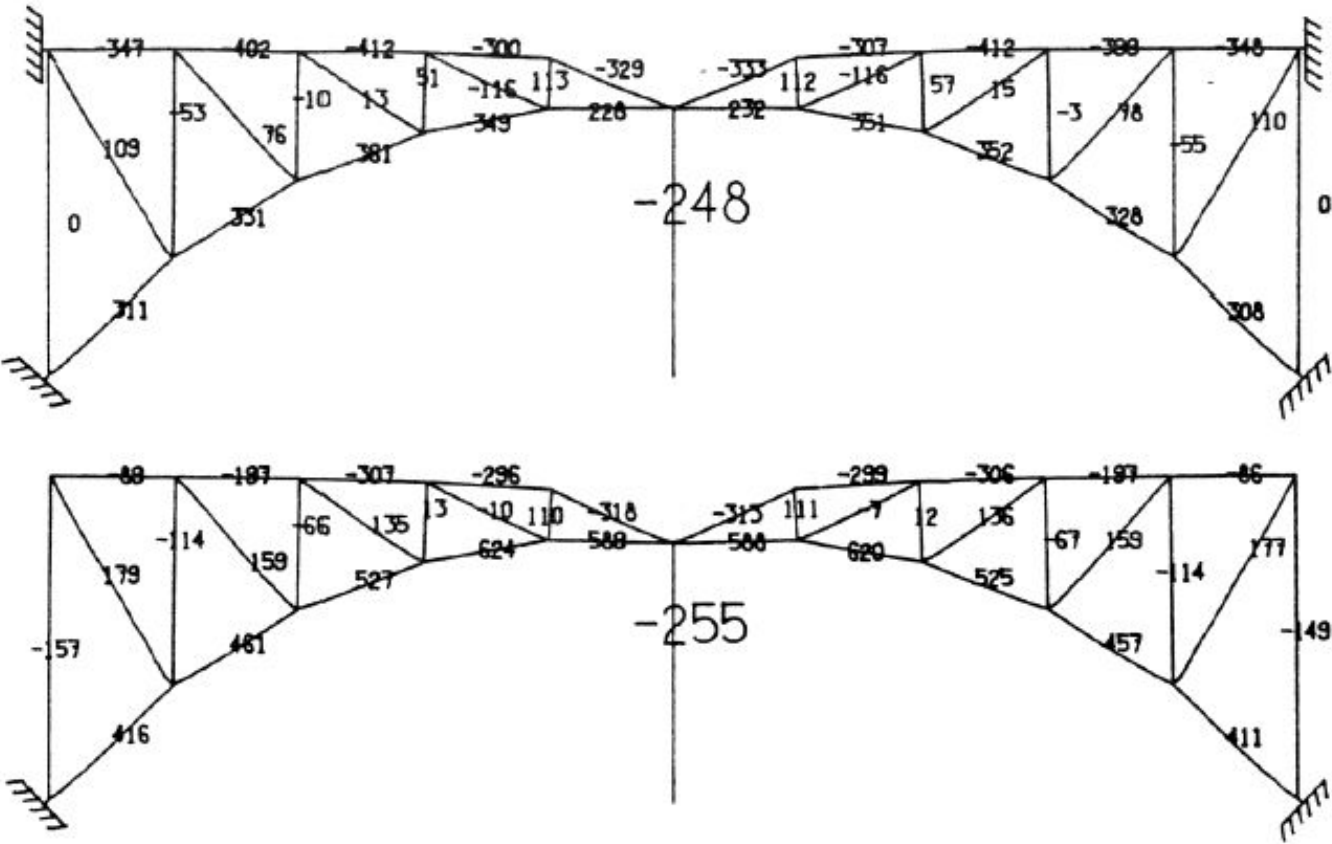
Figure 1. The visual variables and their effectiveness in signifying the three levels of measurement of data (after Bertin [1983]).



