



Node-and-Edge Graphs

GC

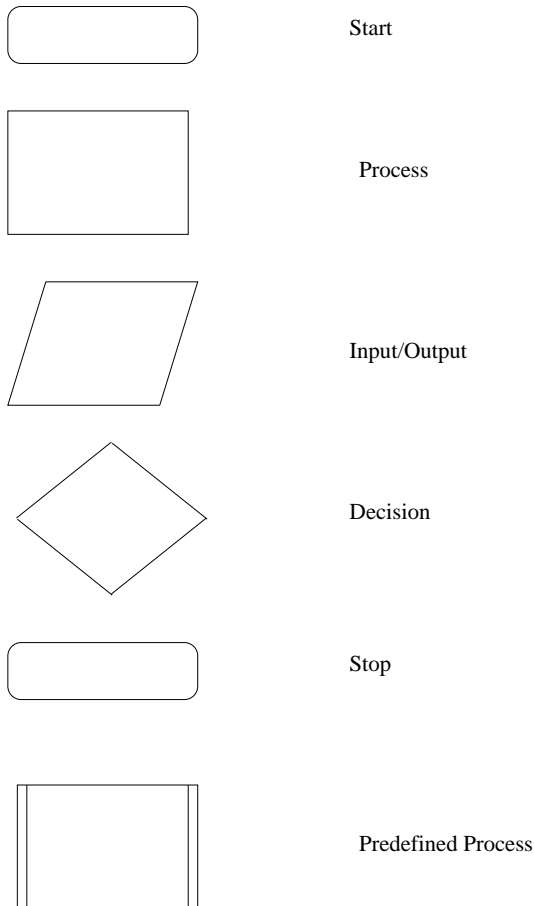
Motivation: effective information transmission

- family trees
- hierarchical structures
 - syntactic structure
 - directories in file systems
 - organigrams
- classification
 - dualism: properties/individuals
 - decision trees
- schematic maps
- state diagrams
 - **flowcharts**
- chemical structure — beyond trees!



Flowcharts

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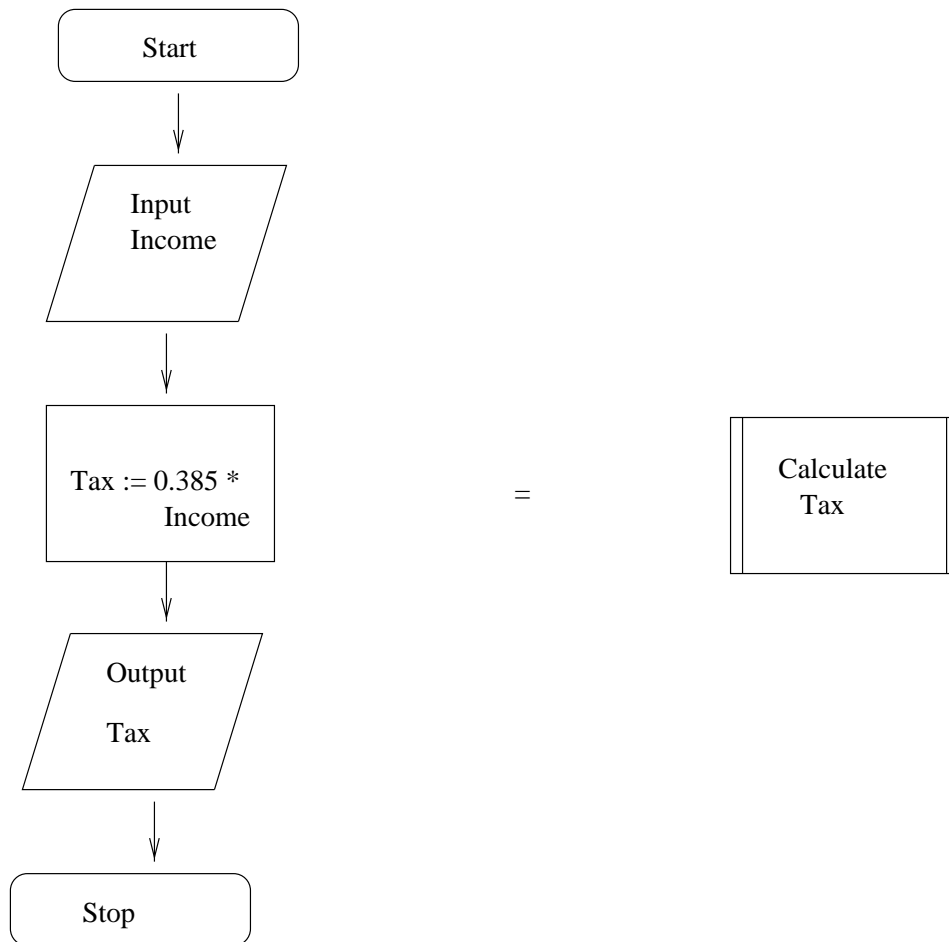
ANSI standard prescribes form (a kind of node & edge graph)

