INSTITUTE OF SONOLOGY

Royal Conservatoire The Hague

Control Flow

Programming and Music

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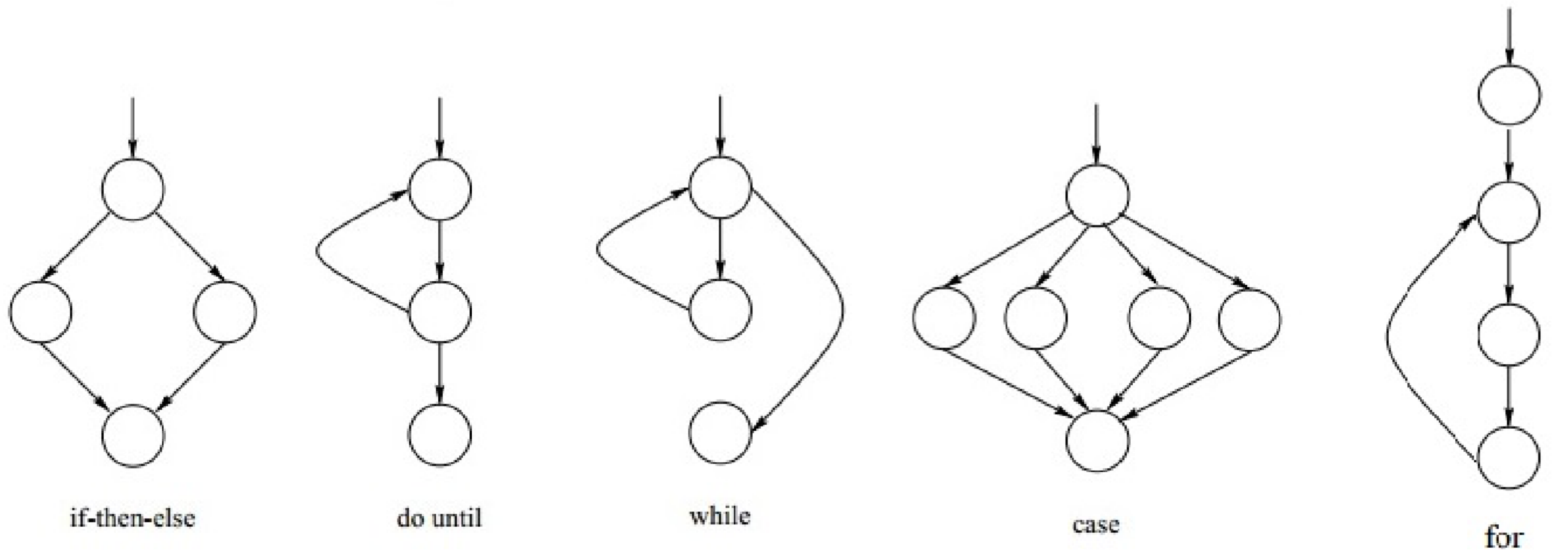
Control Flow



"Control flow is the order function calls, instructions, and statements are executed or evaluated when a program is running. Control flow statements are used to determine what section of code is run in a program at a given time. An example of a control flow statement is an if/else statement."

Boolean expressions

A **boolean** expression is an expression that results in a **boolean** value, that is, in a value of either **<u>true</u>** or **<u>false</u>**.

Complex boolean expressions can be built out of simple expressions, using the following boolean operators:

& *(and, true if and only if both sides are true)*
|| *(or, true if either side is true (or if both are true))*
not *(not, changes true to false, and false to true)*

Parentheses can be used for grouping the parts of complex boolean expressions.

Boolean evaluations

Arithmetic tests that can be used to create **boolean values**. These compare two or more objects and the evaluation returns a boolean value used for program logic.

<, less than

<=, less than or equal to

==, equal to

!=, not equal to

>=, greater than or equal to

>, greater than

Truth Tables

Truth Table for AND

A	B	F
0	0	0
0	1	0
1	0	0
1	1	1

Truth Table for OR

A	B	F
0	0	0
0	1	1
1	0	1
1	1	1

Conditionals

Conditional statements are used to test values and perform different actions depending on the result of the test.

The test **condition** must result in a **boolean expression** with only an option of **true** or **false** checked for in the test.

The most commonly used conditional is the ***if statement*** which tests an input and if it passes the test an action is executed.

