Examples: Version 6.9

This is a collection of diagrams the author has had occasion to produce using m4 circuit macros and others, and gpic or dpic. In some cases, there are other or better m4 or pic constructs for producing the same drawings, but the source-file names are shown for reference. Most of the examples can be processed using either dpic -p or gpic -t, which has meant that in a few cases the source is slightly more complicated than it would be if only one processor had been assumed.

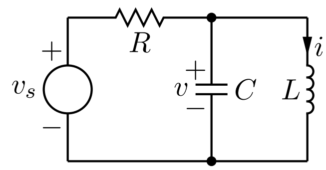


Figure 1: The quick-start example from the manual `[quick.m4]`.

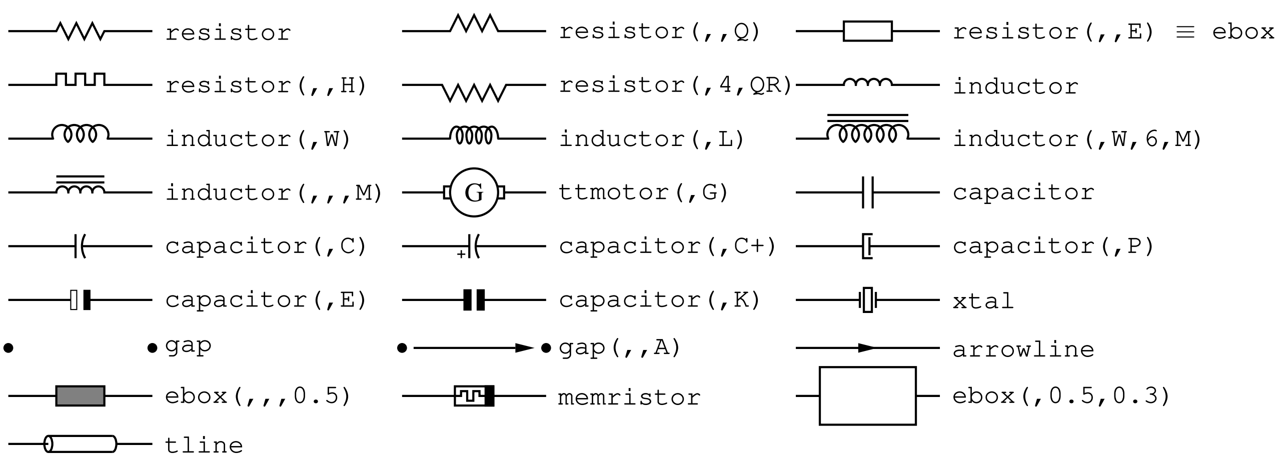


Figure 2: Two-terminal elements, showing some variations `[CctTable.m4]`.

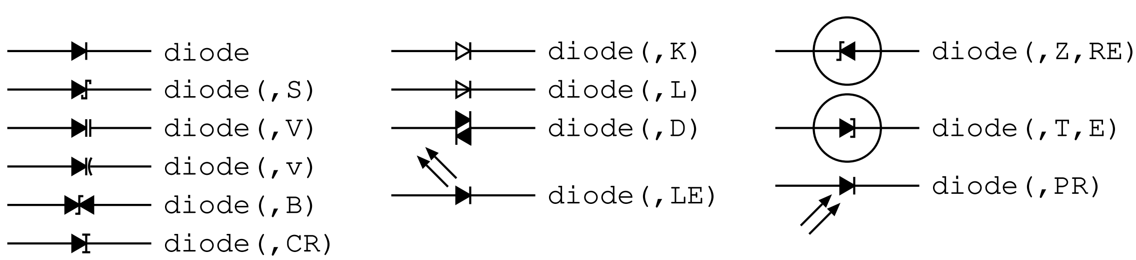


Figure 3: Diodes `[Diodes.m4]`.

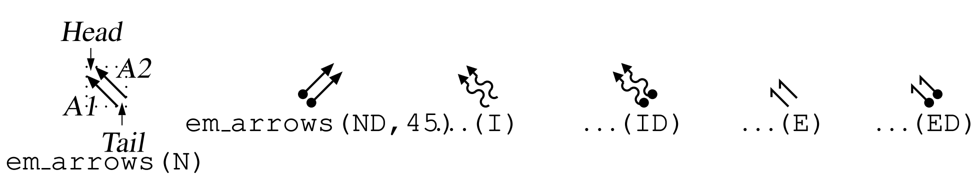


Figure 4: Radiation arrows `[Emarrows.m4]`.

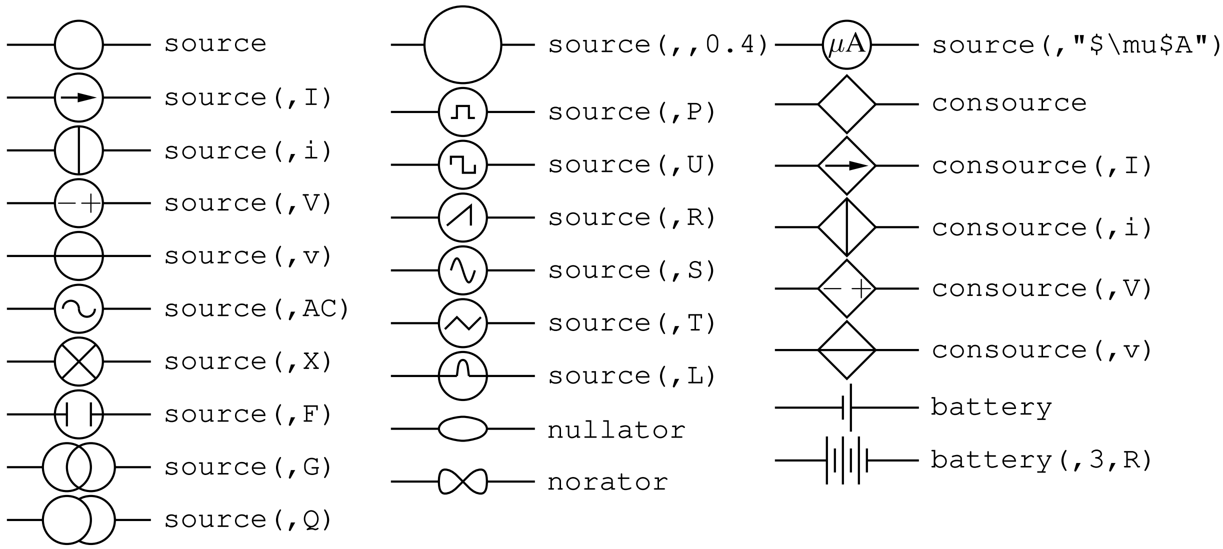


Figure 5: Sources and source-like elements `[Sources.m4]`.

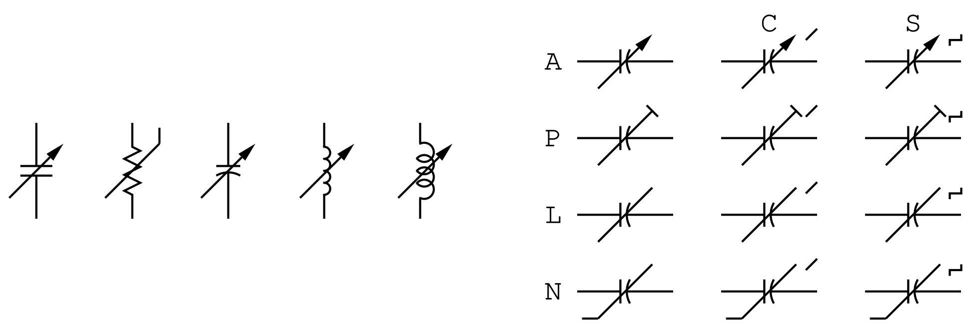


Figure 6: Arrows and marks indicating variability `[Variable.m4]`.

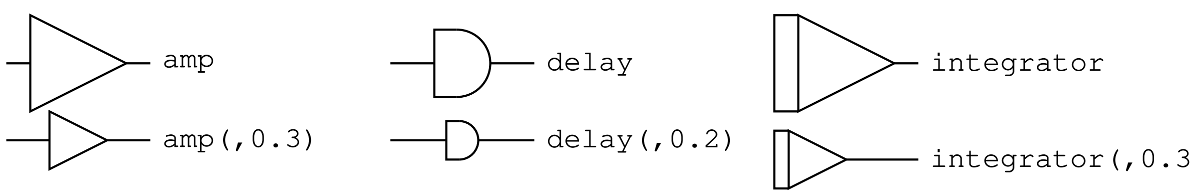


Figure 7: Macros `amp`, `delay`, and `integrator` `[AmpTable.m4]`.

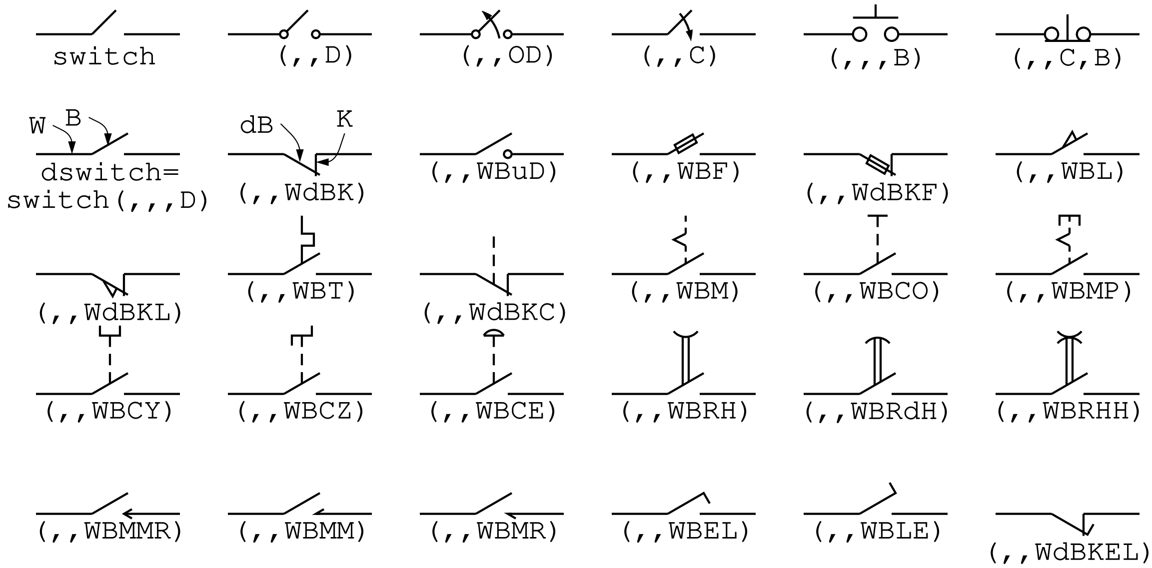


Figure 8: The `switch` and `dswitch` macros `[Switches.m4]`.

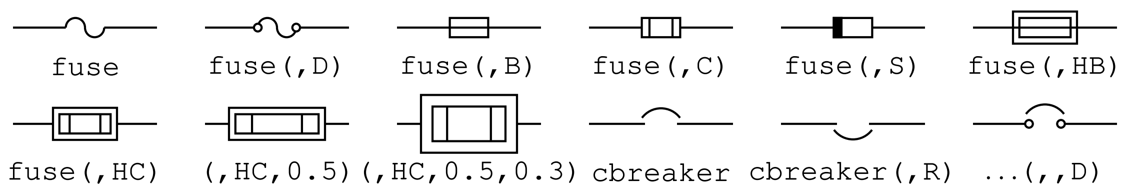


Figure 9: Macros `fuse` and `cbreaker` `[Fuses.m4]`.

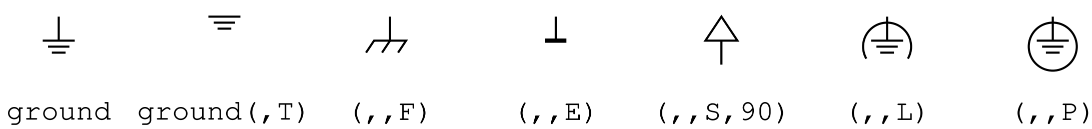


Figure 10: Ground symbols `[Grounds.m4]`.

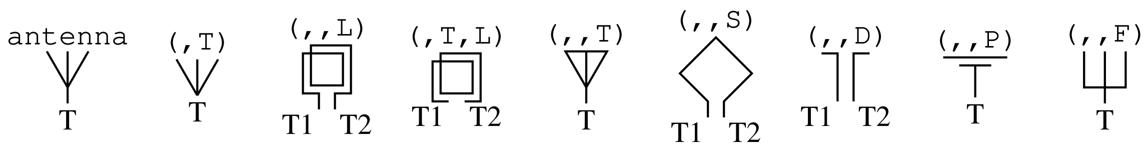


Figure 11: Antenna symbols `[Antennas.m4]`.