- arrows connect nodes, showing temporal sequence
- iteration can be shown
- small circles sometimes added to simplify points where control flows together



Simple Example

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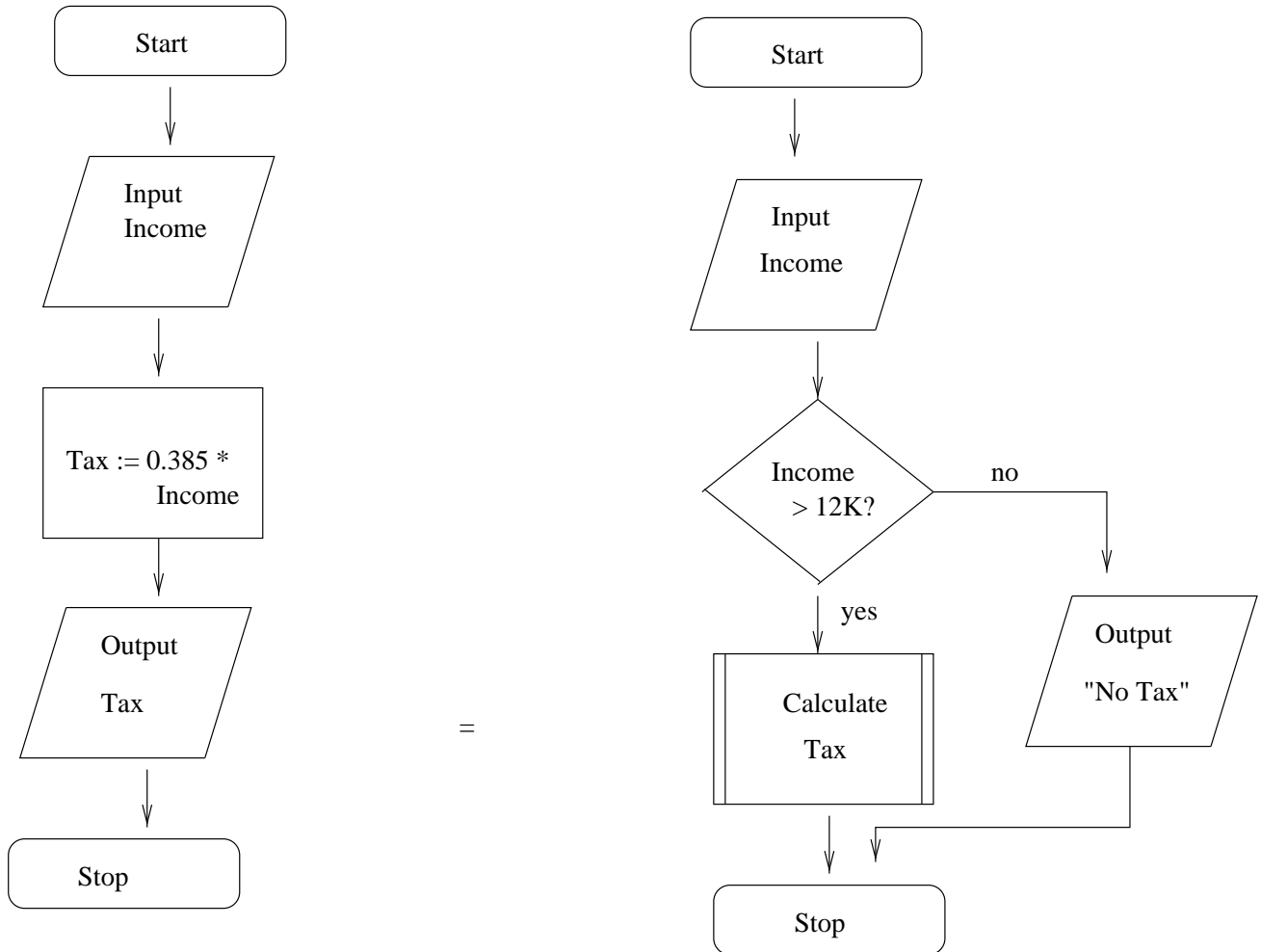