If

The **if statement** usually has an **else branch** which specifies actions to take if the test fails.

Related conditionals are **switch** and **case** that offer many branches as well as those used for iteration on collections (**while**, **for**).

Brackets, Braces, and Parentheses

SuperCollider uses **brackets**, **braces**, and **parentheses** in its language syntax.

Brackets [ ] are used to define arrays of objects (or literals).

Braces { } are used to define function or class bodies.

Parentheses ( ) are used to express events, separate expressions or define function argument lists.

Boolean logic

```
(1 == 1) || (1 == 2)

1 == 2

1 != 2

1 <= 2

if(0.5.coin, {"true it is"}, {"false sometimes"})
```

Iteration

When a task or function has to be executed repeatedly, an **iteration** is applied.

An example of an iteration is a ***loop***.

A loop is when a sequence of statements is specified once but may be carried out several times in succession with changing variables.

Iteration is often performed to a **condition** where it iterates until the condition is met.

Iteration coupled with conditions attribute to the **control flow** of a program.

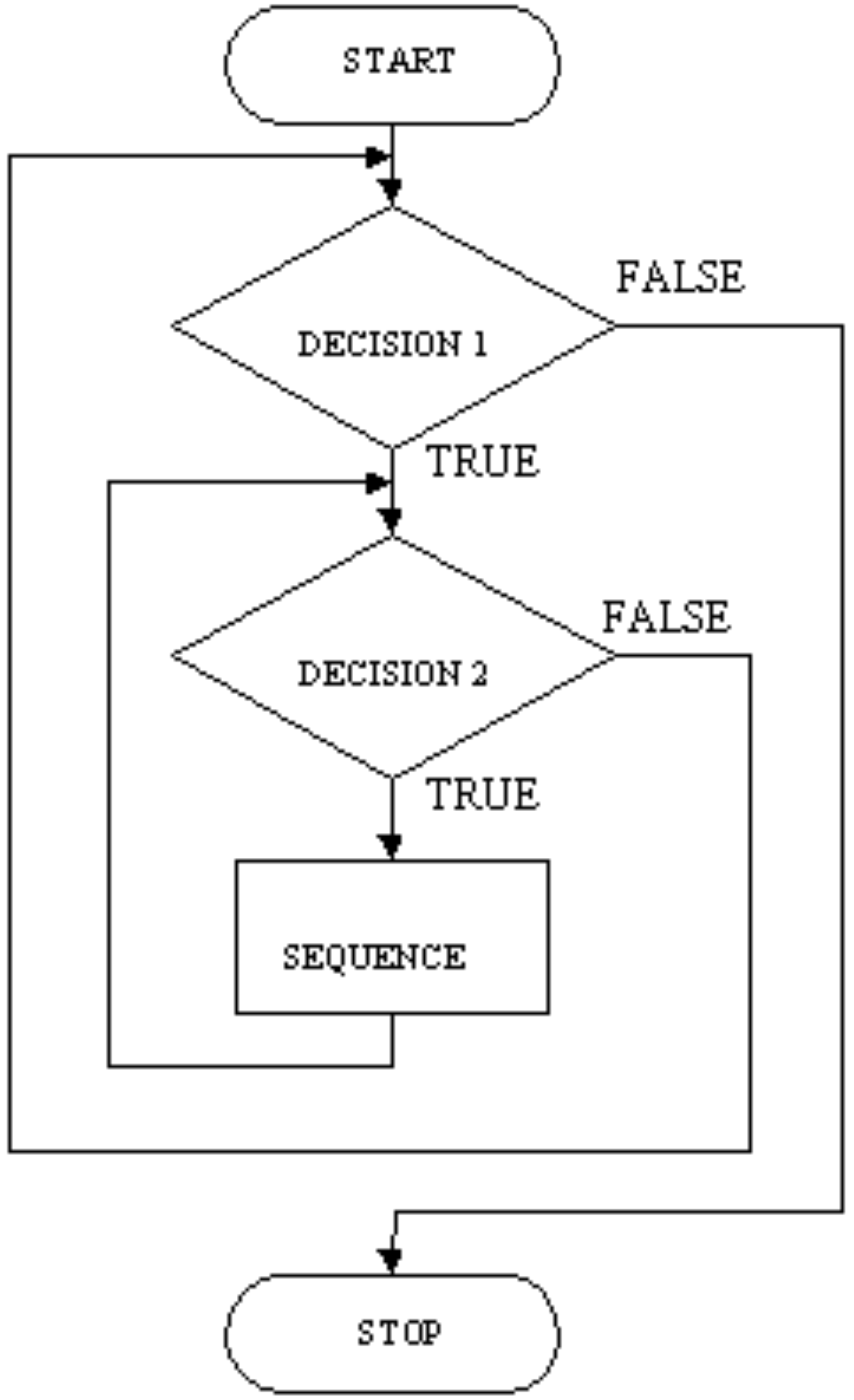
Iteration

In SuperCollider **Iteration** can be executed in various ways such as using the following:

*** do** *(execute a number of time or iterate a collection)*
*** for** *(go from a start to a end count and execute a function)*
*** forBy** *(like for but has a variable step size)*
*** while** *(execute while a certain test condition fails)*
*** loop** *(a function method and loops that function)*
*** repeat** *(repeats an object call a number of times)*

Additionally the collection objects have special iteration methods.

Iteration


START
FALSE
DECISION 1
TRUE
FALSE
DECISION 2
TRUE
SEQUENCE
STOP

Iteration

```
do ( [1,2], {|item, i| (item * 10 + i).postln } )

7.do ( { rrand(10,100).postln } )

for (10, 50, { arg i; i.postln });

forBy (10, 100, 10,  { arg i; i.postln });

x = Prand([10, 12]).loop.asStream;
x.nextN(32);
```

Exercises

```
(
    NF(\iop, {|freq=78, mul=1.0, add=0.0|
        var noise = LFNoise1.ar(0.001).range(freq, freq + (freq * 0.1));
