This file gives a list of examples for process using circus-time operators.

1 Example 1 — Processes

section *action_grammar_rules* **parents** *circustime_toolkit*

channel $d : \mathbb{N}$

$| \quad outside : \mathbb{N}$

channel $c : \mathbb{N} \times \mathbb{N} \times \mathbb{N} \times \mathbb{N}$

$| \quad n1, n2 : \mathbb{N}$
$| \quad x?, y!, z? : \mathbb{N}$

$| \quad f : \mathbb{N} \pfun \mathbb{N} \times \mathbb{N}$

$S == [\, y : \mathbb{N} \,]$

$letExpr == \mathbf{let}\, x == 1 \bullet x$
$muExpr1 == (\mu\, x : \mathbb{N} \bullet x)$
$muExpr2 == (\mu\, x : \mathbb{N} \mid true)$
$condExpr == \mathbf{if}\, true\, \mathbf{then}\, 1\, \mathbf{else}\, 2$
$bindExpr == \langle\!|\, one == 1 \,|\!\rangle$
$tupleExpr == (1, \{2\}, \mathbb{P}\{3\})$

process $P \mathrel{\widehat=} \mathbf{begin}$
$\quad A \mathrel{\widehat=} c \longrightarrow \mathbf{Skip}$
$\quad \bullet\, A$
end

Production rule:

`LCIRCTIME expression:e RCIRCTIME CIRCSTARTBY process:pr`

- simple StartBy operator with expressions to express the process

process $Test1 \mathrel{\widehat{=}} \langle 10 + outside \rangle \blacktriangleleft P$

process $Test2 \mathrel{\widehat{=}} \langle n1 + n2 \rangle \blacktriangleleft P$

process $Test3 \mathrel{\widehat{=}} \langle f \rangle \blacktriangleleft P$

process $Test4 \mathrel{\widehat{=}} \langle \theta\ S \rangle \blacktriangleleft P$

process $Test5 \mathrel{\widehat{=}} \langle x? \rangle \blacktriangleleft P$

process $Test6 \mathrel{\widehat{=}} \langle letExpr \rangle \blacktriangleleft P$

process $Test7 \mathrel{\widehat{=}} \langle muExpr1 \rangle \blacktriangleleft P$

process $Test8 \mathrel{\widehat{=}} \langle muExpr2 \rangle \blacktriangleleft P$

process $Test9 \mathrel{\widehat{=}} \langle condExpr \rangle \blacktriangleleft P$

process $Test10 \mathrel{\widehat{=}} \langle bindExpr \rangle \blacktriangleleft P$

process $Test11 \mathrel{\widehat{=}} \langle tupleExpr.1 \rangle \blacktriangleleft P$

process $Test12 \mathrel{\widehat{=}} \langle 1 \mathinner{..} 20 \rangle \blacktriangleleft P$

process $Test13 \mathrel{\widehat{=}} P\ ;\ \langle 10 + outside \rangle \blacktriangleleft P$

process $Test14 \mathrel{\widehat{=}} \langle 10 + outside \rangle \blacktriangleleft P \setminus \{\!|\ c\ |\!\}$

process $Test15 \mathrel{\widehat{=}} P \mathrel{\mathrm{J}} \{\!|\ c\ |\!\} \mathrel{\mathrm{K}} \langle outside \rangle \blacktriangleleft P$

process $Test16 \mathrel{\widehat{=}} P \mathrel{\mathrm{J}} \{\!|\ c\ |\!\} \mathrel{\mathrm{K}} \langle outside \rangle \blacktriangleleft \langle outside \rangle \blacktriangleleft P$

Production rule:

`process:pl CIRCENDBY LCIRCTIME expression:e RCIRCTIME`

- simple EndtBy operator with expressions to express the process

process $Test17 \mathrel{\widehat{=}} P \blacktriangleright \langle 10 + outside \rangle$

process $Test18 \mathrel{\widehat{=}} P \blacktriangleright \langle n1 + n2 \rangle$

process $Tes19 \mathrel{\widehat{=}} P \blacktriangleright \langle f \rangle$

process $Test20 \mathrel{\widehat{=}} P \blacktriangleright \langle \theta\ S \rangle$

process $Test21 \mathrel{\widehat{=}} P \blacktriangleright \langle x? \rangle$

process $Test22 \mathrel{\widehat{=}} P \blacktriangleright \langle letExpr \rangle$