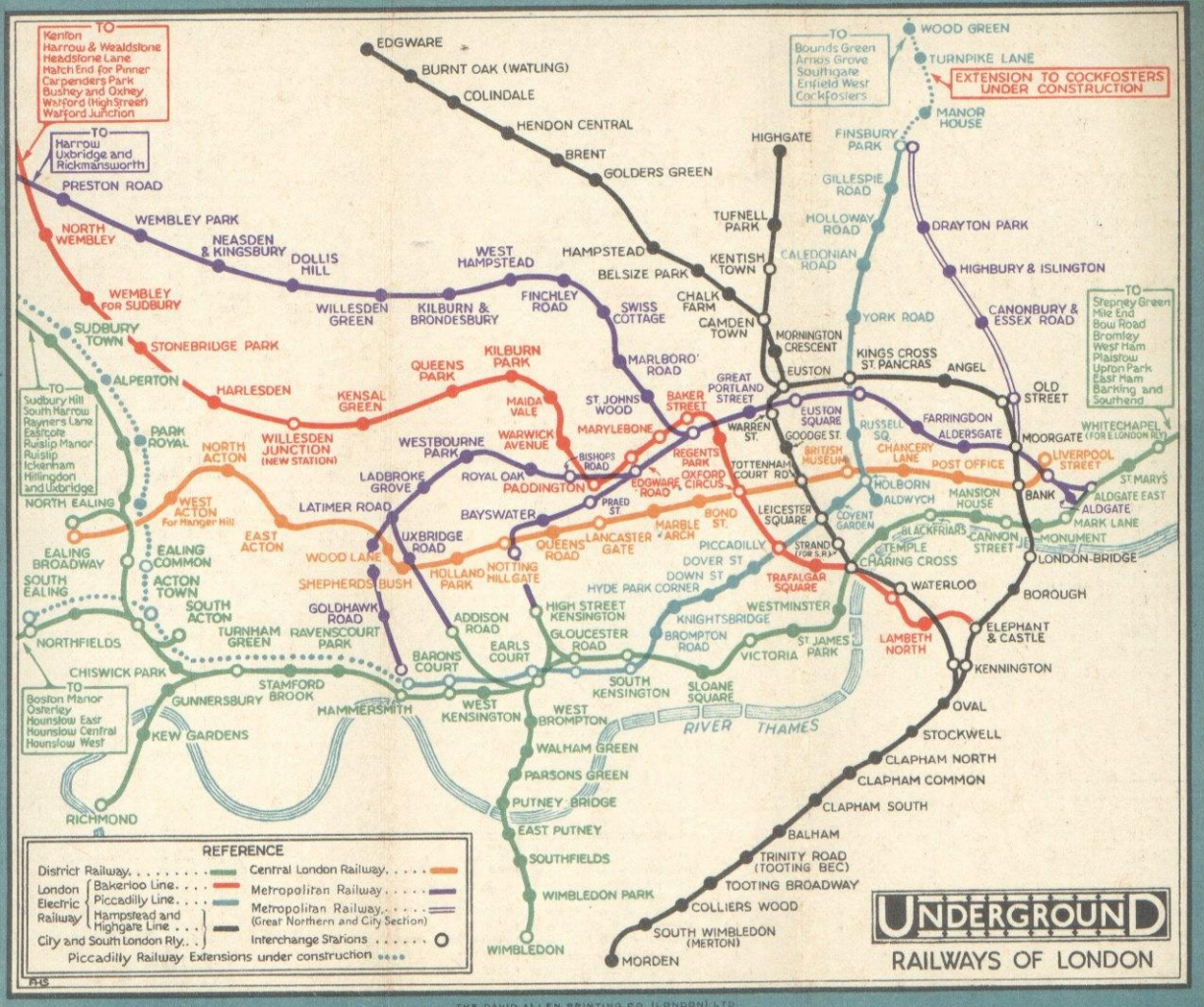
### **3. SCHEMATIC DRAWINGS**



# Sutherland's Sketchpad (1963)



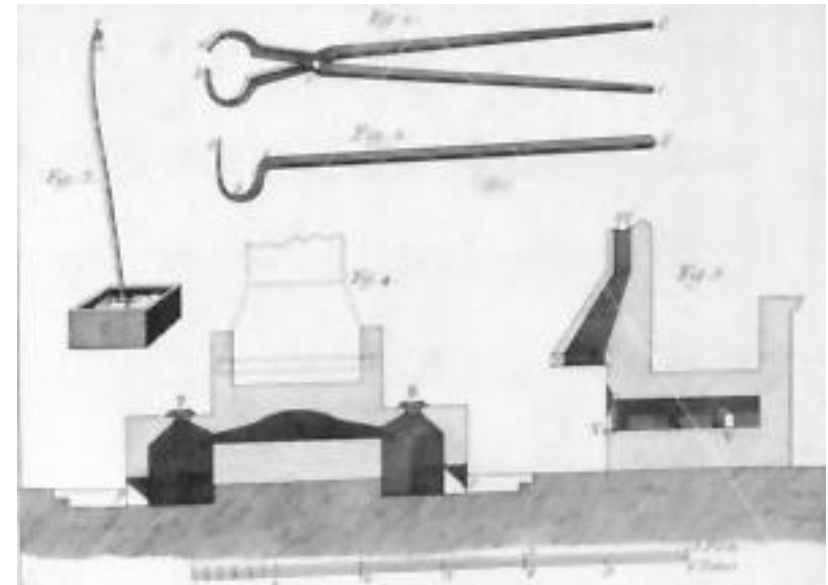
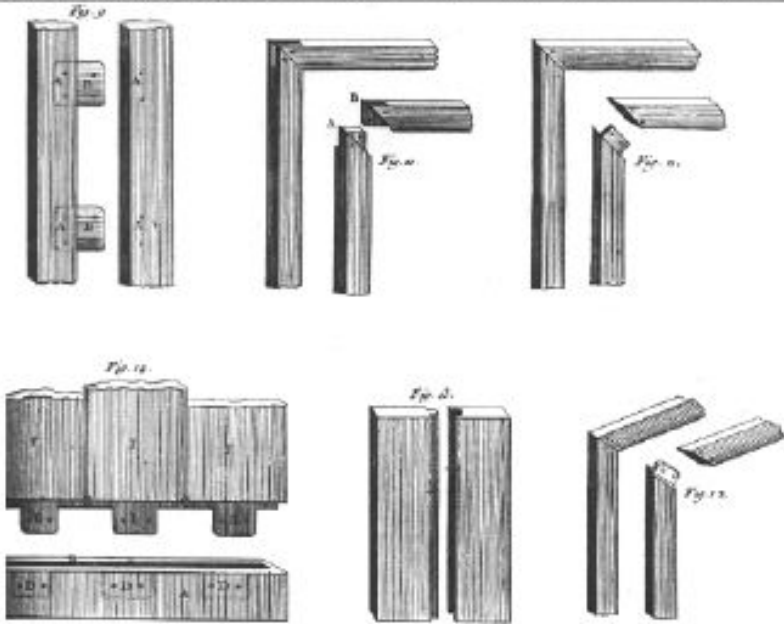
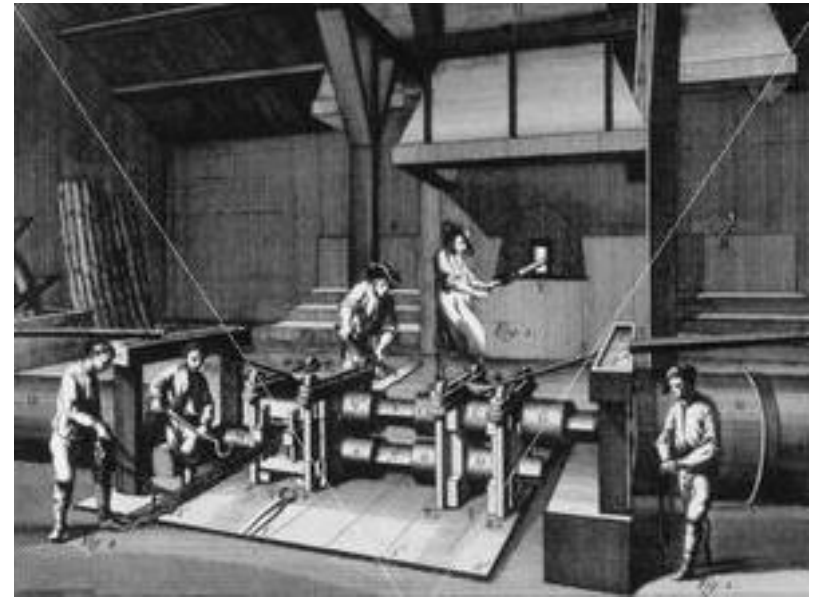
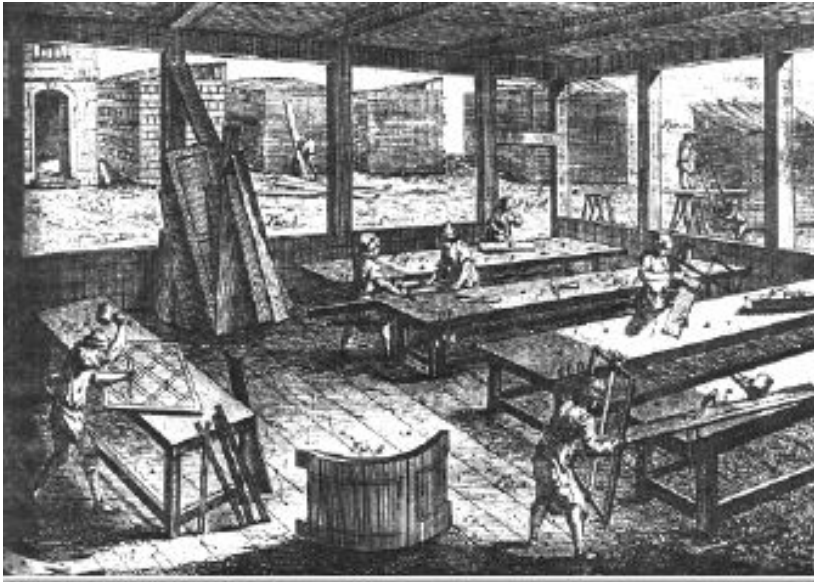
# The London Underground Map (1920)