        var osc = SinOsc.ar([noise, noise * 1.04, noise * 1.02, noise * 1.08],0,0.2);
        var out = DFM1.ar(osc,freq*4,SinOsc.kr(0.01).range(0.92,1.05),1,0,0.005,0.7);
        HPF.ar(out, 40)
    }).play;
)
```

```
(
    NF(\dsc, {|freq = 1080|
        HPF.ar(
            BBandStop.ar(Saw.ar(LFNoise1.ar([19,12]).range(freq,freq*2), 0.2).excess(
            SinOsc.ar( [freq + 6, freq + 4, freq + 2, freq + 8])),
            LFNoise1.ar([12,14,10]).range(100,900),
            SinOsc.ar(20).range(9,11)
        ), 80)
        ;
    }).play;
)
```

```
var <>pindex, <>cindex;

initialize {
    if(pindex.isNil, { pindex = 1000 });
    if(cindex.isNil, { cindex = 2000 });
}

clearProcessSlots {
    pindex = 1000;
    (this.pindex - 1000).do{|i| this[this.pindex+i] = nil; }
}

clearOrInit {|clear=true|
    if(clear == true, { this.clearProcessSlots() }, { this.initialize() });
}

transform {|process, index|
    if(index.isNil && pindex.isNil, {
        this.initialize();
    });

    pindex = pindex + 1;
    this[pindex] = \filter -> process;
}

control {|process, index|
    var i = index;

    if(i.isNil, {
        this.initialize();
        cindex = cindex + 1;
        i = cindex;
    });

    this[i] = \pset -> process;
}
```

```
(
    NF(\depfm, {|freqMin=5, freqMax=20, mul=20, add=80, rate=0.5, modFreq=2100, index=0.3, amp=0.2|
        var trig, seq, freq;
        trig = Dust.kr(rate);
        seq = Dwhite(freqMin, freqMax, inf).midicps;
        freq = Demand.kr(trig, 0, seq);
        HPF.ar(PMOsc.ar(LFCub.kr([freq, freq/2, freq/3, freq/4], 0, mul, add),
        LFNoise1.ar(0.3).range(modFreq,modFreq*2), index) * amp, 50)
    }).play;
)
```

Exercises

1. Write a program to find the sum of three numbers, where these numbers can be different each time the program runs.

2. Write a programs that calculates which is the largest of three input numbers.

3. Write a program that generates a random number and based on its value prints the value number of times the word 'Sonology'.

4. Write a program that prints out all odd numbers between 10 and 50

…

Exercises

5. Write a loop that displays the multiplication table of a given number from 1to 9.

6. Write a nested loop that will print a pattern that follows the logic:

```
1
22
333
4444
```