- '=' *not* part of diagram
—indicates meaning of bordered box
- relatively easy to understand (but so is this process)



Conditional Process

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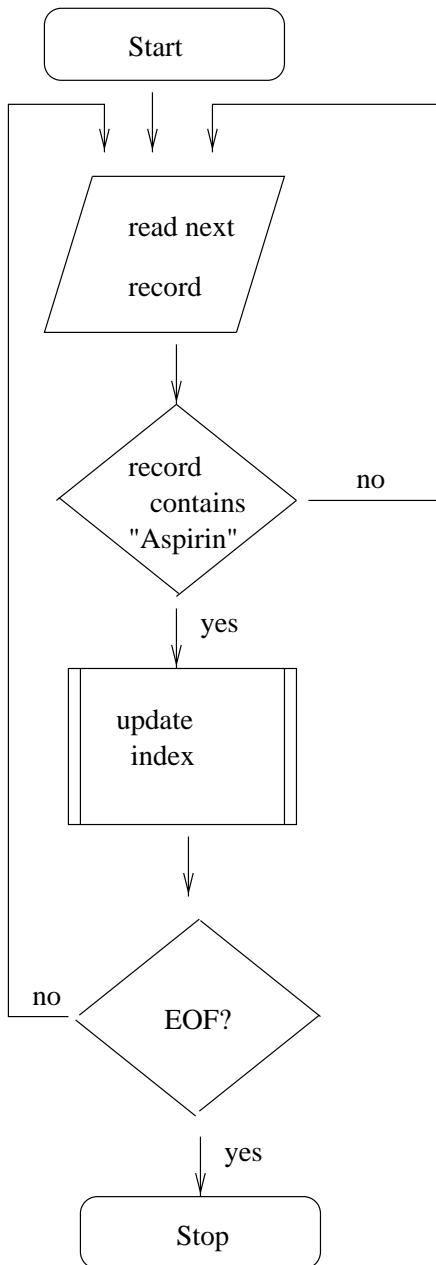


- input/output might be further specified (CD, tape, screen,...)
- input is now a problem —chart makes it obvious



Iteration

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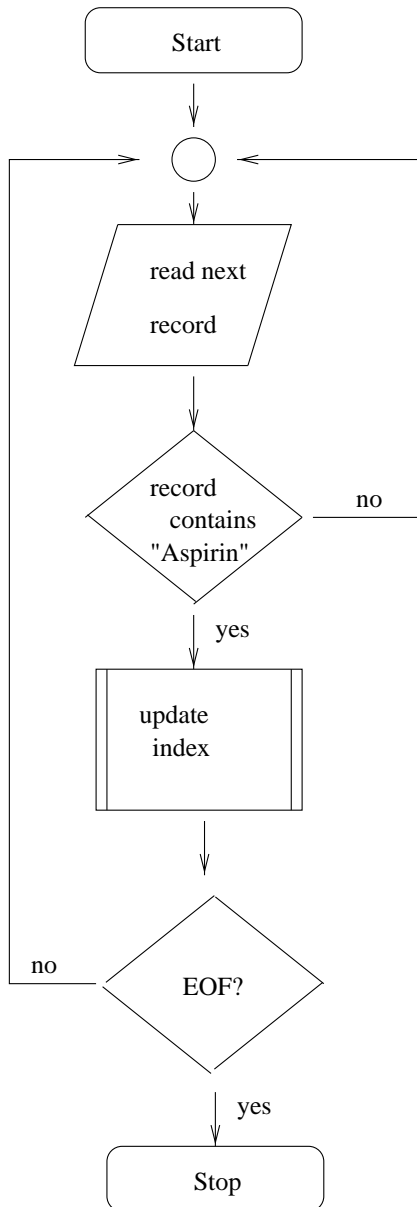