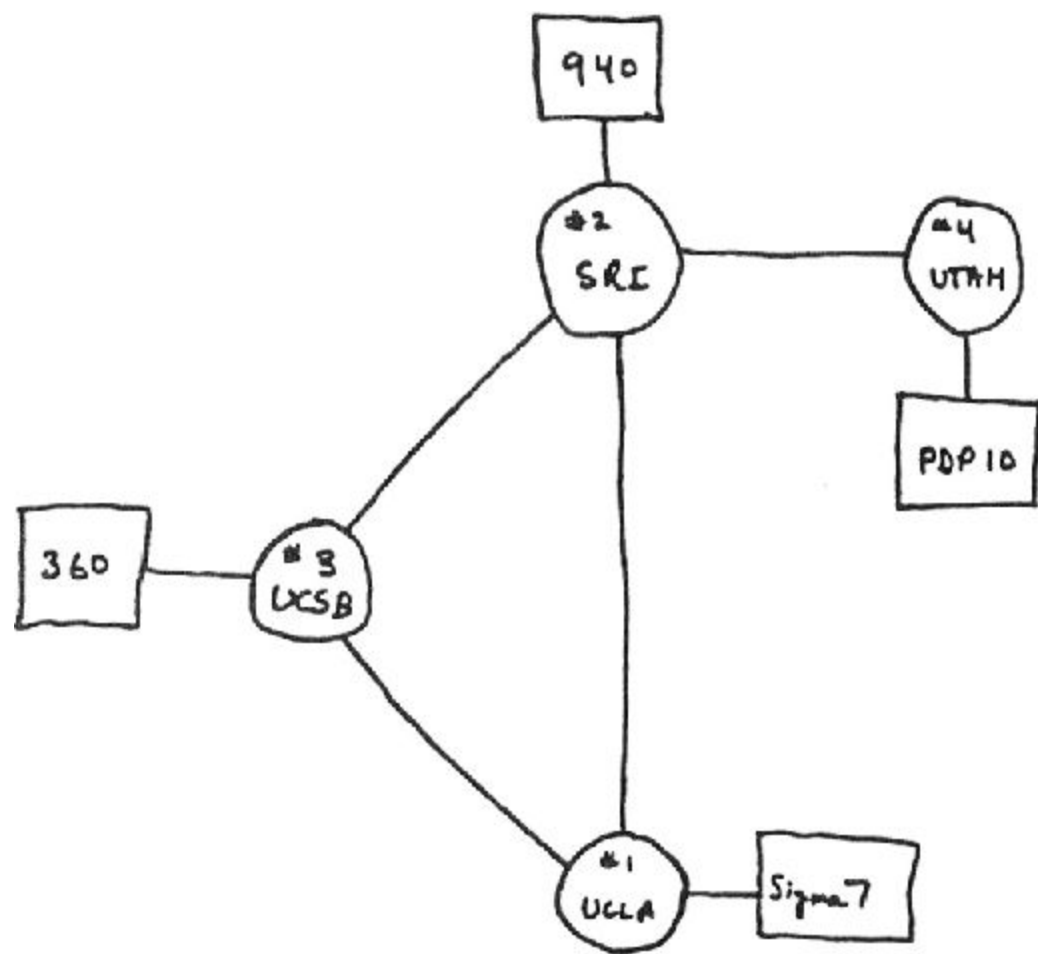


# Henry Beck's London Underground Diagram (1931)

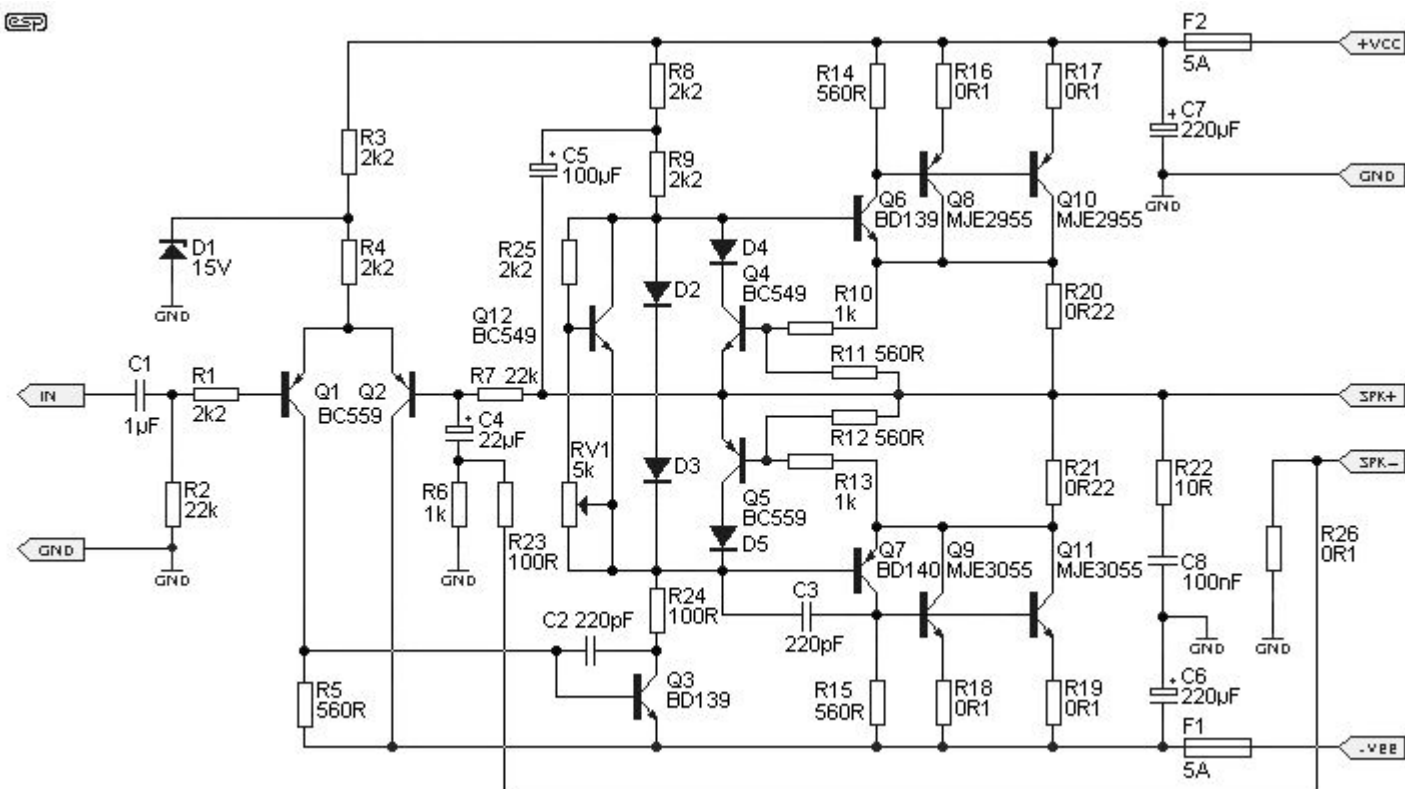




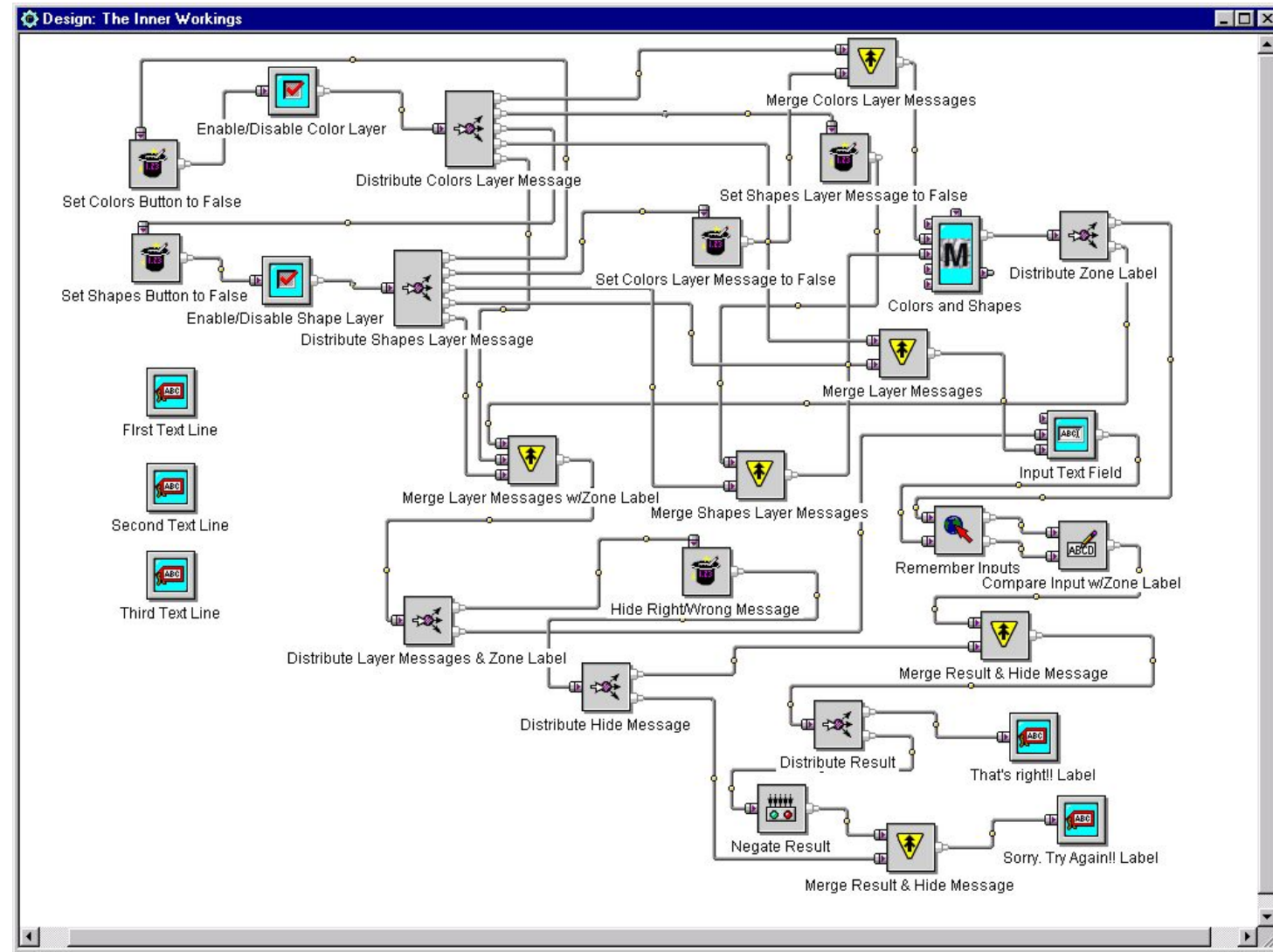