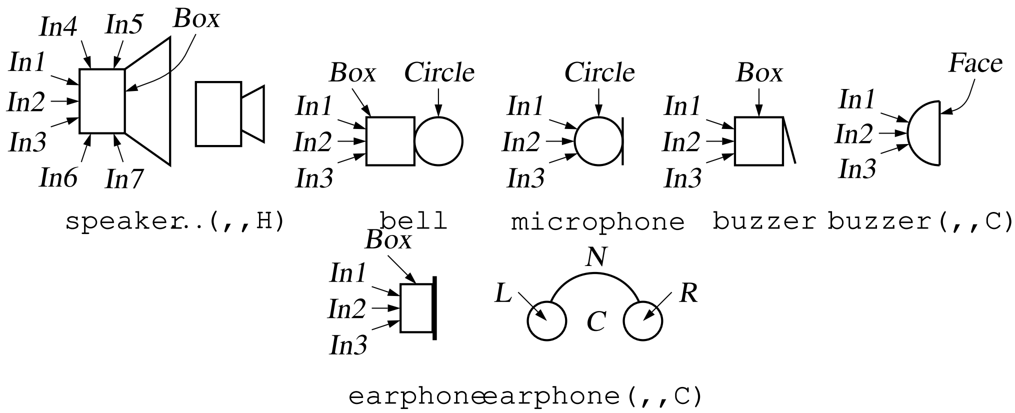


Figure 12: Audio elements [Audio.m4].

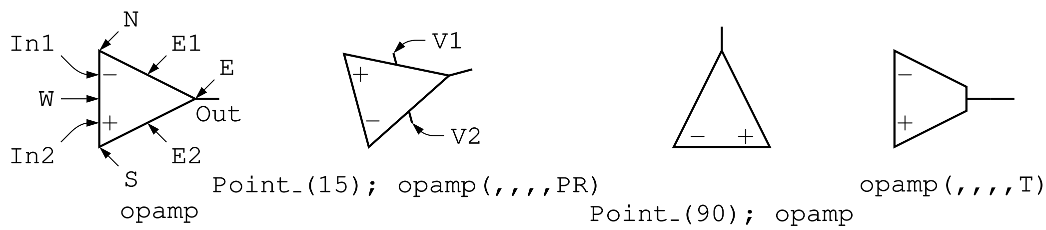


Figure 13: The opamp [Opamp.m4].

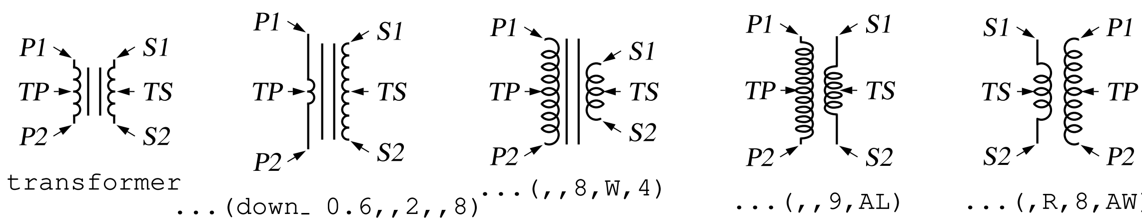


Figure 14: The transformer element, drawing direction down [Xform.m4].

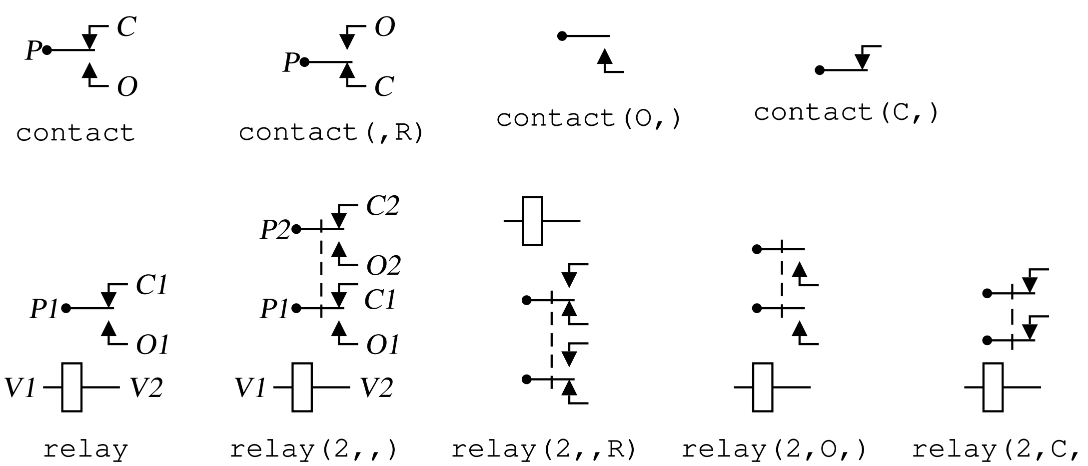


Figure 15: The contact and relay macros [Relay.m4].

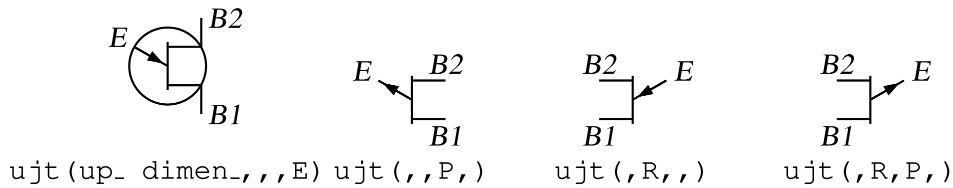


Figure 16: UJT examples [ujt.m4].

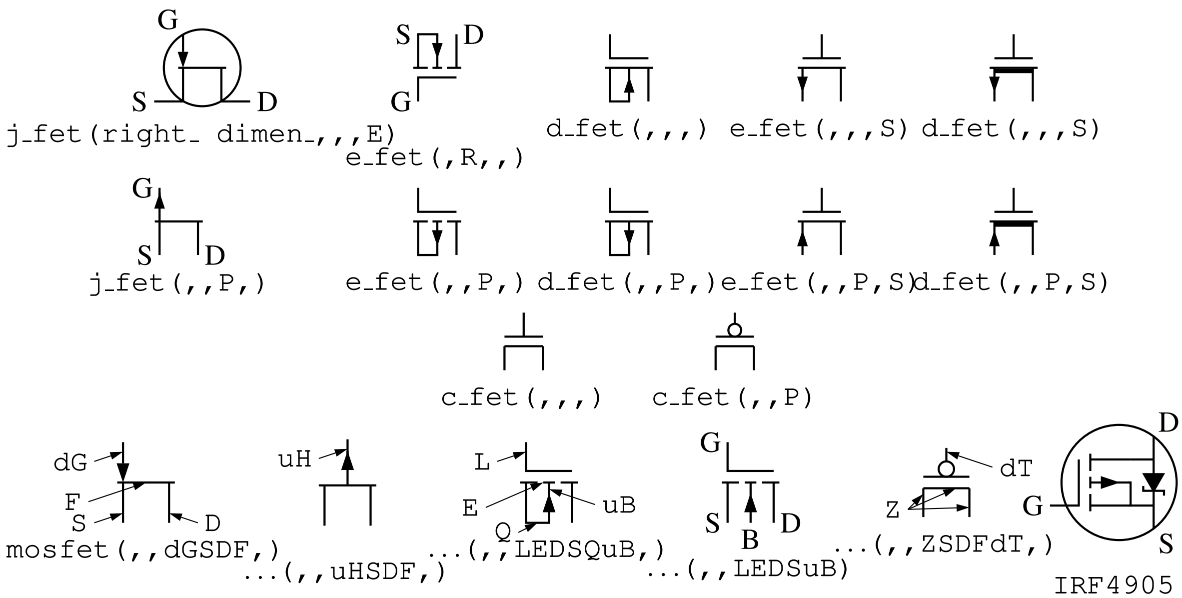


Figure 17: FETs, showing programmable components and example customizations [fet.m4].

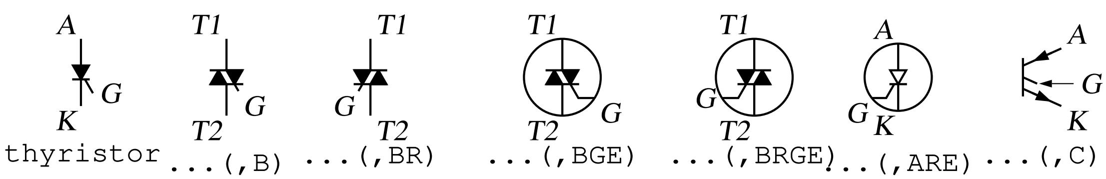


Figure 18: Thyristor examples [thyristor.m4].

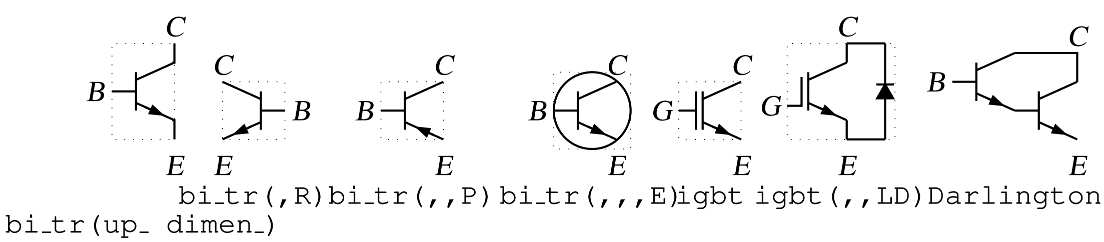


Figure 19: Bipolar transistors (drawing direction: up) [Bip.m4].

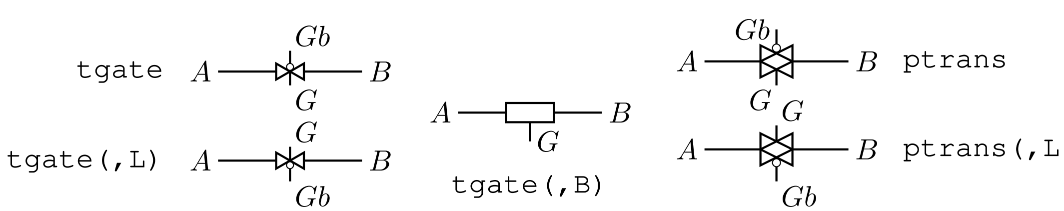


Figure 20: The tgate and ptrans elements [Tgate.m4].

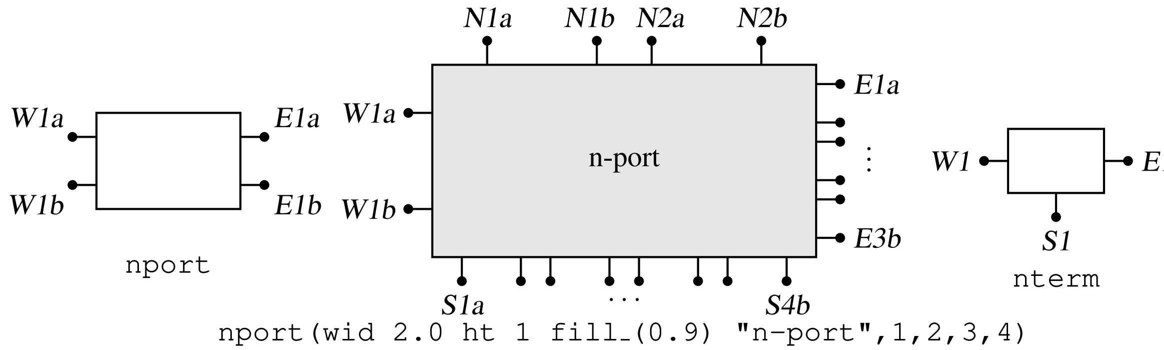


Figure 21: The `nport` and `nterm` macros `[Nport.m4]`.

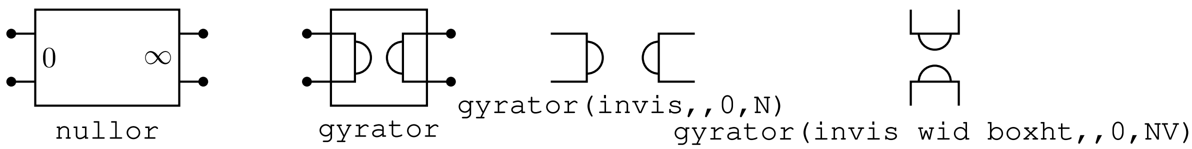


Figure 22: Some customizations of `nport` `[NLG.m4]`.

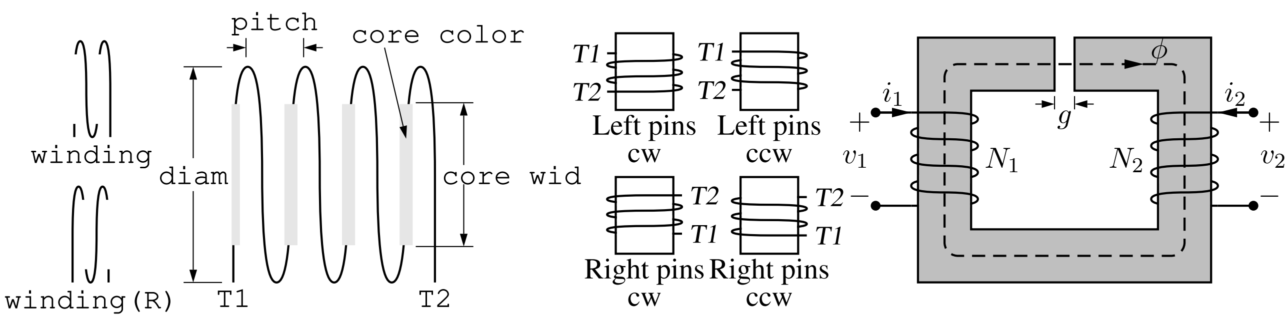


Figure 23: The macro `winding(L|R,diam,pitch,turns,core wid,core color)` `[Windings.m4]`.