- flow and decision is sufficient



Using Connectors

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- neater, same content



Flowcharts

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- graphic rendition of process
- old fashioned among programmers (little used)
- popular in simple presentations

Dataflow Diagrams

- graphic rendition of process organization
- popular among programmers (today)
- modular, top-down view



Dataflow Diagrams

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User's view of GLOSSER

The screenshot displays the GLOSSER user interface, which is divided into several panels. The main panel on the left shows a text document titled "Glosser Prototype November 1996" with a menu bar (Stop, Info..., Taal, Help, Lees tekst...) and a toolbar (Woordenboek, Morfologie, Voorbeelden). The text in the main panel is:

DE LA TERRE A LA LUNE
Trajet Direct en 97 Heures 20 Minutes

par Jules Verne

I

LE GUN-CLUB

Pendant la guerre fédérale des États-Unis, un nouveau club très influent s'établit dans la ville de Baltimore, en plein Maryland.

...

Mais en quoi les Américains surpassèrent singulièrement les Européens, ce fut dans la science de la balistique. Non que leurs armes **atteignent** un plus haut degré de perfection, mais elles offrirent des dimensions inusitées, et eurent par conséquent des portées inconnues jusqu'alors.

...

The right side of the interface contains three stacked panels:

- Woordenboek**: A dictionary entry for "atteindre" [atFedr] t51 31. It lists various meanings and examples: "0.1 met moeite bereiken => geraken (tot), reiken (tot) 32", "0.1 bereiken => halen, komen tot 0.2 raken => treffen, aantasten 0.3 fig. raken => treffen, kwetsen 1.1 ~ 70 ans 70 jaar worden 1.1 ~ un livre sur l'armoire bij een boek op de kast kunnen 6.2 ~ qn. au bras iem. in de arm treffen 6.2 ~ qn. de qc. iem. met iets raken 6.3 ~ qn. dans ses convictions iem. in zijn overtuigingen krenken".
- Morfologische analyse**: A morphological analysis panel showing the selected analysis: "atteindre+ Subj+ PL+ P3+ FinV".
- Voorbeelden**: A panel showing examples of the word "atteindre" in context. It includes a French sentence: "En 1972, la balance des produits de la TI était encore excédentaire. En 1980, le déficit **atteignait** 2 milliards de dollars et, selon certaines sources, la barre des 10 milliards a été franchie en 1982." and a Dutch sentence: "In 1975 beschikt zij nog over een handelsoverschot in IT-producten. Tegen 1980 had het handelstekort een waarde van 5 miljard \$ **bereikt**, en volgens sommige bronnen werd het cijfer van 10 miljard \$ in 1982 overschreden." It also includes a public domain notice: "Public Domain. Originally published in the Official Journal of the European Union. Esprit A announcement (French)".