## **3a) NODE-AND-LINK DIAGRAMS**



THE ARPA NETWORK

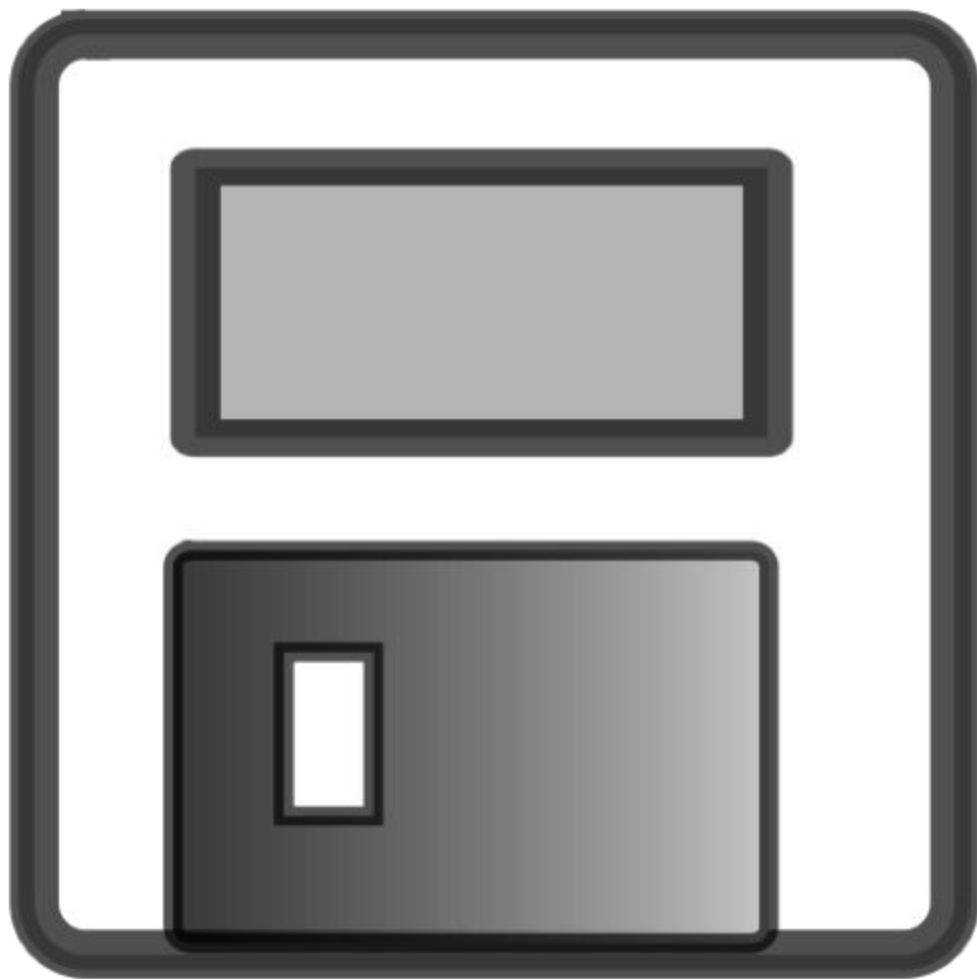


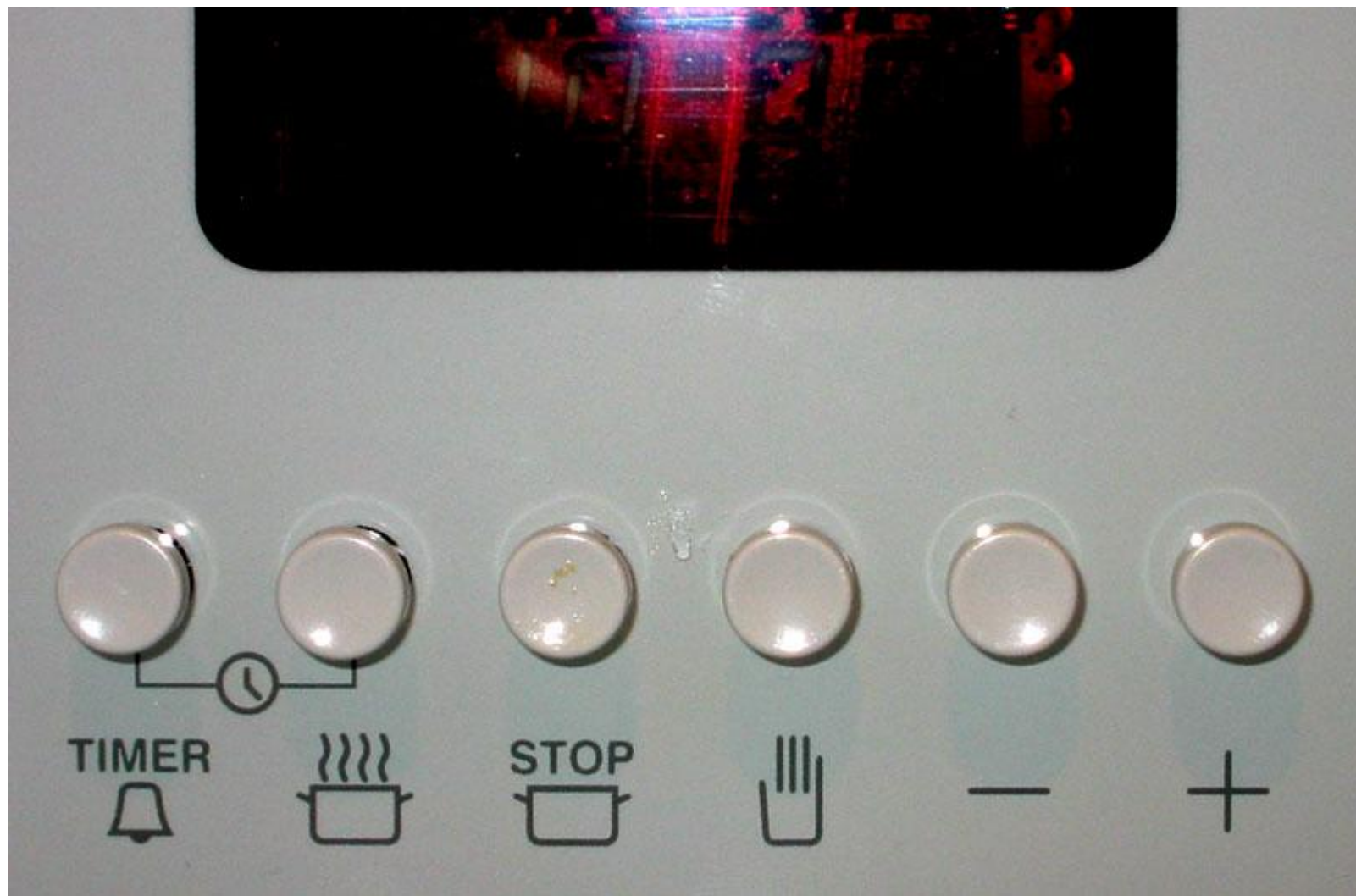
# The future of “no-code / low-code”? Java Studio (1995)