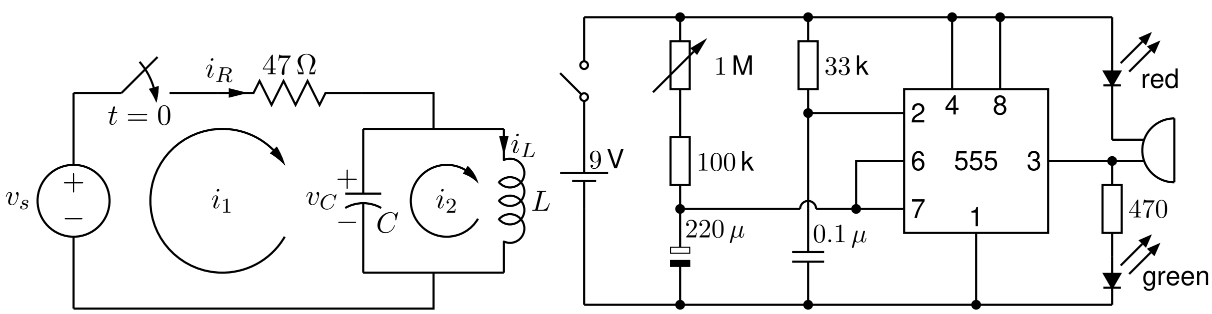


Figure 24: Two simple labeled circuits `[ex01.m4]` `[Timer.m4]`.

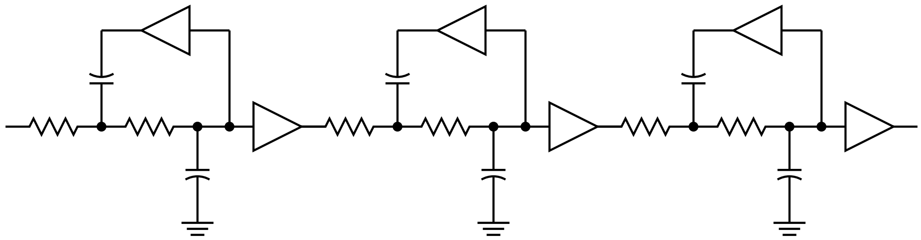


Figure 25: A six-pole filter `[Sixpole.m4]`.

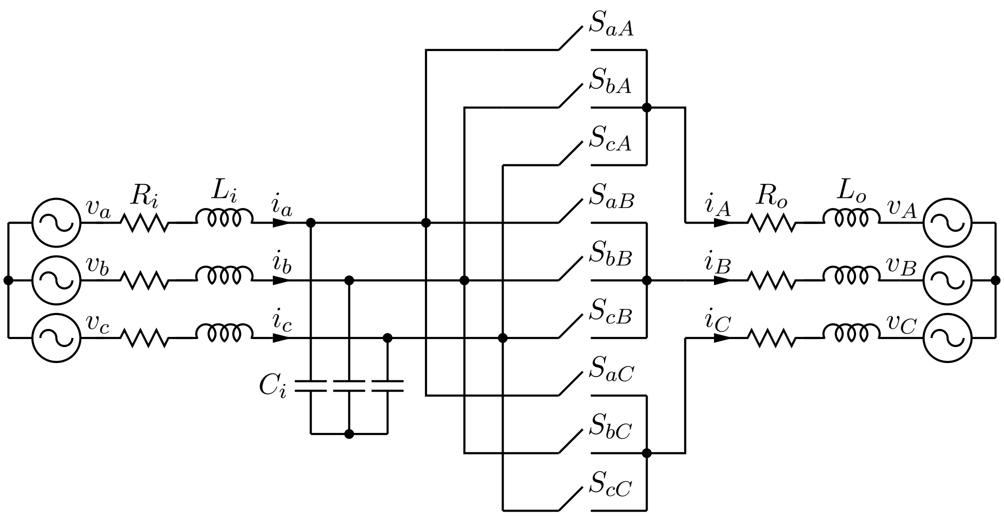


Figure 26: A three-phase switched AC-AC converter `[MC.m4]`.

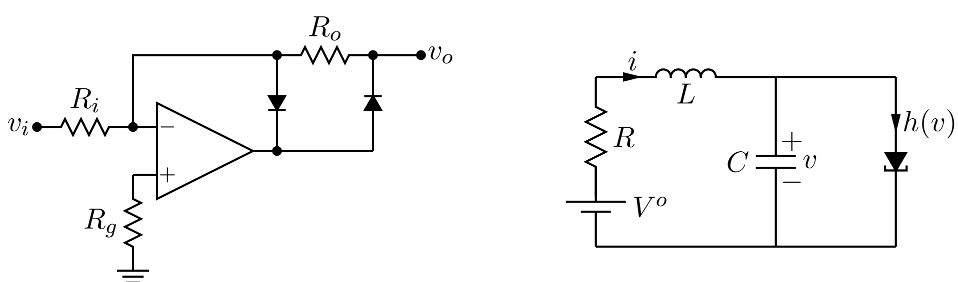


Figure 27: Precision half-wave rectifier and a tunnel diode circuit (illustrating `opamp`, `diode`, `resistor`, `ground`, and labels) `[ex18.m4]` `[ex19.m4]`.

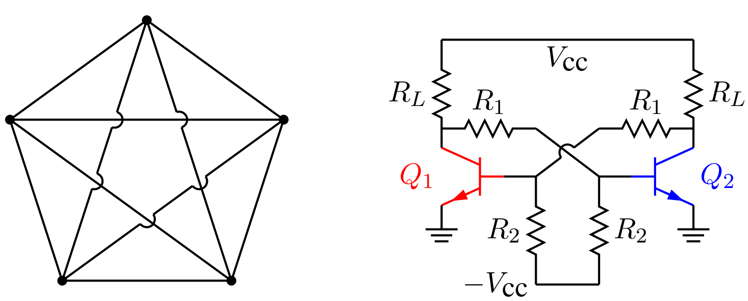


Figure 28: Non-planar graph and bistable circuit (illustrating the `crossover` macro and colored elements) `[ex10.m4]` `[bistable.m4]`.

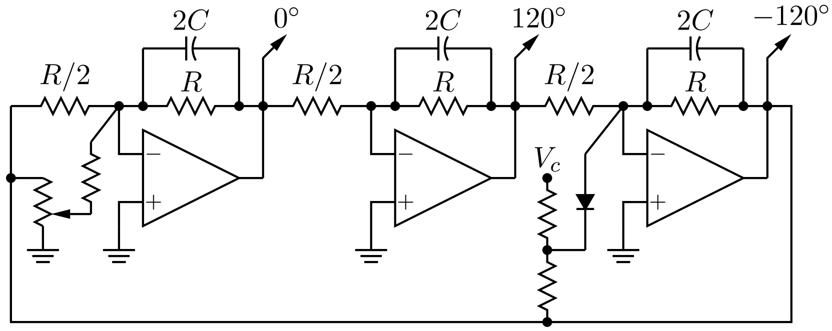


Figure 29: Three-phase oscillator [Three.m4].

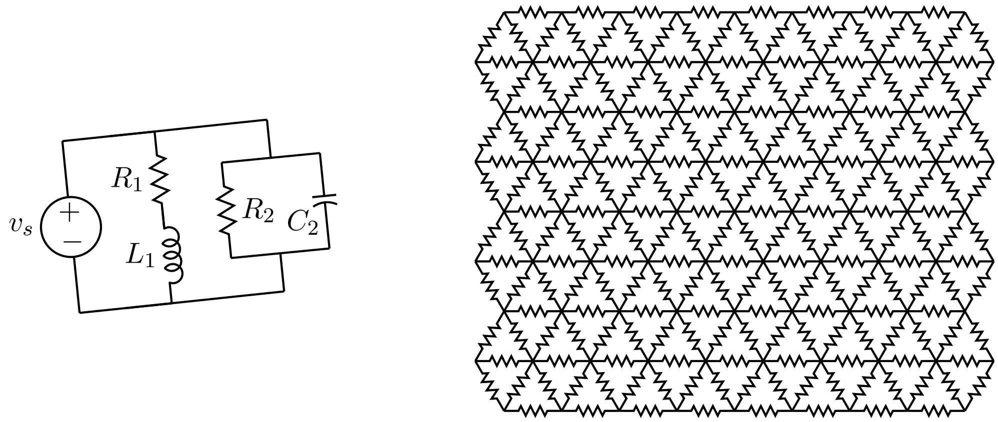


Figure 30: A skewed circuit used to test the macro `gpar_(`*element*, *element*, *separation*`)`, and a repetitive network created by Pic looping `[gpar.m4][ex17.m4]`.

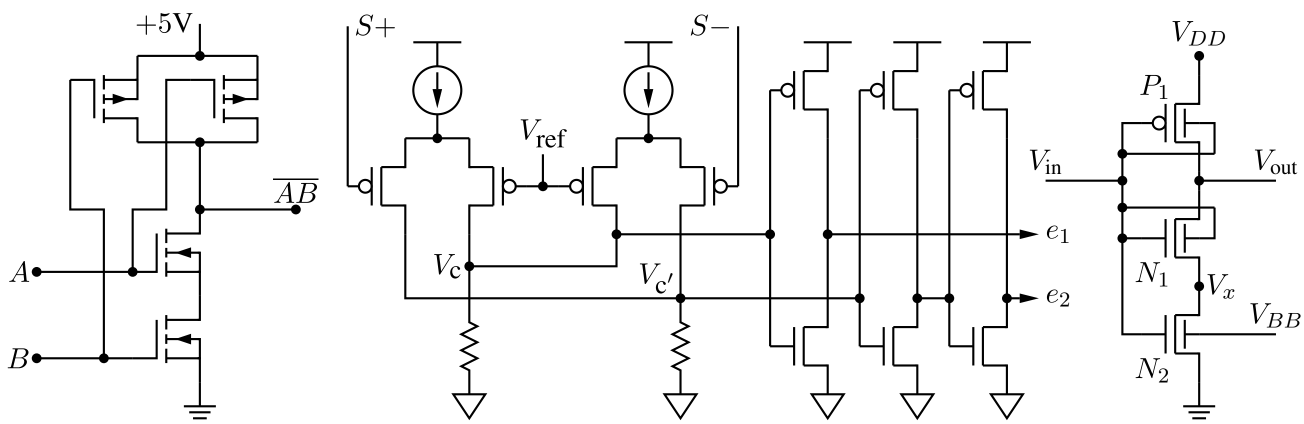


Figure 31: A CMOS NAND gate, a test circuit, and an XMOSFET example `[ex12.m4]`.

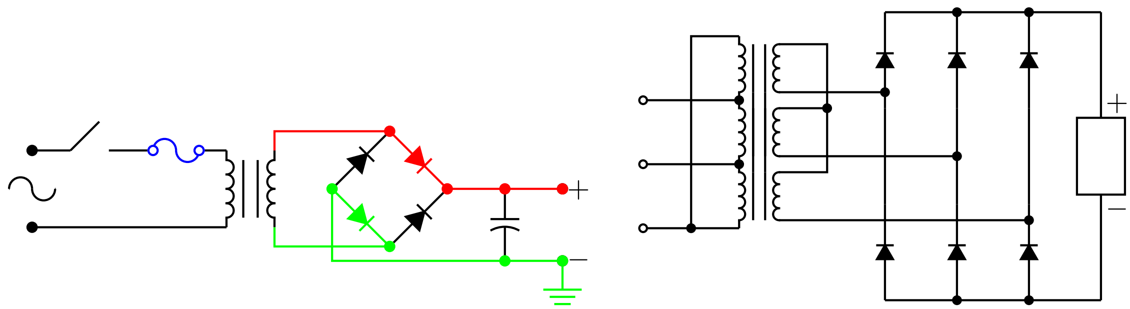


Figure 32: An elementary power supply circuit with colored elements, and a multiple-winding transformer with 3-phase rectifier [pwrsupply.m4].

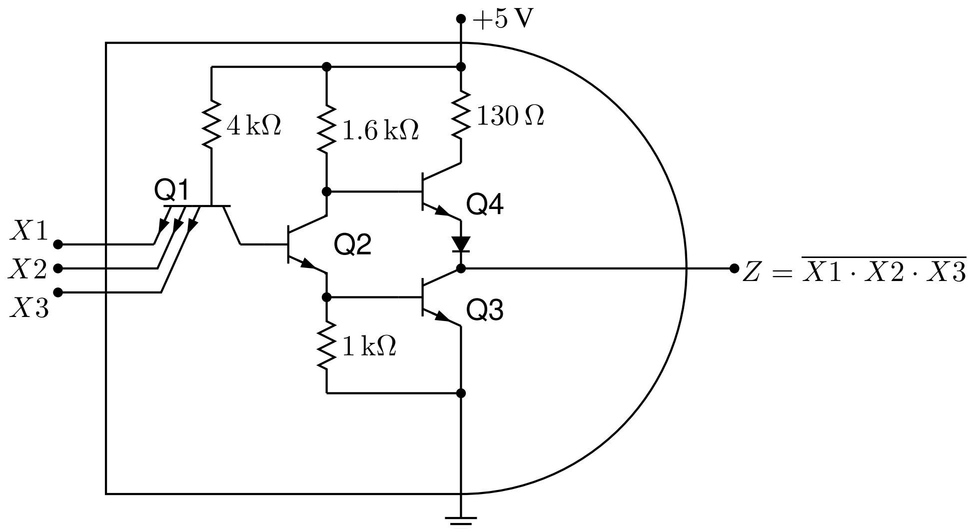


Figure 33: TTL NAND gate illustrating a transistor with multiple emitters [TTLnand.m4].