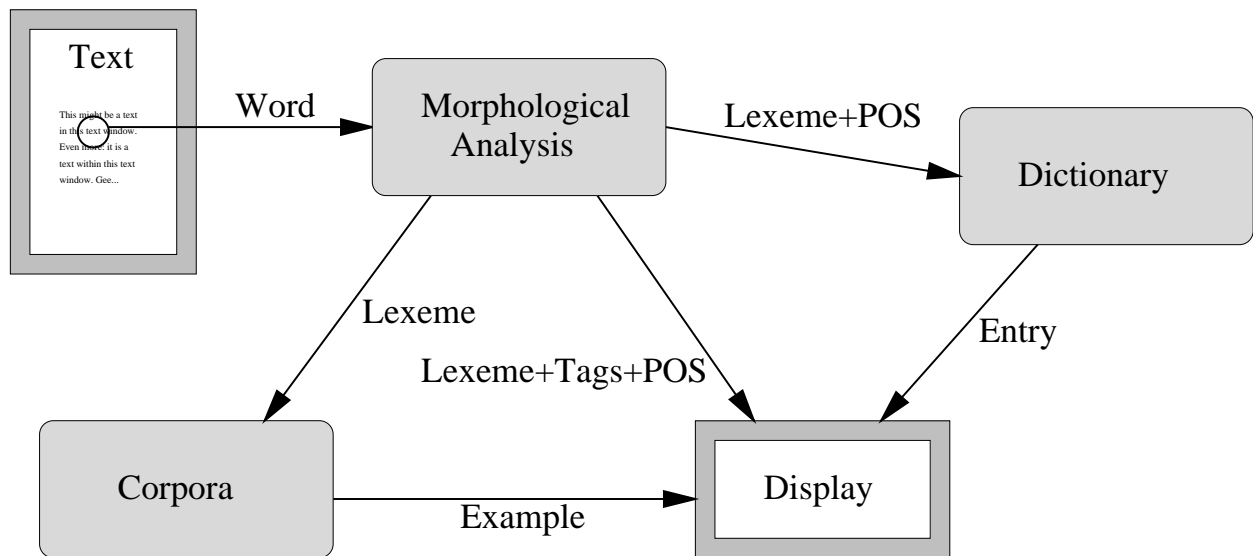
Screens for a text to be read, a morphological analysis, an entry in a bilingual dictionary, and a set of examples taken from (monolingual and bilingual) corpora



Developer's View

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System Architecture of GLOSSER (how it works)



- software too complex for flowchart
- flowchart view (detail down to level of decision points) too atomistic

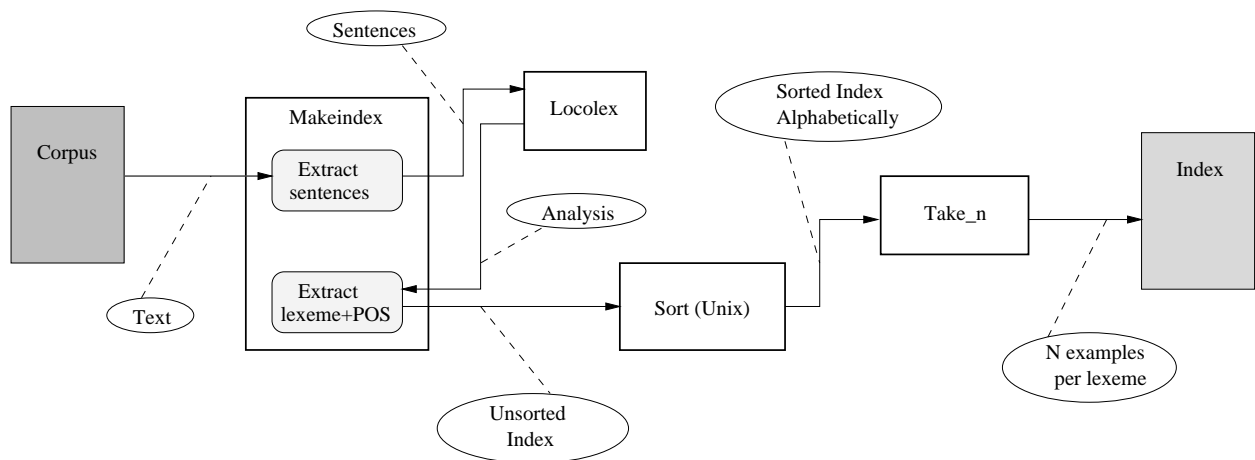
Flowcharts still popular outside of programming!