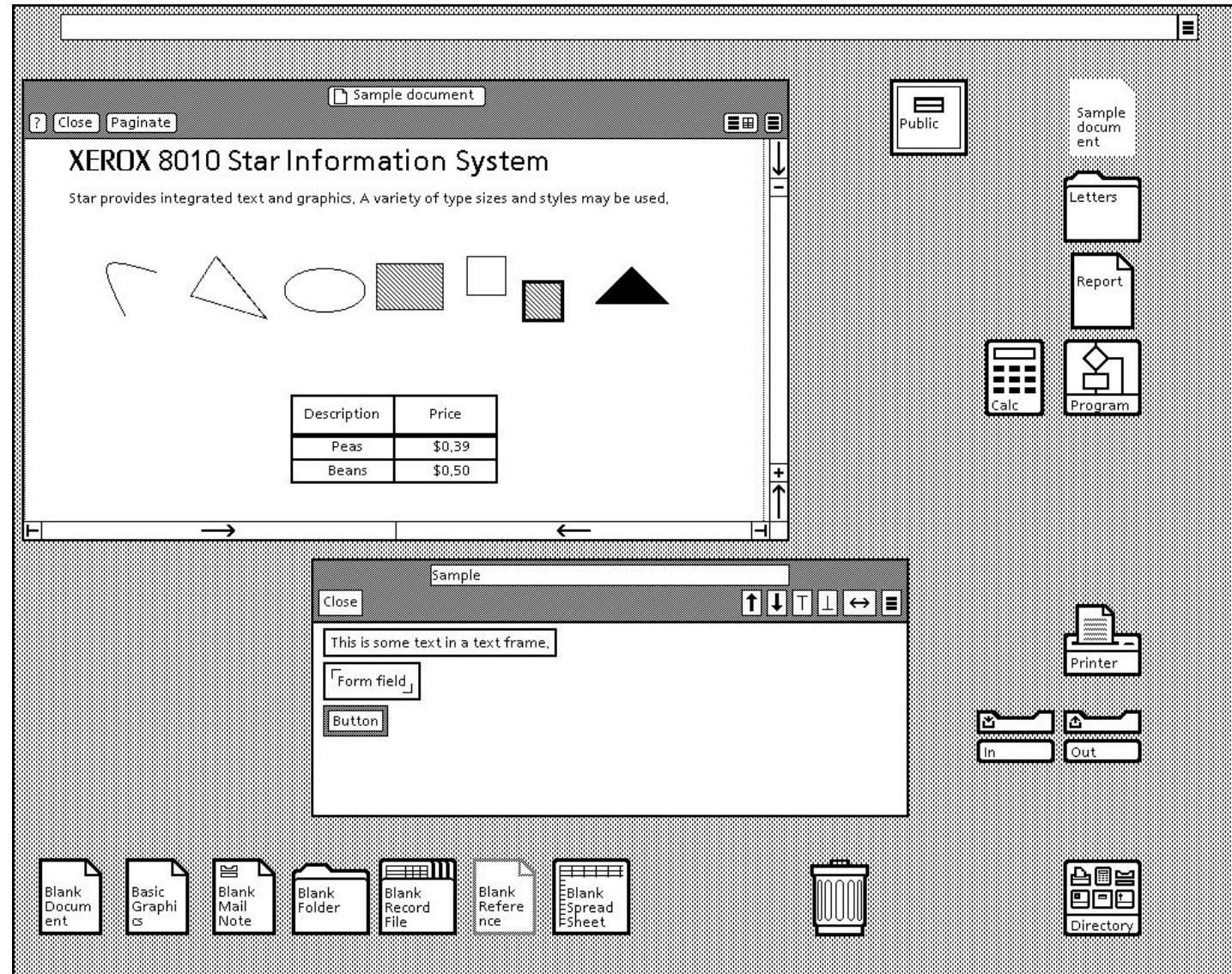


## **4. ICONS AND SYMBOLS**





## **5. VISUAL METAPHOR**









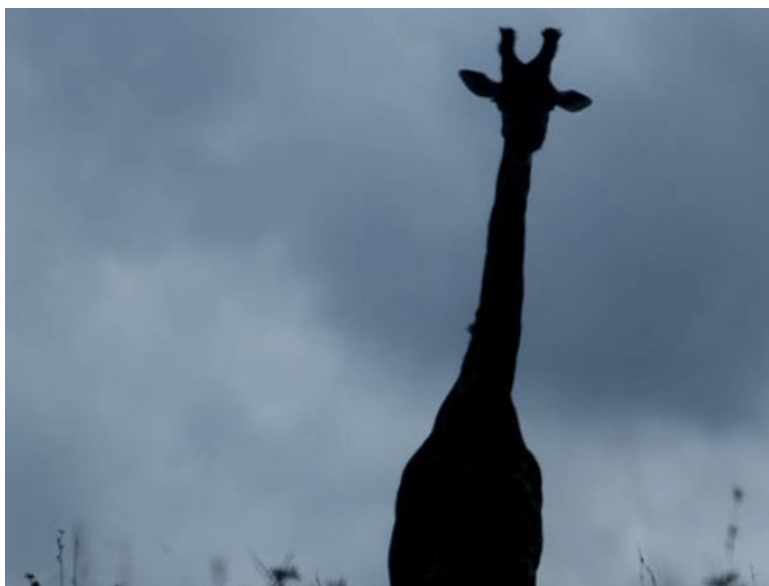




## **6. PICTURES**







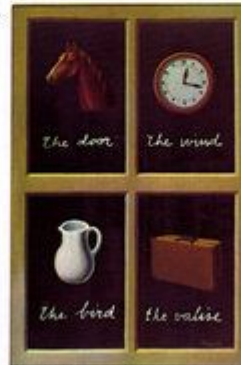


# WAYS OF SEEING

JOHN BERGER

Seeing comes before words. The child looks and recognizes before it can speak.

But there is also another sense in which seeing comes before words. It is seeing which establishes our place in the surrounding world; we explain that world with words, but words can never undo the fact that we are surrounded by it. The relation between what we see and what we know is never settled.



The Surrealist painter Magritte commented on this always-present gap between words and seeing in a painting called *The Key of Dreams*.

The way we see things is affected by what we

# Correspondence theory for graphic design

	Graphic Resources	Correspondence	Design Uses
Marks	Shape Orientation Size Texture Saturation Colour Line	Literal (visual imitation of physical features) Mapping (quantity, relative scale) Conventional (arbitrary)	Mark position, identify category (shape, texture colour) Indicate direction (orientation, line) Express magnitude (saturation, size, length) Simple symbols and colour codes
Symbols	Geometric elements Letter forms Logos and icons Picture elements Connective elements	Topological (linking) Depictive (pictorial conventions) Figurative (metonym, visual puns) Connotative (professional and cultural association) Acquired (specialist literacies)	Texts and symbolic calculi Diagram elements Branding Visual rhetoric Definition of regions
Regions	Alignment grids Borders and frames Area fills White space Gestalt integration	Containment Separation Framing (composition, photography) Layering	Identifying shared membership Segregating or nesting multiple surface conventions in panels Accommodating labels, captions or legends
Surfaces	The plane Material object on which the marks are imposed (paper, stone) Mounting, orientation and display context Display medium	Literal (map) Euclidean (scale and angle) Metrical (quantitative axes) Juxtaposed or ordered (regions, catalogues) Image-schematic Embodied/situated	Typographic layouts Graphs and charts Relational diagrams Visual interfaces Secondary notations Signs and displays



# Use 1: Usability analysis

- Analyse a design using this taxonomy  
(e.g. Uses connotative correspondence)
- Determine if the uses are appropriate  
(e.g. do people think that blue is 'off' or 'cold'?)

Cases where the visual analysis implies one connection but the operation implies another will create substantial usability problems