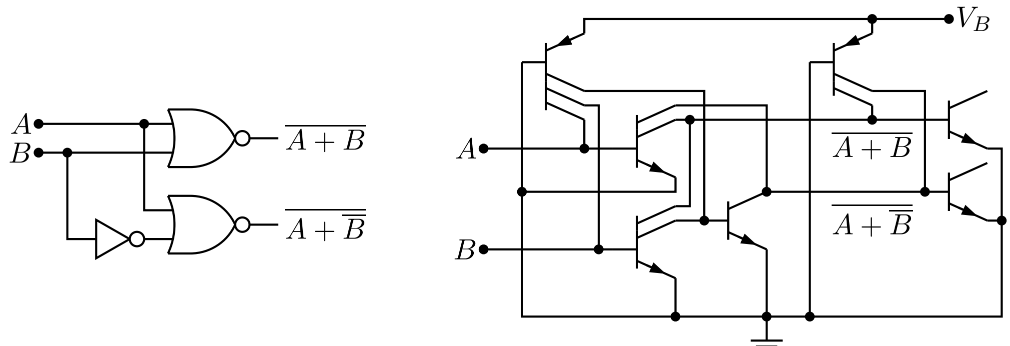


Figure 34: Gate circuit and equivalent embedded I^2L components illustrating multiple collectors [I2L.m4].

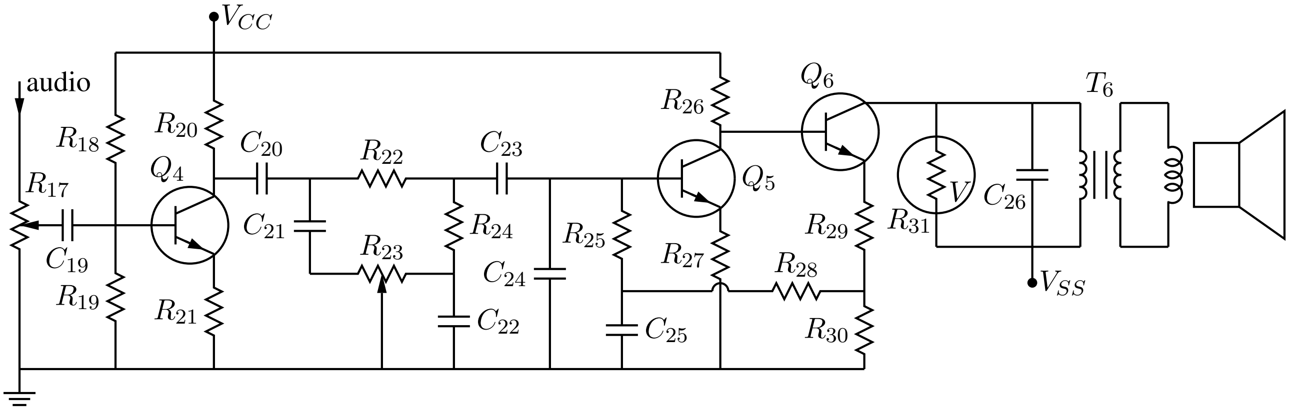


Figure 35: Transistor radio audio chain (a modest circuit with a few custom elements) `[ex11.m4]`.

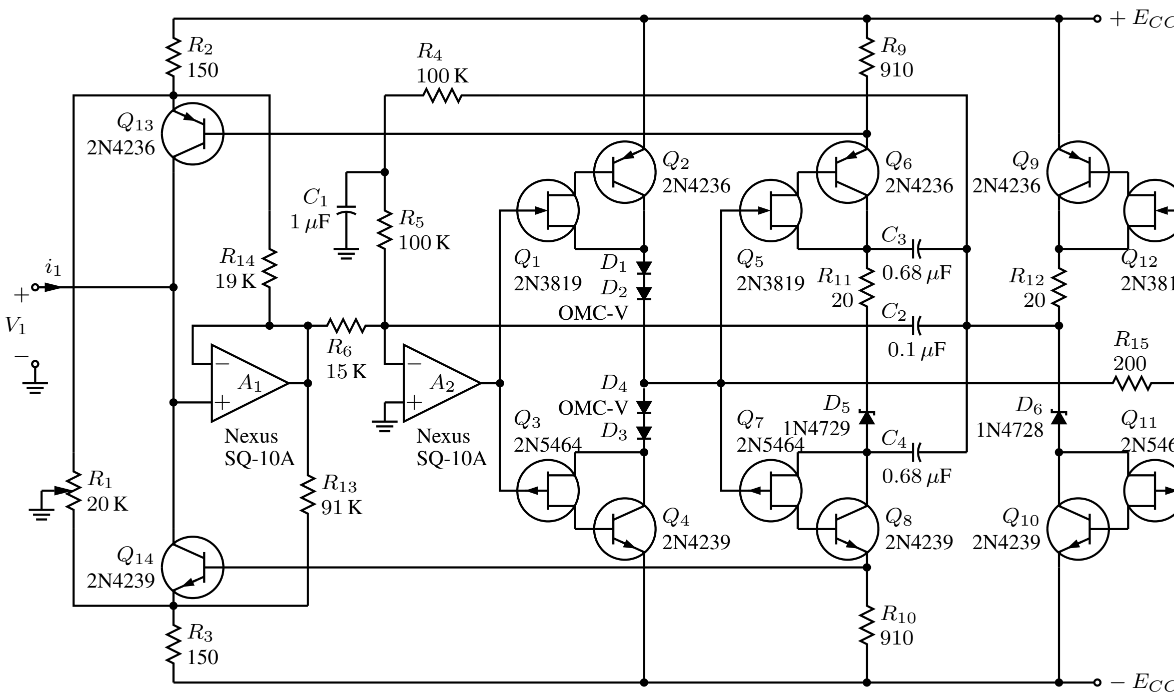


Figure 36: Realization of a controlled source (illustrating stacked element labels) `[Csource.m4]`.

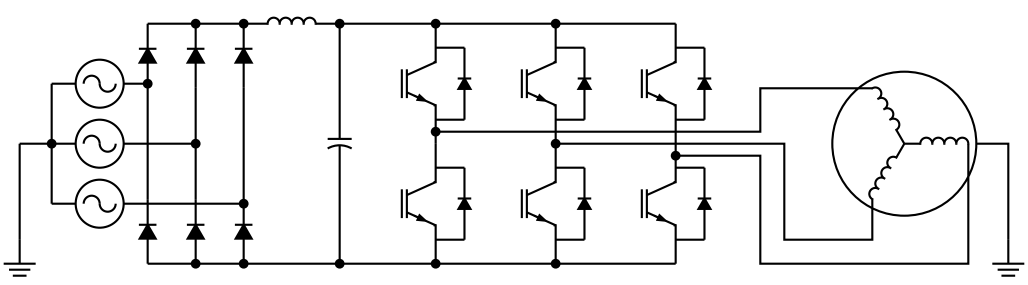


Figure 37: Synchronous machine driven by variable-speed drive and rectifier `[Drive.m4]`.

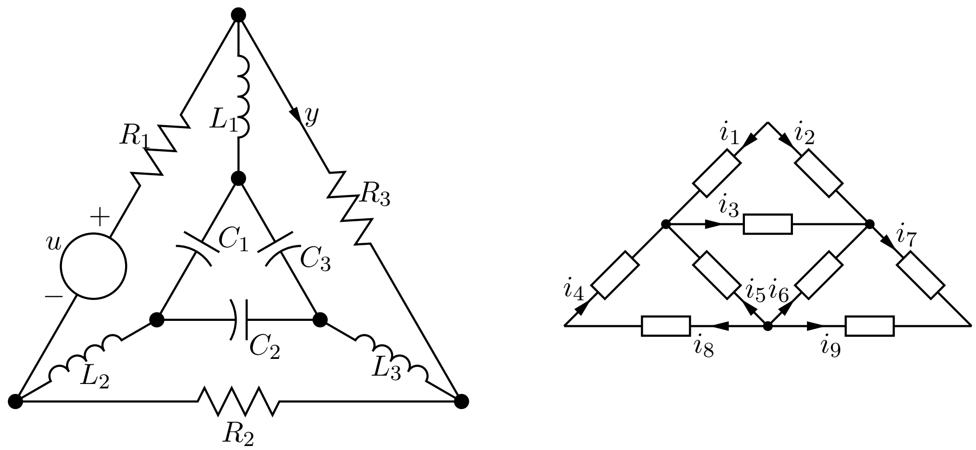


Figure 38: Labels on non-manhattan elements `[ex04.m4]`.

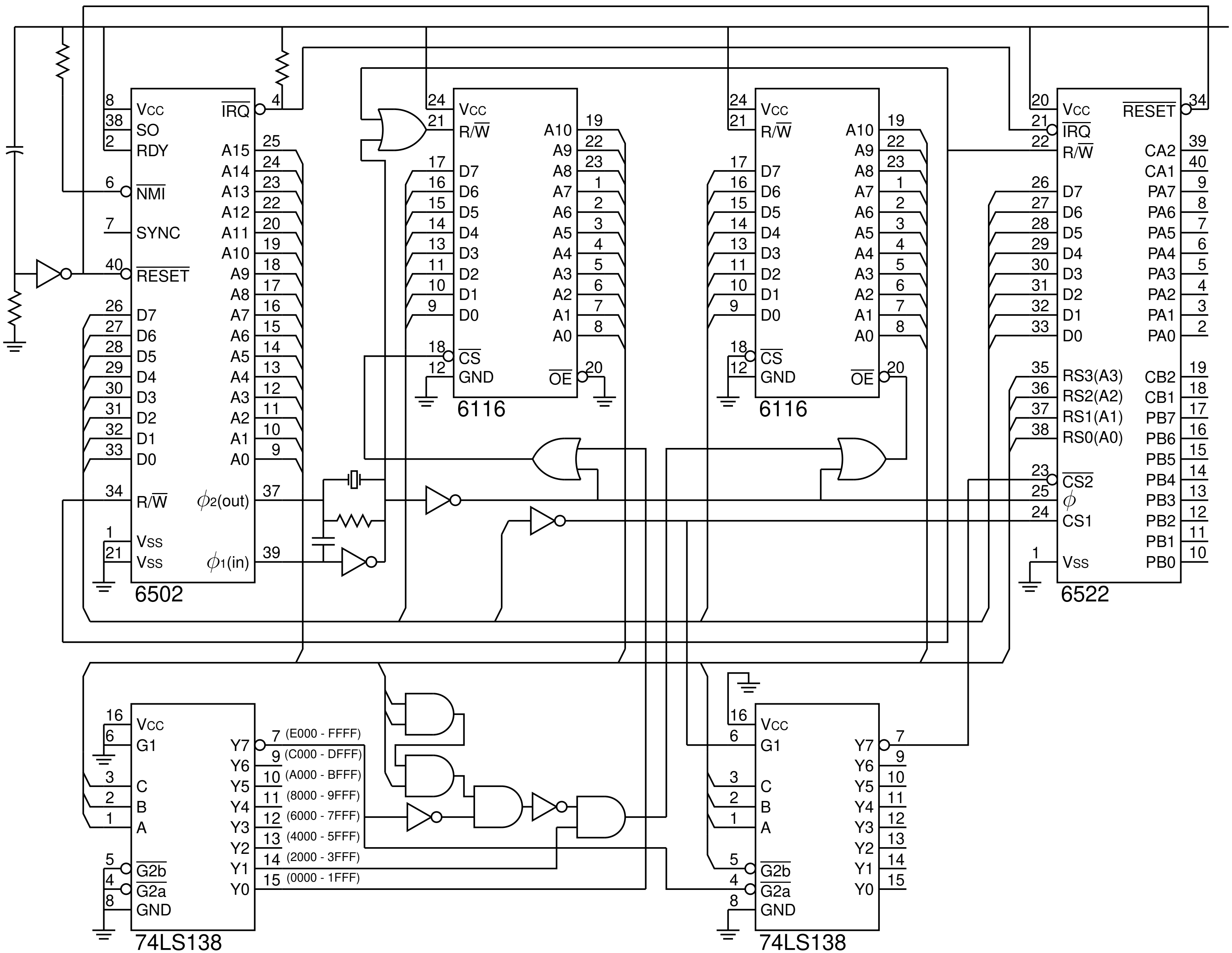


Figure 39: A digital circuit of moderate size, redrawn from M. P. Maclenan and G. M. Burns, "An Approach to Drawing Circuit Diagrams for Text Books," Tugboat (12)1, March 1991, pp. 66-69 `[lcct.m4]`.

