

The SysSon Platform

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(Status: completed)

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1 Adding an Offline Preprocessing Stage

1.1 Next Steps

The remaining six steps will be covered in this technical report.

1.1.1 Accessing Sonification Instances

There is a persistent problem of understanding how to correctly model nested or extended objects. The `proc` inside a `Sonification` is one example. How to provide sonification context when creating an `AuralProc`? We have solved this “top-down” by enforcing the `AuralProc` to be created from inside an `AuralSonification`, essentially extending the implementation of the former type.

With `FScape` this problem reappears: If an aural-proc encounters a `Gen`, we will be able to construct an `fscape-rendering` from the `gen-view-factory`, but if the `FScape` graph itself wants to access the sonification, for example the `SOURCES` map of matrices, how we do that? Unambiguous association is theoretically impossible, as there is no 1:1 relationship between an `FScape` instance and some outer `Sonification` (the same `fscape` could be part of two different sonifications, for example).

A simple work-around however is to hook into our custom `gen-view-factory`. This factory is globally installed to support `SysSon` `UGens` inside `FScape` by way of providing a `UGenGraphBuilderContextImpl`, somehow the equivalent of the aural-view. It is here that `requestInput` is invoked, and therefore this is the point where we can try to find the sonification. The relevant `requestInput` calls may then come from the real-time part of the aural-sonification, when resolving a `Gen`. In that part, we store the sonification in a transaction-local variable, and this can be recovered in `requestInput`.

1.2 Next Steps

In order to make good choices in the next steps, we should consider a specific example of offline processing, the pieces of which must be enabled in these steps to eventually write a fully functional program.

Say, we have a dimension reference and we average the matrix over that dimension and output it as a new matrix. For example, the input matrix has shape `[time:180, lon:12, lat:36, alt:601]`, and we want to average across the longitudes, yielding shape `[time:180, lat:36, alt:601]`. So we have to average 180 times 12 windows of size $36 \times 601 = 21636$. That’s an in-memory buffer of roughly 2 MB.

A hypothetical program is given in Fig. 1.

Here we introduce a hypothetical `UGen` that directly writes a `NetCDF` file. Eventually, we will want to provide an `FScape.Output` instead, probably naming the `UGen` `MkVar`.

1.2.1 Implementation and Publication

The design and implementation is described in detail in the SMC 2017 paper: H. H. Rutz and R. Höldrich, “A Sonification Interface Unifying Real-Time and Offline Processing,” in Proceedings of the 14th Sound and Music Computing Conference (SMC), Espoo, 2017.

```

Graph {
  val v      = Matrix("var")
  val d      = Dim(v, "dim")
  val p      = v.valueSeq
  val isOk   = p >= 0 & p < 1000 // TODO, need isFillValue function
  val flt    = p * isOk
  val dSz    = d.size
  val tSz    = d.succSize // good name?
  val cSz    = dSz * tSz
  val m      = Metro(cSz)
  val sum    = RunningWindowSum(flt, tSz, m)
  val count  = RunningWindowSum(isOk, tSz, m)
  val sumTrunc = ResizeWindow(sum, size = cSz, start = cSz - tSz)
  val cntTrunc = ResizeWindow(count, size = cSz, start = cSz - tSz)
  val dataOut = sumTrunc / cntTrunc
  val specIn  = v.spec
  val specOut = specIn.drop(d)
  MatrixOut("file", specOut, in = dataOut)
}

```

Figure 1: Offline patch averaging over a dimension