# Use 1: Usability analysis



# Use 1: Usability analysis



Mapping, Categorical: Off, cold, warm, hot

Mapping, Magnitude, Colder -> Warmer

# Use 1: Usability analysis

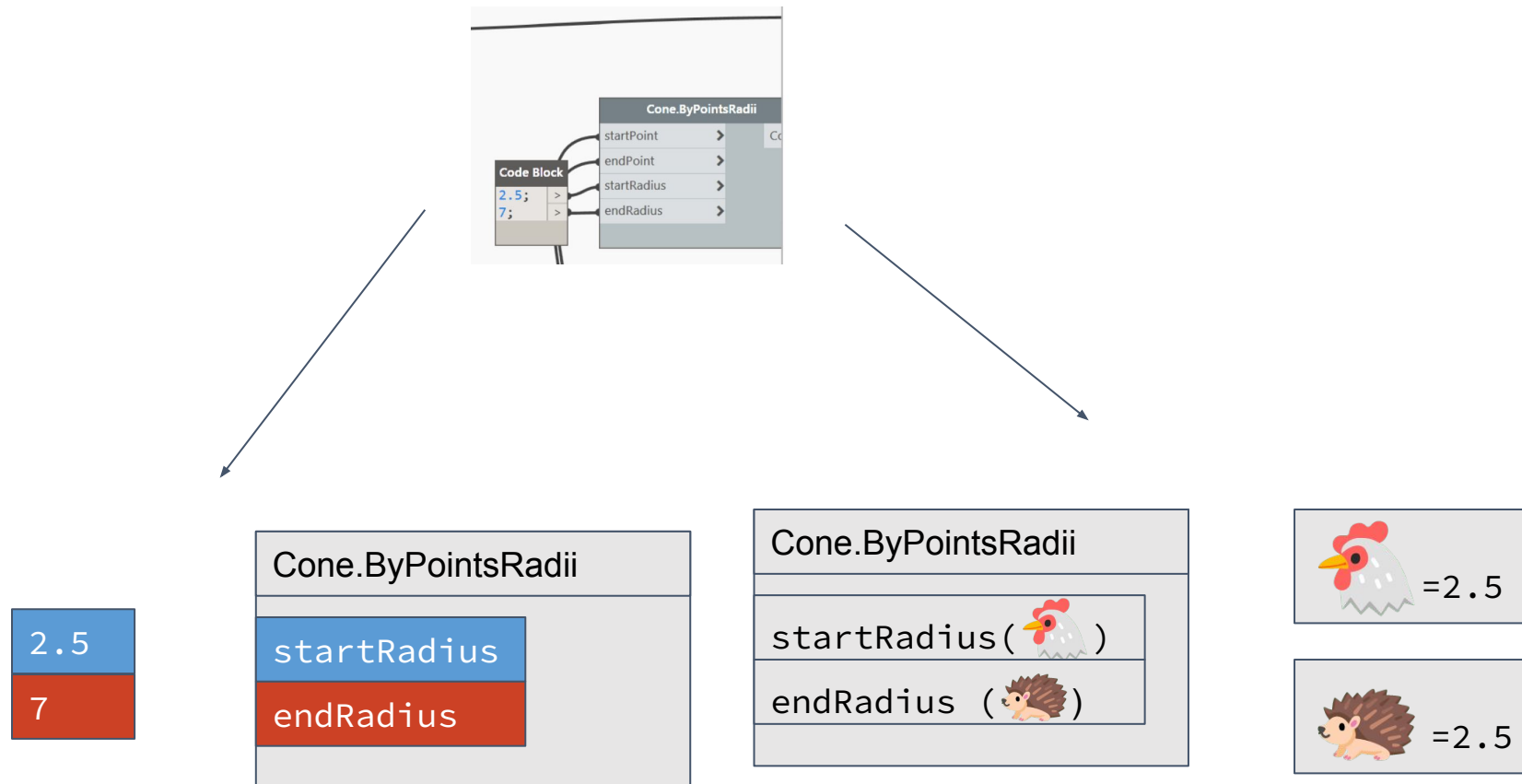


Mapping, Categorical: Off, cold, warm, hot

~~Mapping, Magnitude, Colder -> Warmer~~

Mapping, Direction(!!!), Colder -> Warmer

# Use 2: Generating divergent designs

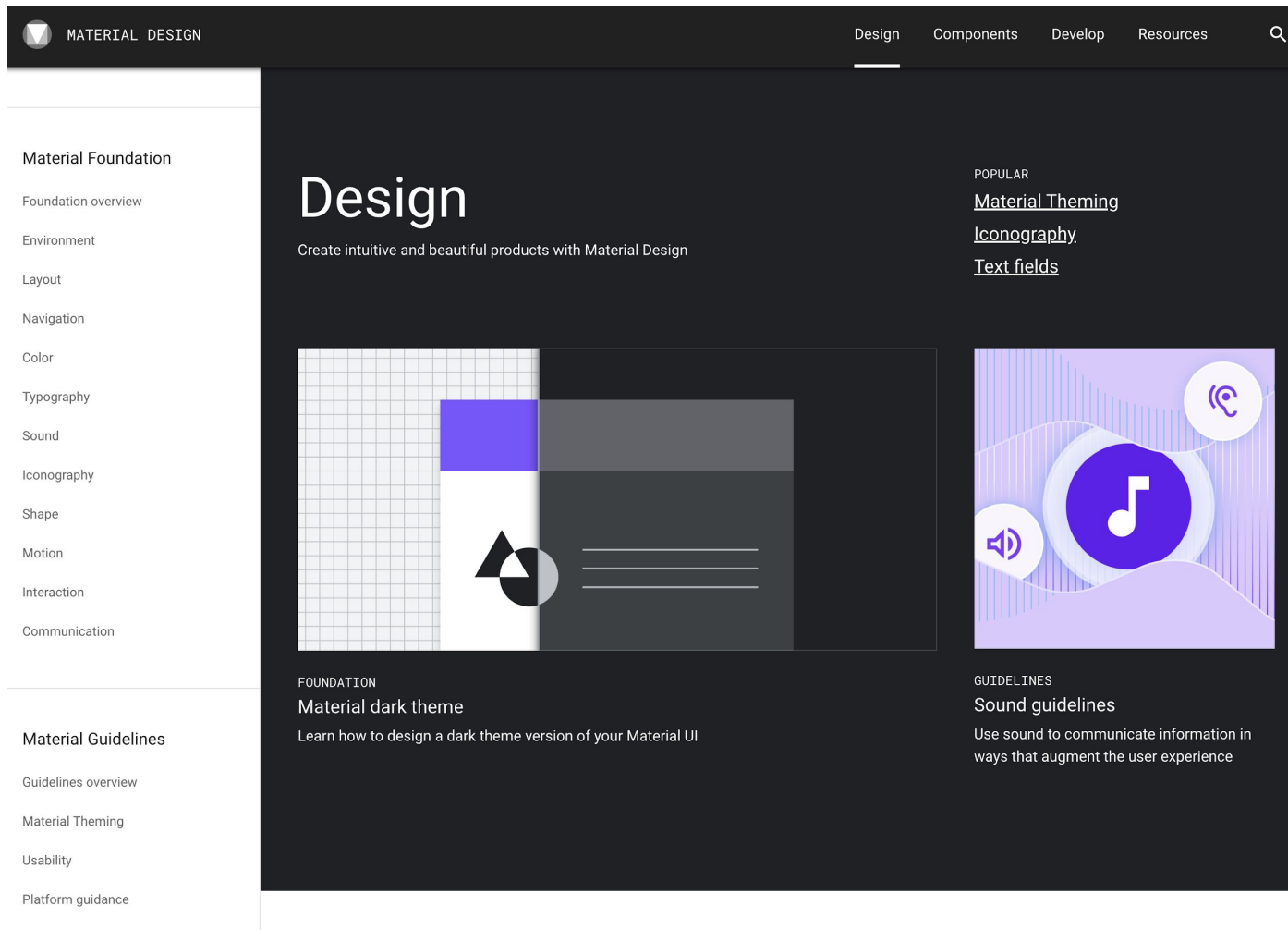


- Topological linking

=>

- Arbitrary conventional

# Use 3: Design systems



## Color usage

Color helps express hierarchy, establish brand presence, give meaning, and indicate element states.

### CONTENTS

Hierarchy

Brand

Meaning

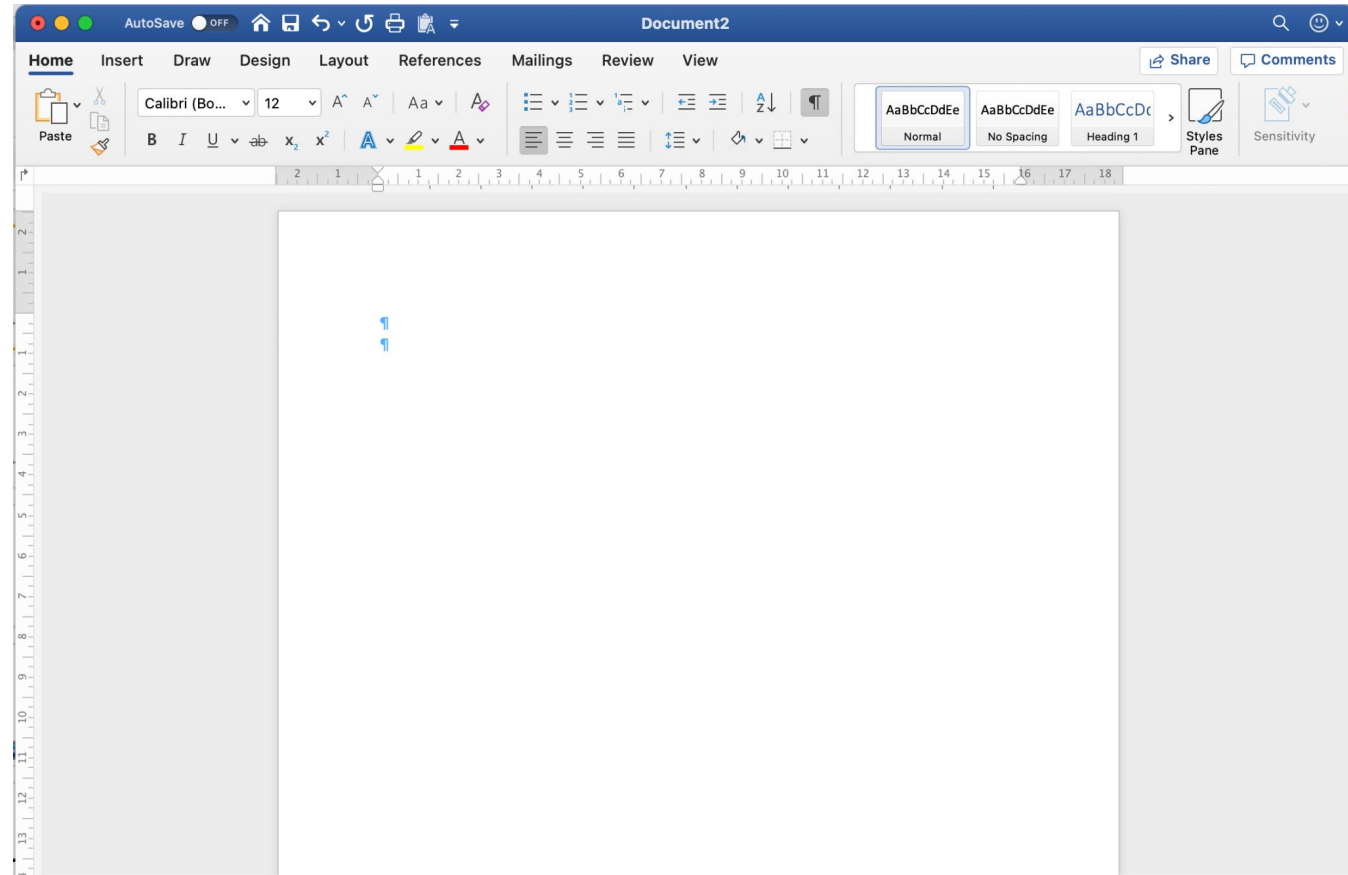
State

(<https://material.io>)