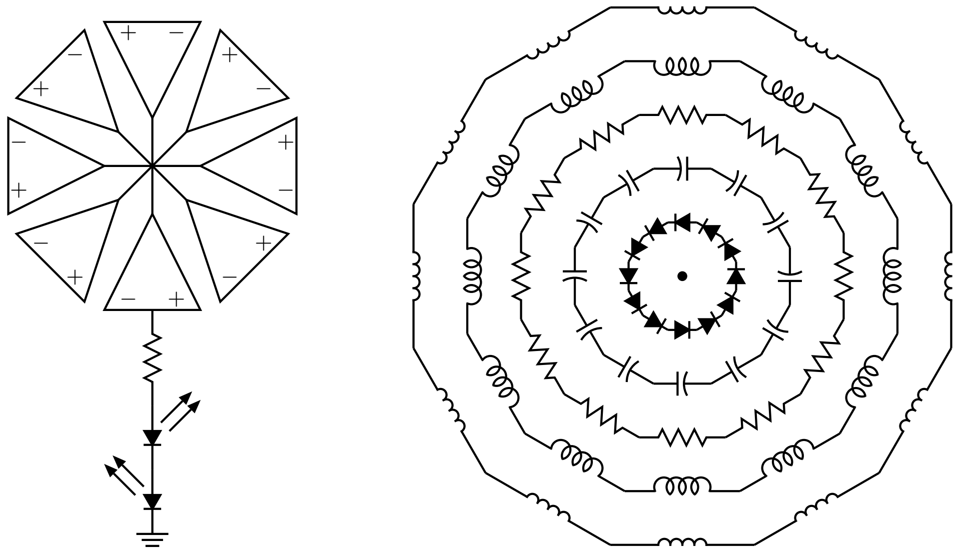


Figure 40: Elements at obtuse angles [ex02.m4].

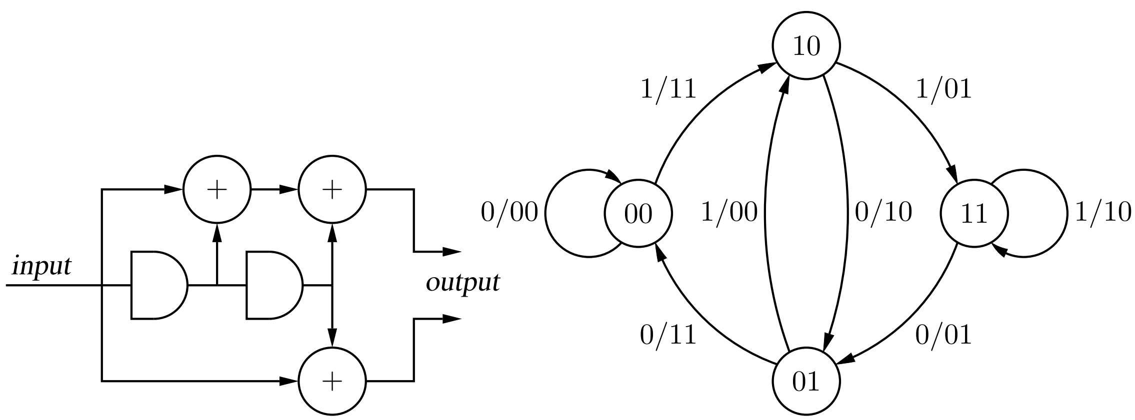


Figure 41: A rate $1/2$ binary convolutional coder and its state diagram [ex16.m4].

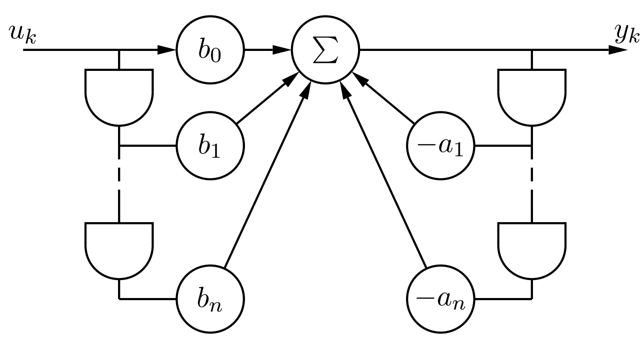


Figure 42: Digital filter [ex03.m4].

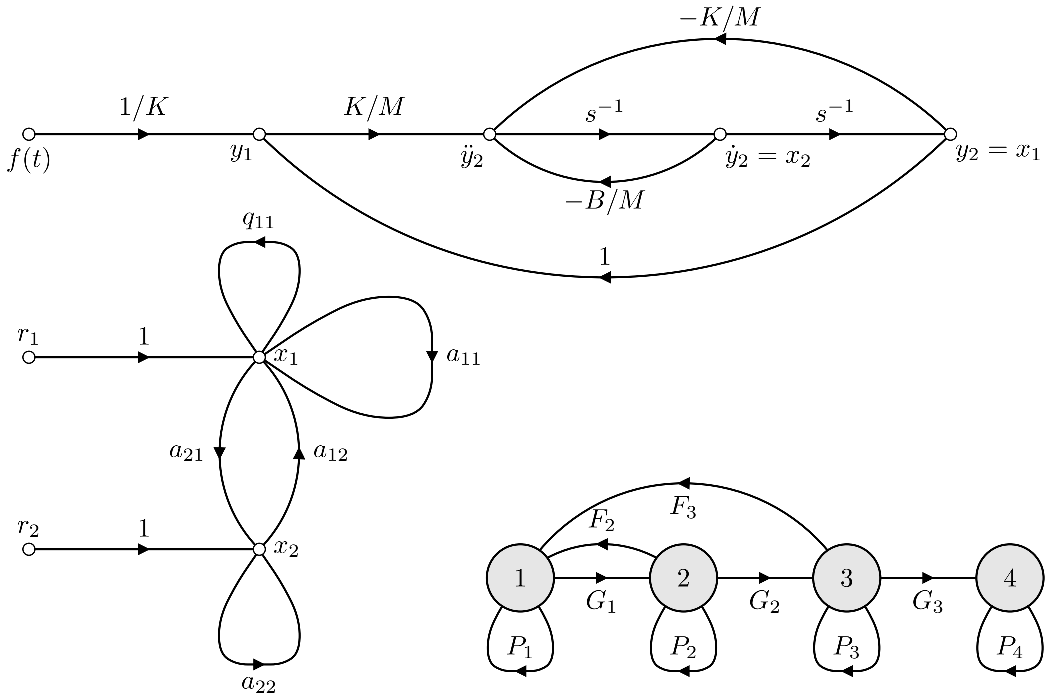


Figure 43: Signal-flow graphs [sfg.m4].

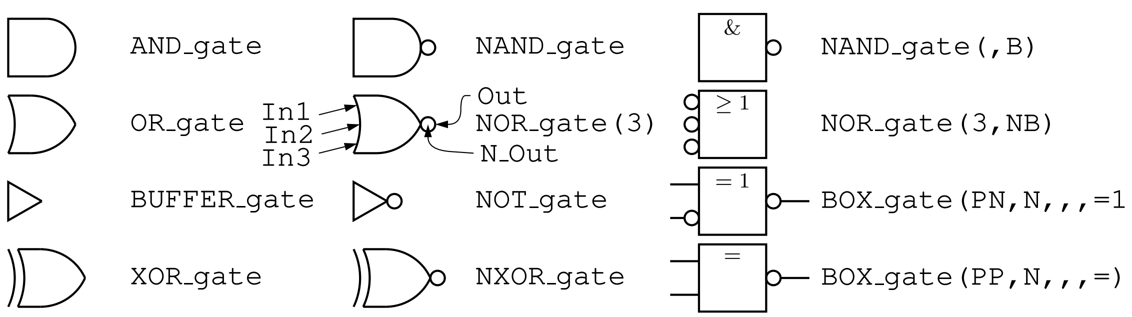


Figure 44: Basic logic gates [Logic.m4].

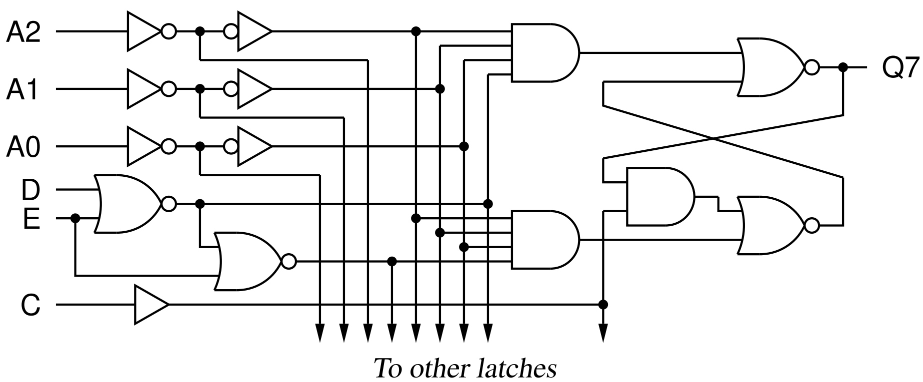


Figure 45: General-purpose latch: a small logic circuit [ex08.m4].

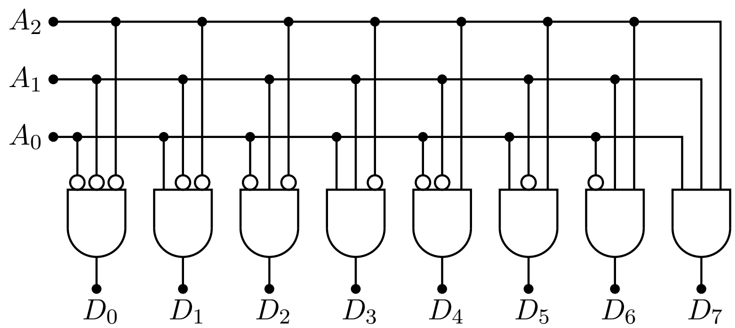


Figure 46: Decoder logic, constructed using the `for_` macro `[Decoder.m4]`.

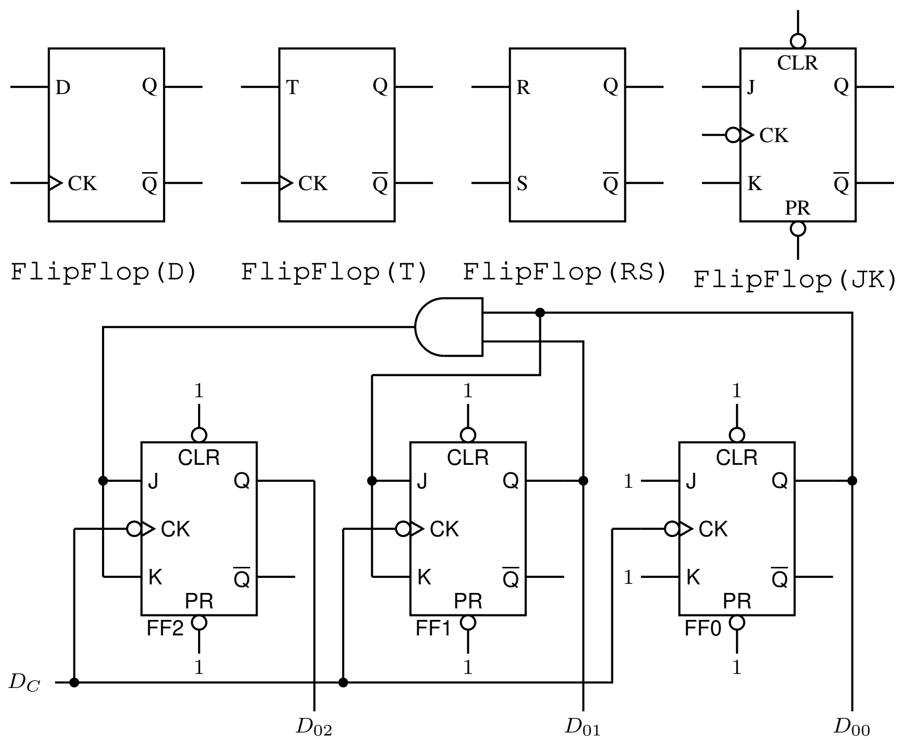


Figure 47: Some flip-flops `[ex21.m4]`.