Developer's View

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Dataflow Diagram for an Indexing Program that indexes words, not strings (e.g., *walking*, *walk*, *walks*, *walked* all indexed to *walk*).



- task of submodules noted
- clarifies some assumptions
- communication noted



Chemical Diagrams

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molecules are atoms (nodes) connected by chemical bonds (edges)

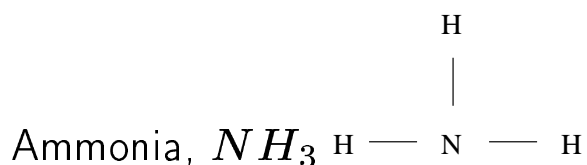
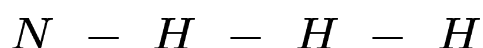


Diagram allows chemists to check structure against what they know of elements, e.g., that hydrogen can make exactly one bond. E.g., the structure below can't be right:



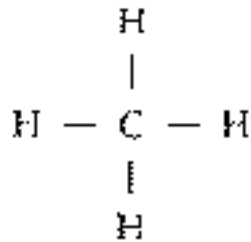
The internal hydrogen atoms can't support the two bonds.



Chemical Diagrams

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Methane, CH_4



diagrams more informative than chemical formulas

Water, H_2O vs. Carbon Dioxide CO_2



The CO_2 connections are *double bonds*, the H_2O are not.

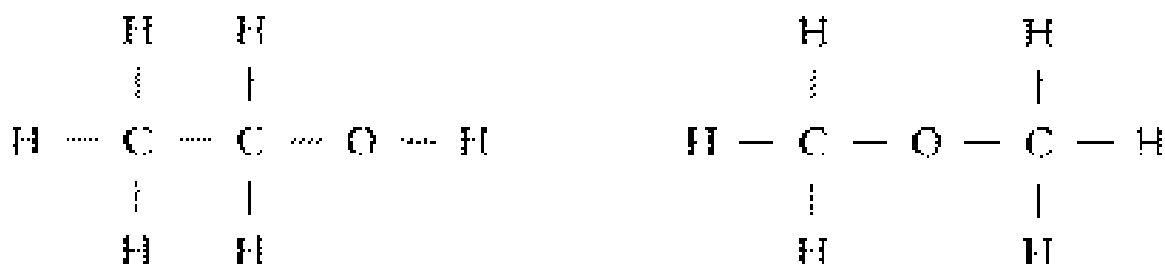


Chemical Diagrams

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Diagrams, developed in mid-19th century, suggest where various structures are possible.

Ethanol vs. Dimethylether



- summarize essential components (atoms) and bonds
- allow *local* checks (number of available bonds “valence”)
- suggest where formulas might mislead

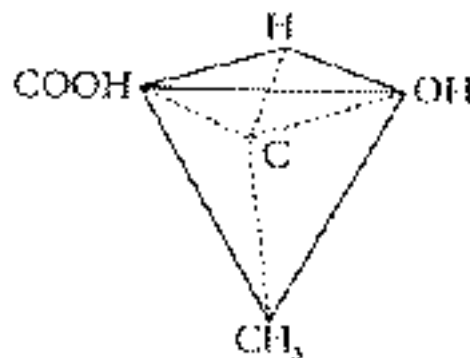
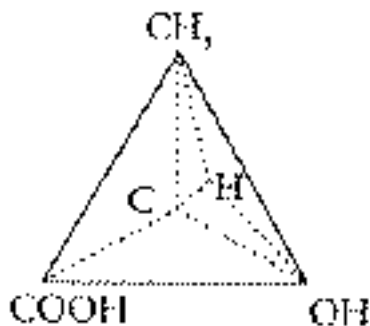


What Diagrams Hide

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Diagrams show in two dimensional structure that is realized in three. This can be misleading.

Van 't Hoff (Dutch Nobel Prize winner) developed stereochemical representations (in three dimensions). Lactic acid, counterclockwise and clockwise:



note that two-dimensional representations would be the same!