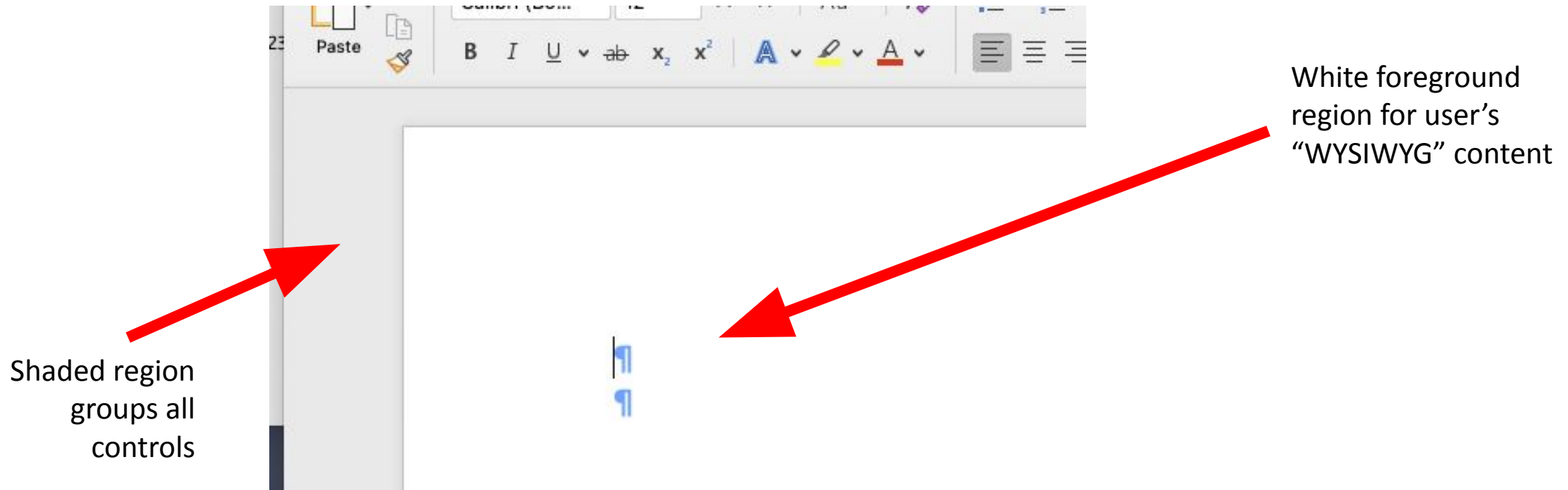
# Analysing visual representation in a UI

Look more carefully at familiar things ...



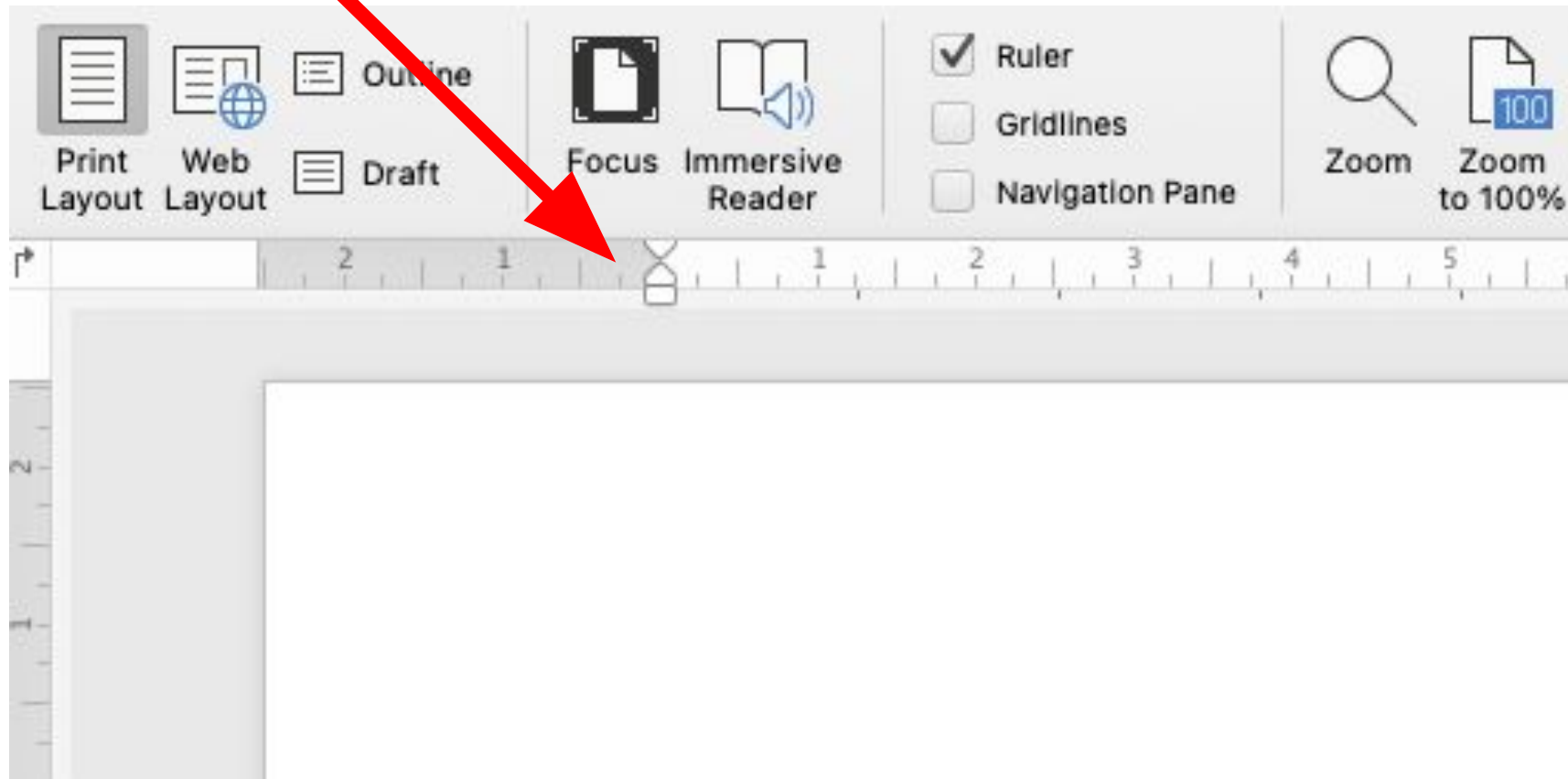
# Analysing visual representation in a UI