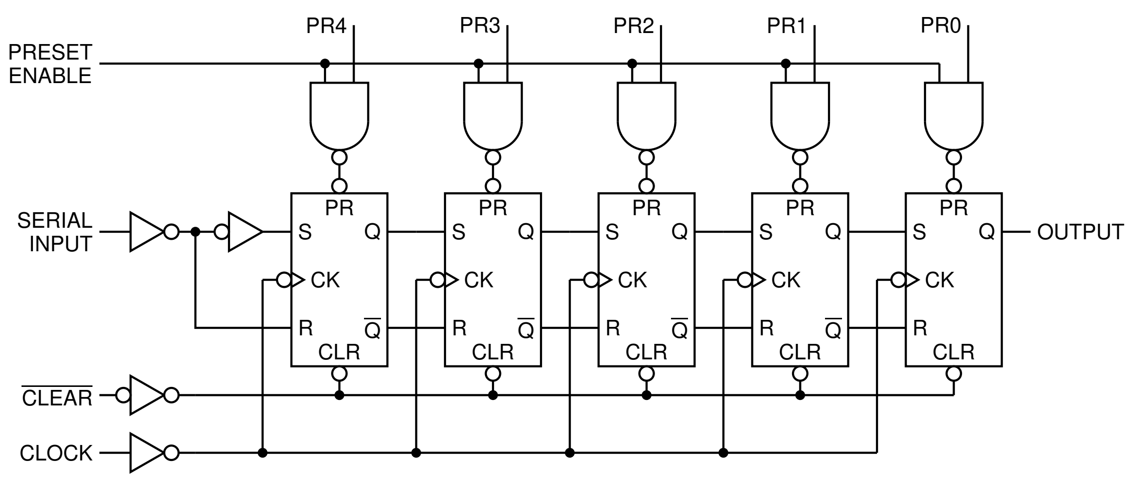
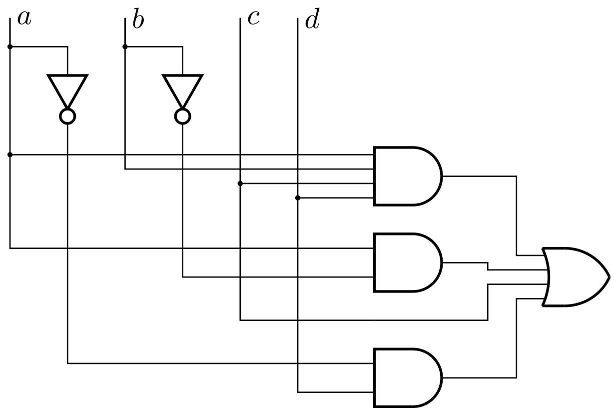
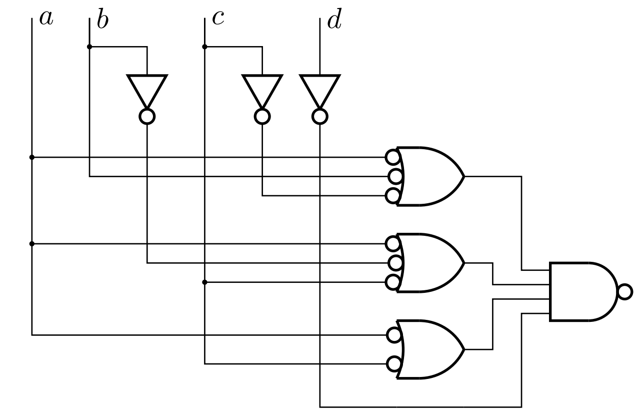


Figure 48: A 5-bit shift register drawn using a custom flip-flop `[ShiftR.m4]`.

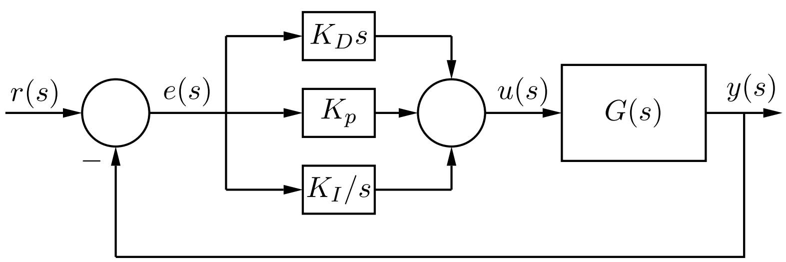


`CanLogic(AND,,OR,,abcd,a~b,c,~ad)`

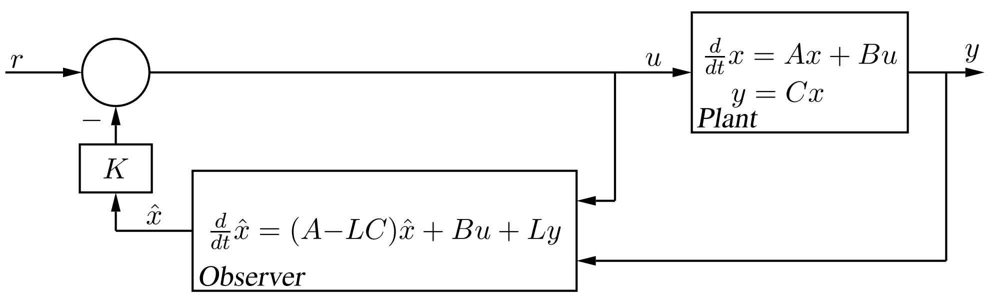


`CanLogic(OR,N,NAND,,ab~c,a~bc,ac,~d)`

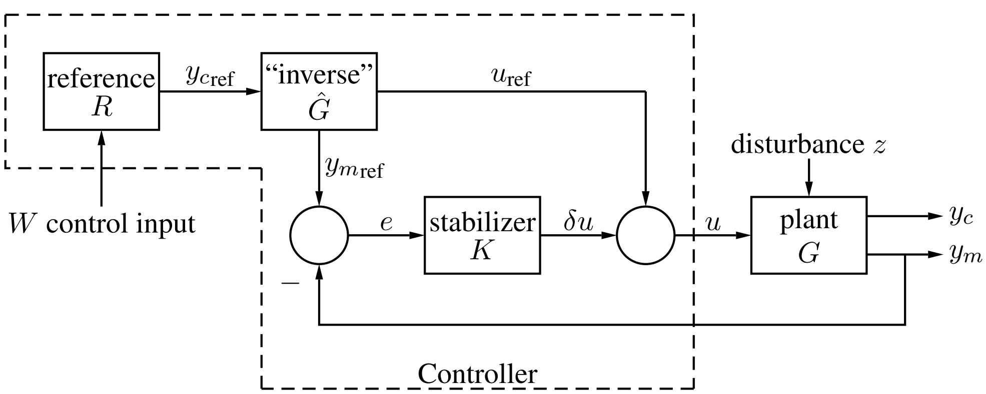
Figure 49: A way of automatically drawing two-layer logic diagrams `[CanLogic.m4]`.



(a) PID control



(b) Output feedback with a full-order observer



(c) Nonlinear feedforward (for performance) and small-signal feedback (for stability)

Figure 50: Control-system block diagrams that do not require m4 `[control.m4]`.

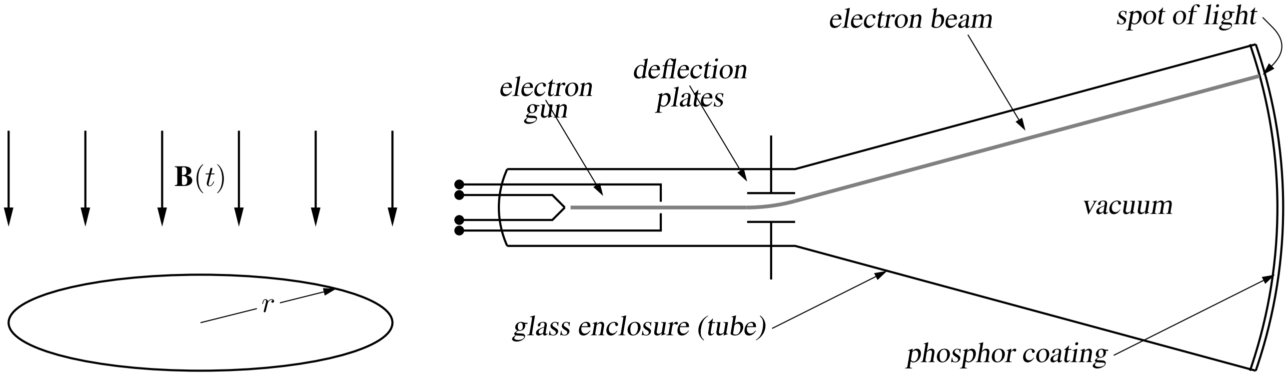


Figure 51: Line diagrams [ex00.m4][ex07.m4].

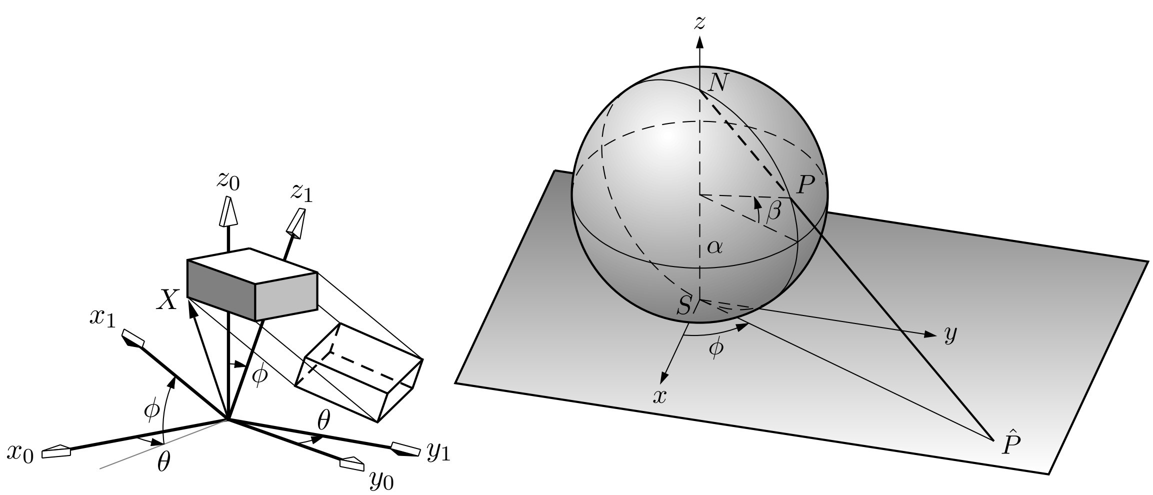


Figure 52: Test of `project` and other `lib3D` macros, showing the projection of a solid onto the y_1, z_1 plane by sighting along the x_1 axis. [exp.m4][Globe.m4].

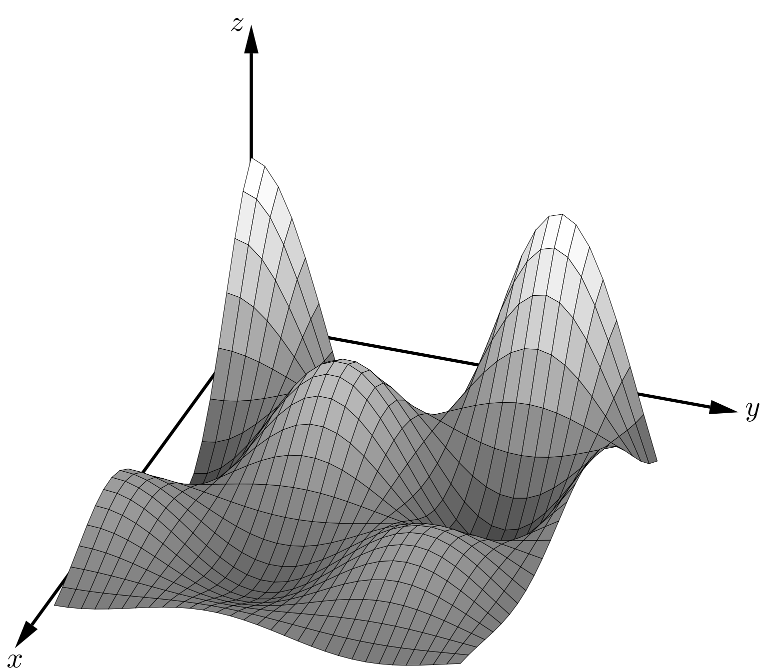
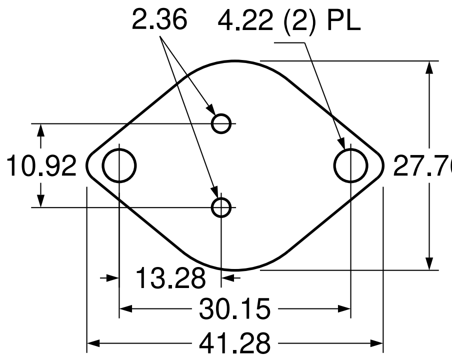
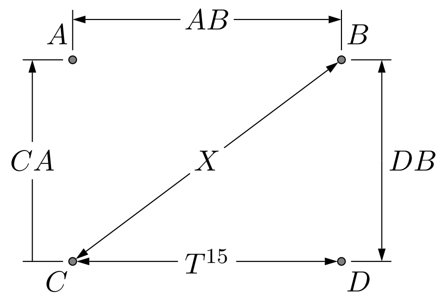
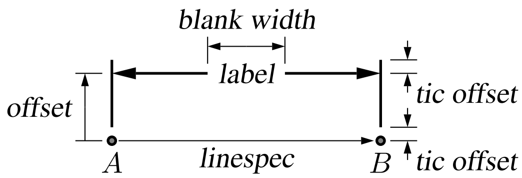


Figure 53: Plotting a surface using a gray scale [graysurf.m4].






```
dimension_(from A to B,0.3,$AB$,20bp__)
dimension_(from C to B,,$X$,16bp__)
dimension_(from C to A,0.3,$CA$,14bp__,,->)
dimension_(from D to B,-0.3,"$DB$" ljust)
dimension_(from C to D,,s_box($T^{%g}$,15),W)
```




```
dimension_(from A to B,0.5,\sl label,29bp__,0.1)
```

Figure 54: Illustrating the macro `dimension_(`*linespec*, *offset*, *label*, `D`|`H`|`W`|*blank width*, *tic offset*,`<-`|`->)`. A negative second argument implies an offset to the right of the *linespec* direction. A *label* starting with `"` or `sprintf` is copied literally. If *label* is an `s_box(...)` then setting argument 4 to `H`, `W`, or `D` tailors the blank width to the `s_box` height, width, or diagonal respectively; i.e., `W` is equivalent to `s_wd+textoffset*2` `[ex09.m4]`.