Shaded regions define separate functional contexts



# Analysing visual representation in a UI

Coordinate space for quantitative calculation of grid layout

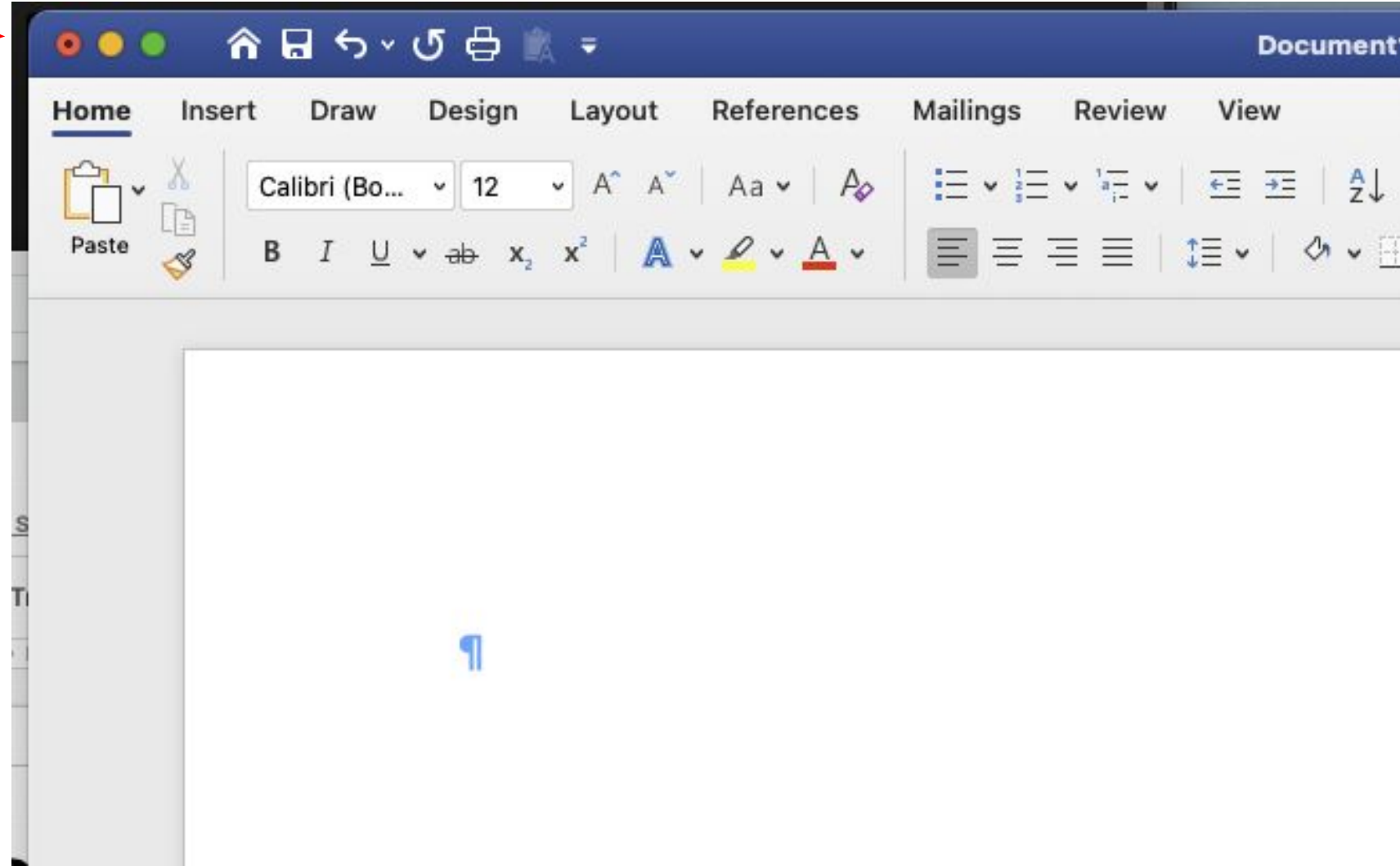


# Analysing visual representation in a UI

Blue coloured border:

1. Corporate identity  
(cf IBM)

2. Context within  
Office suite - Excel  
docs have green  
borders, PPT are  
orange.



# Analysing visual representation in a UI

How do we read these?



Difficult standards:  
When the designer's mental  
model differs from the user's  
mental model



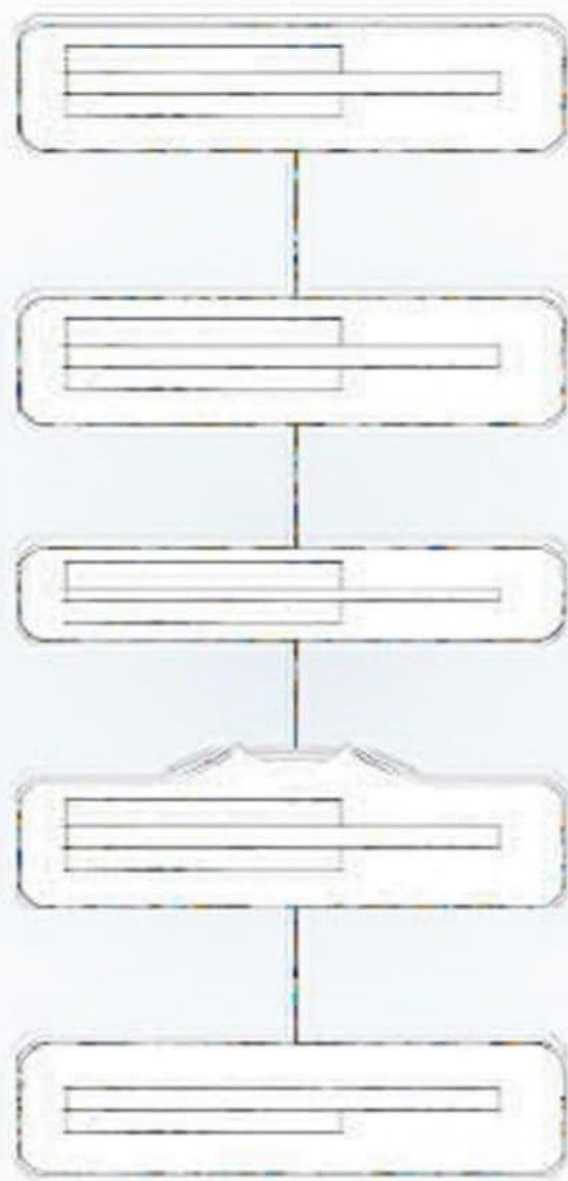


# The programming analogy challenge 2025:

## Example #1: Note-taking tablet

What do you mean by a note - is this a representation that has operational semantics?

- Are they syntactically delimited? (e.g. bullets)
- Are they flat or hierarchical?
  - Nested or Tree?
    - How far should the tree go?
      - This far?
        - Is it a problem if you put the most important thing at the bottom level?
          - Or perhaps just nest them with the real content via [this hyperlink](#)
- Are there cross-references? Dependencies? Inclusions?



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- Do they have state / side-effects / values? (e.g. to-do list)



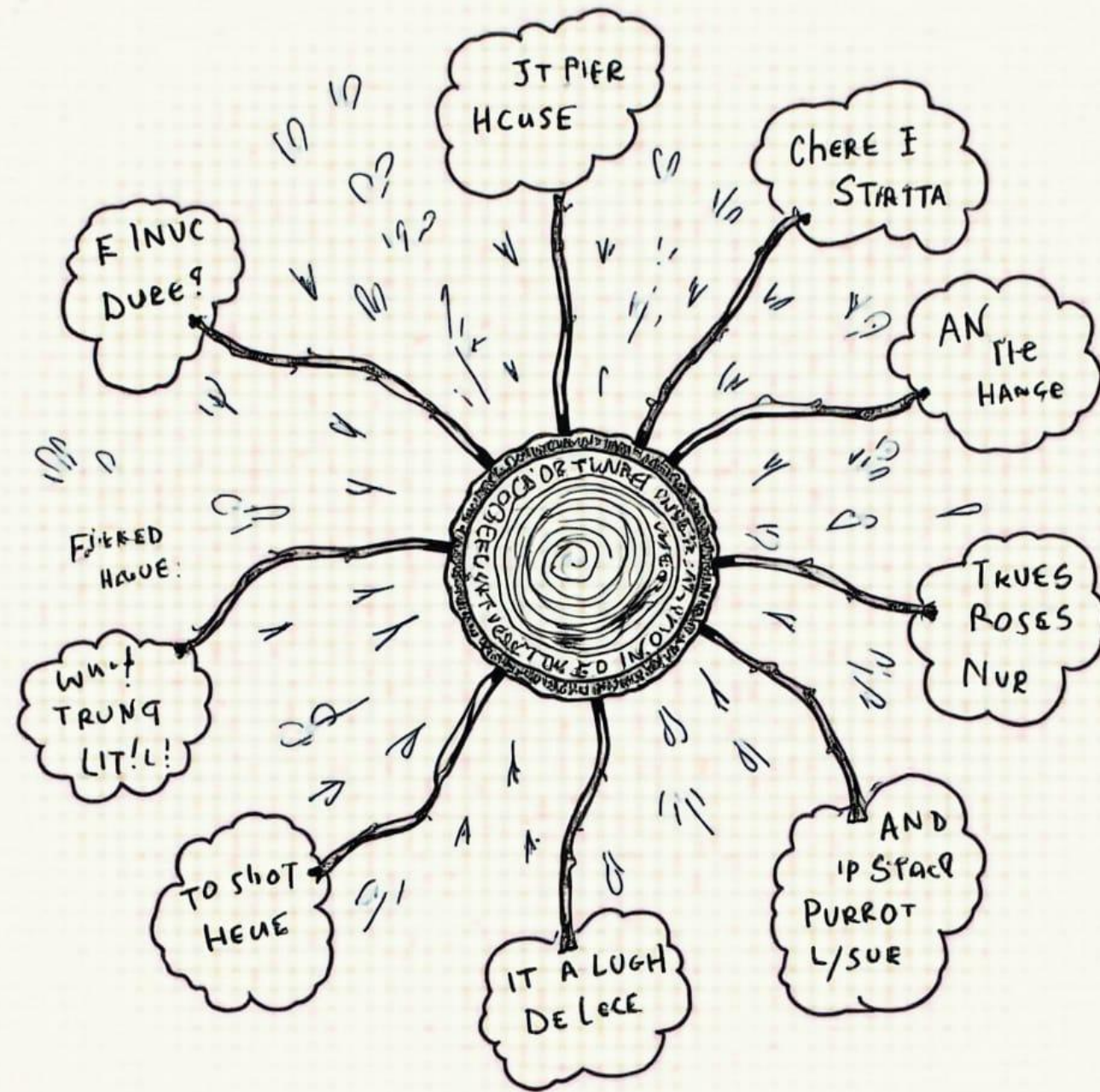
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