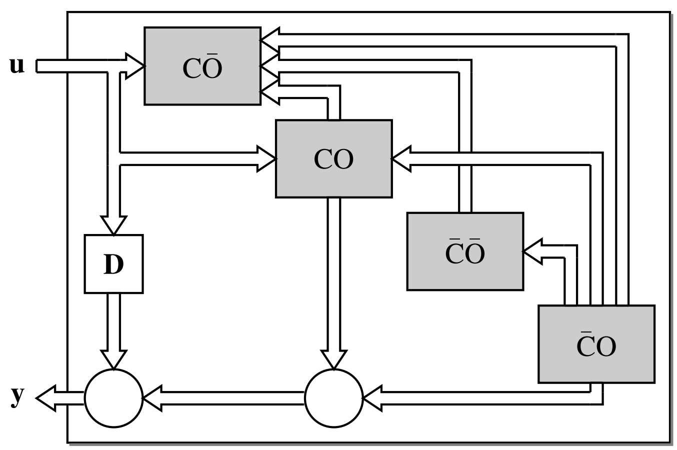


Figure 55: Use of `darrow` `[ex05.m4]`.

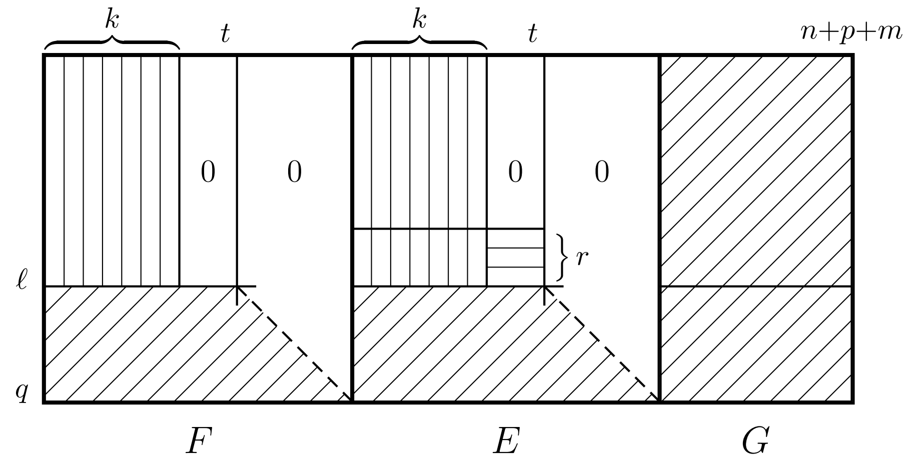


Figure 56: Crosshatching by `for` loops `[ex06.m4]`.

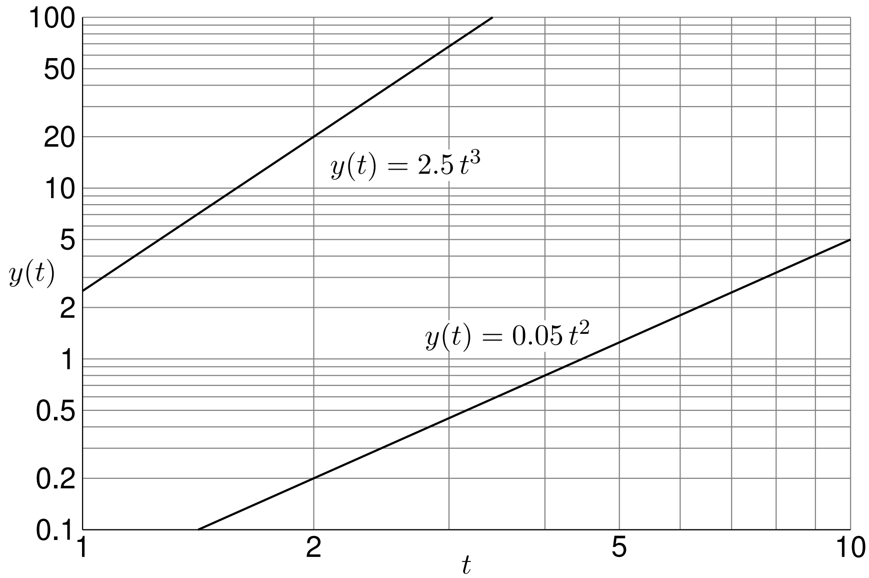


Figure 57: A graph drawn using the pic language `[Loglog.m4]`.

Figure 58: Conestoga Sailing Club (illustrating the filling of arbitrary shapes) `[csc.m4]`.

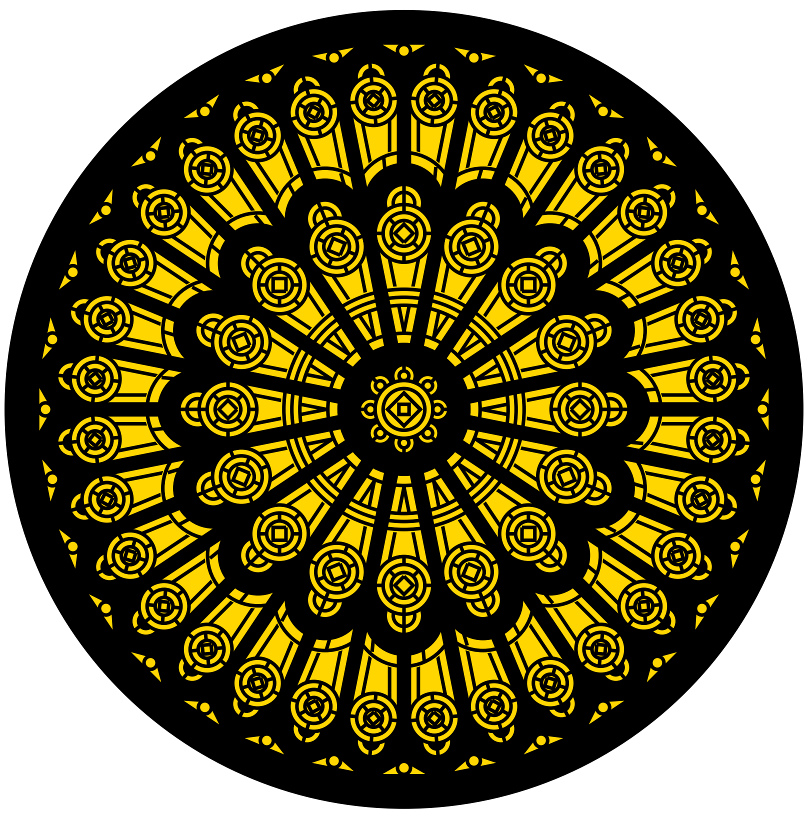


Figure 59: Redrawn from a detail of the set design for the musical *Dracula,* used for testing `dpic`. This diagram consumes much LaTeX main memory but can be produced as the raw postscript output of `dpic -r` since no text formatting is required `[rose.m4]`.

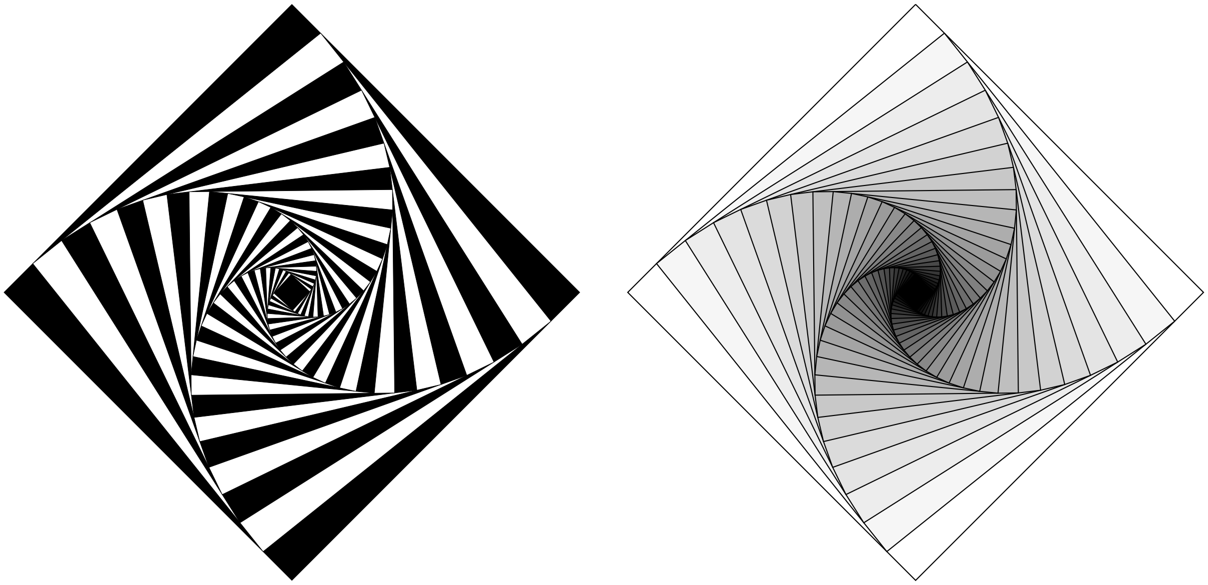


Figure 60: Variations on M. Goossens, S. Rahtz, and F. Mittelbach, *The LaTeX Graphics Companion,* Addison-Wesley 1997, pp. 57-58 `[diamond.m4]`.

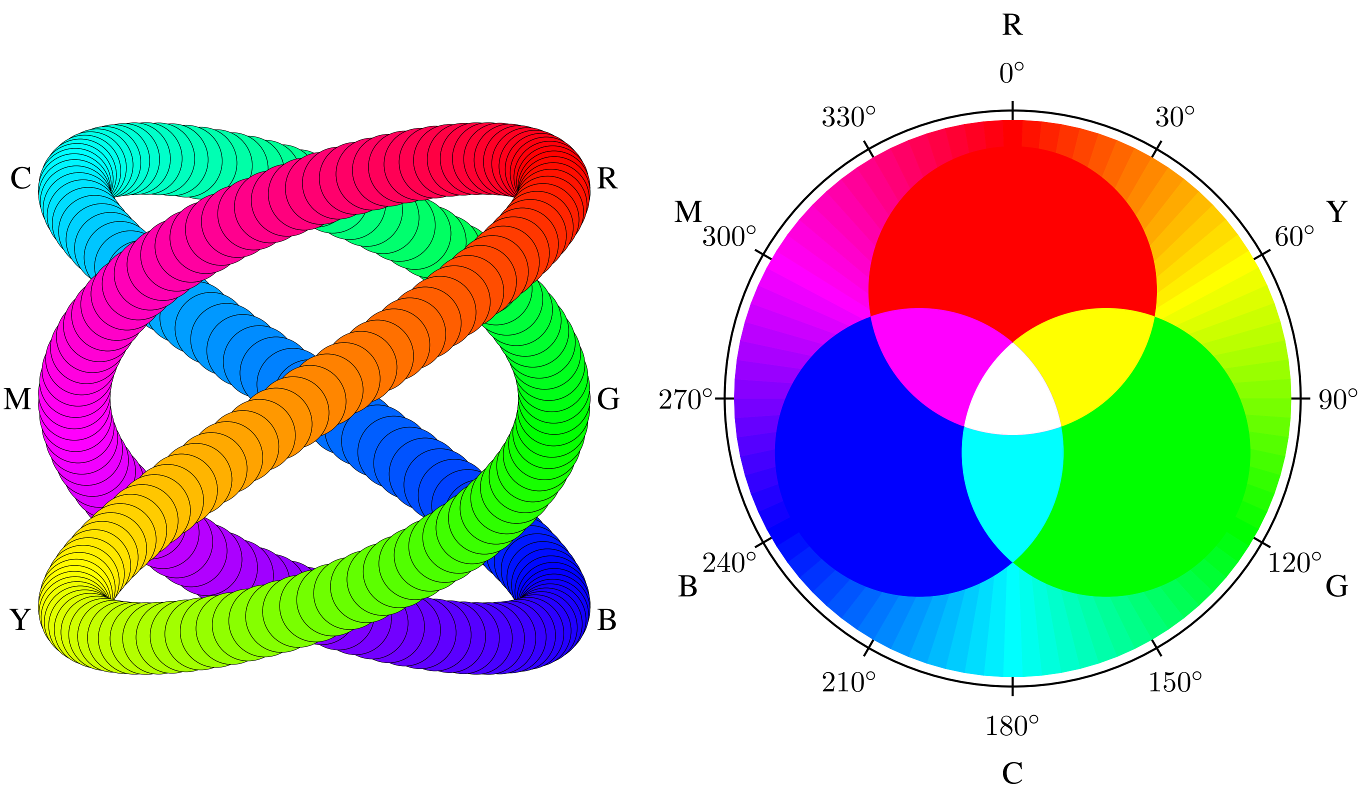


Figure 61: An exercise in calculating RGB colours `[worm.m4]`.

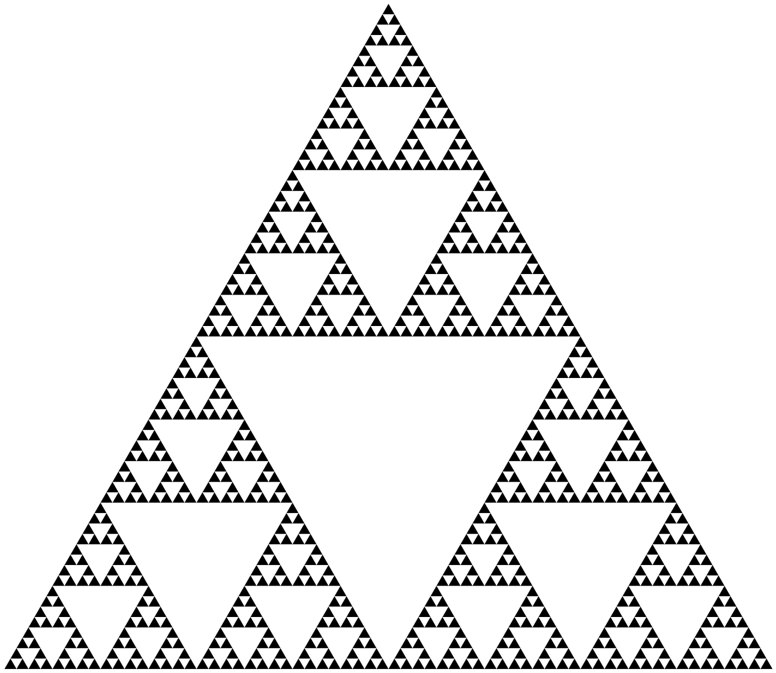


Figure 62: The Sierpinski triangle: a test of pic macro recursion [Sierpinski.m4].

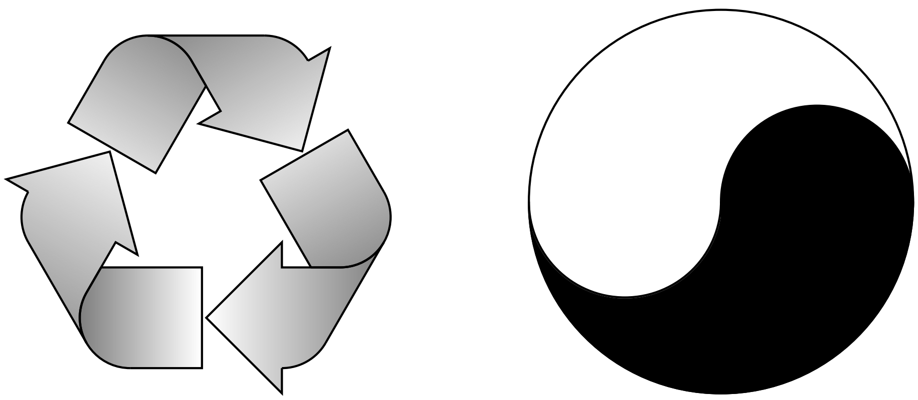


Figure 63: Modest repetition and partial fill [recycle.m4][yinyang.m4].

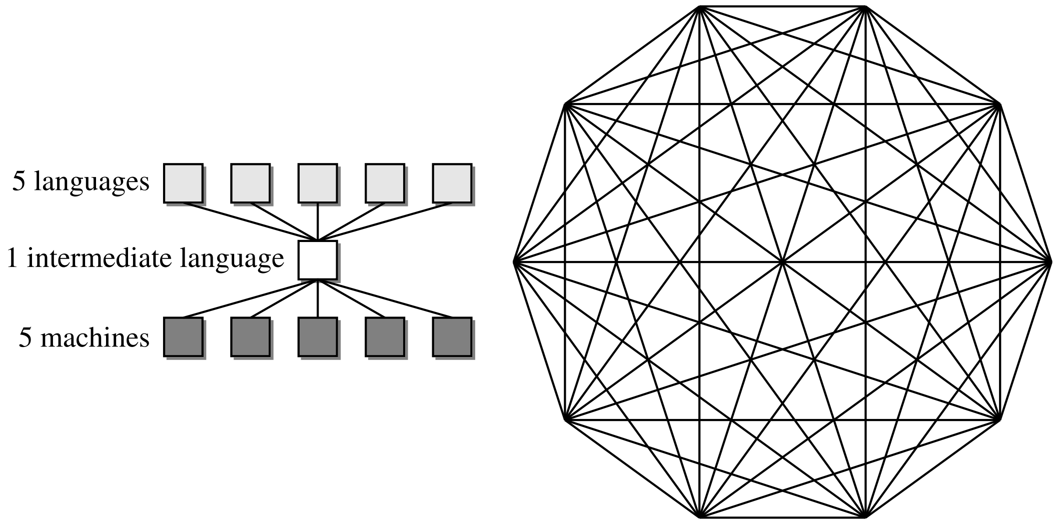


Figure 64: Simple diagrams that are easily drawn by looping `[ex15.m4]`.

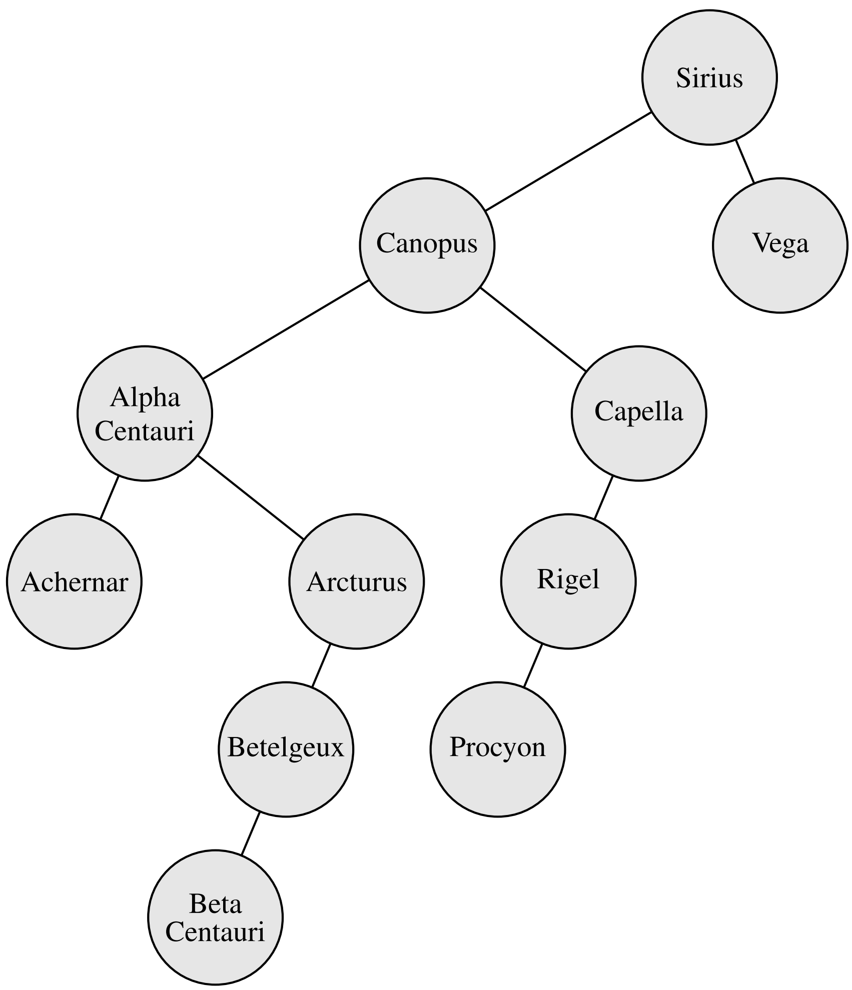


Figure 65: A binary tree `[Btree.m4]`.

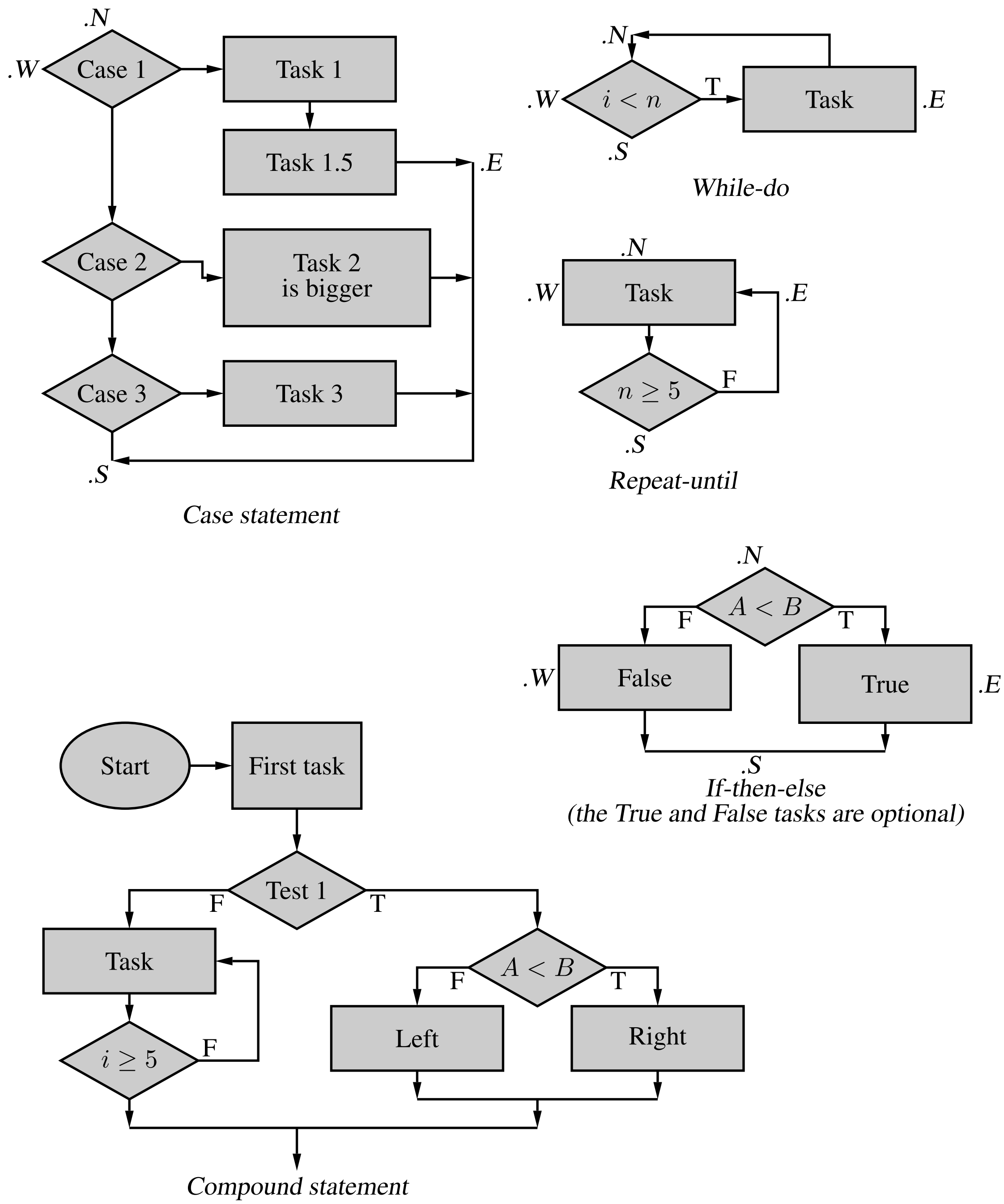


Figure 66: A flowchart sampler `[Flow.m4]`.

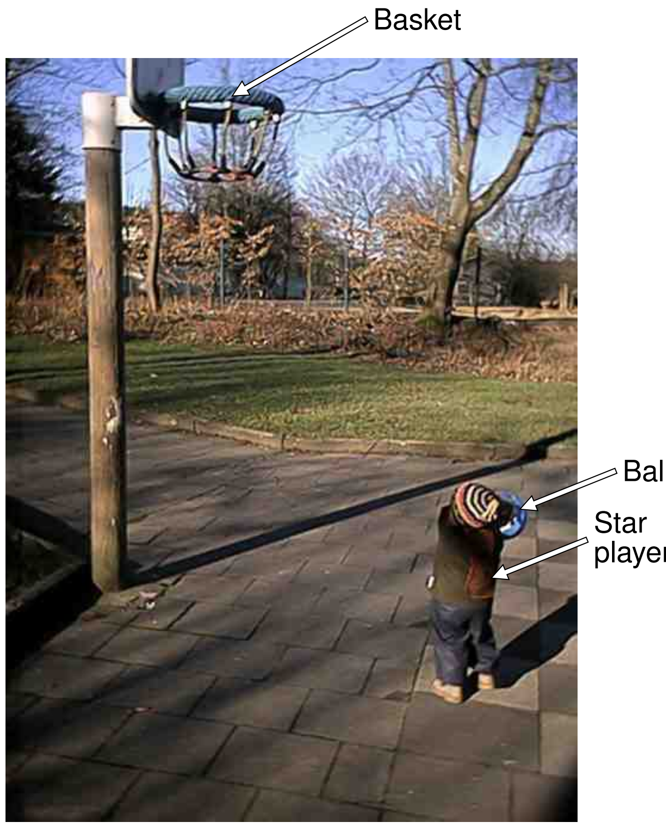


Figure 67: Overlaying a figure with line graphics `[Incleps.m4]`.