process $Test23 \mathrel{\widehat{=}} P \blacktriangleright \langle muExpr1 \rangle$

process $Test24 \mathrel{\widehat{=}} P \blacktriangleright \langle muExpr2 \rangle$

process $Test25 \mathrel{\widehat{=}} P \blacktriangleright \langle condExpr \rangle$

process $Test26 \mathrel{\widehat{=}} P \blacktriangleright \langle bindExpr \rangle$

process $Test27 \mathrel{\widehat{=}} P \blacktriangleright \langle tupleExpr.1 \rangle$

process $Test28 \mathrel{\widehat{=}} P \blacktriangleright \langle 1 \mathinner{..} 20 \rangle$

process $Test29 \mathrel{\widehat{=}} P \ ; \ P \blacktriangleright \langle 10 + outside \rangle$

process $Test30 \mathrel{\widehat{=}} P \blacktriangleright \langle 10 + outside \rangle \setminus \{\!| c |\!\}$

process $Test31 \mathrel{\widehat{=}} P \ \mathrm{J} \ \{\!| c |\!\} \ \mathrm{K} \ P \blacktriangleright \langle outside \rangle$

process $Test32 \mathrel{\widehat{=}} P \ \mathrm{J} \ \{\!| c |\!\} \ \mathrm{K} \ P \blacktriangleright \langle outside \rangle \blacktriangleright \langle outside \rangle$

Production rule:

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process:pl CIRCTIMEOUT  LCIRCTIME expression:e RCIRCTIME  process:pr
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- simple Timeout operator with expressions to express the process

process $Test33 \mathrel{\widehat{=}} P \overset{\langle 10+outside}{\triangleright} \rangle P$

process $Test34 \mathrel{\widehat{=}} P \overset{\langle n1+n2 \rangle}{\triangleright} P$

process $Test35 \mathrel{\widehat{=}} P \overset{\langle f \rangle}{\triangleright} P$

process $Test36 \mathrel{\widehat{=}} P \overset{\langle \theta \, S \rangle}{\triangleright} P$

process $Test37 \mathrel{\widehat{=}} P \overset{\langle x? \rangle}{\triangleright} P$

process $Test38 \mathrel{\widehat{=}} P \overset{\langle letExpr \rangle}{\triangleright} P$

process $Test39 \mathrel{\widehat{=}} P \overset{\langle muExpr1 \rangle}{\triangleright} P$

process $Test40 \mathrel{\widehat{=}} P \overset{\langle muExpr2 \rangle}{\triangleright} P$

process $Test41 \mathrel{\widehat{=}} P \overset{\langle condExpr \rangle}{\triangleright} P$

process $Test42 \mathrel{\widehat{=}} P \overset{\langle bindExpr \rangle}{\triangleright} P$

process $Test43 \mathrel{\widehat{=}} P \overset{\langle tupleExpr.1 \rangle}{\triangleright} P$

process $Test44 \mathrel{\widehat{=}} P \overset{\langle 1..20 \rangle}{\triangleright} P$

process $Test45 \mathrel{\widehat{=}} P \,;\, P \overset{\langle 10+outside \rangle}{\triangleright} P$

process $Test46 \mathrel{\widehat{=}} P \overset{\langle 10+outside \rangle}{\triangleright} P \setminus \{\!|\, c \,|\!\}$

process $Test47 \mathrel{\widehat{=}} P \,\mathrm{J}\, \{\!|\, c \,|\!\}\, \mathrm{K}\, P \overset{\langle outside \rangle}{\triangleright} P$

process $Test48 \mathrel{\widehat{=}} P \,\mathrm{J}\, \{\!|\, c \,|\!\}\, \mathrm{K}\, P \overset{\langle outside \rangle}{\triangleright} P \overset{\langle outside \rangle}{\triangleright} P$

Production rule:

```
process:pl CIRCTIMEDINTERRUPT:ti  LCIRCTIME expression:e RCIRCTIME  process:pr
```

- simple Timedinterrupt operator with expressions to express the process

process $Test49 \mathrel{\widehat{=}} P \triangle_{\langle 10+outside \rangle} P$

process $Test50 \mathrel{\widehat{=}} P \triangle_{\langle n1+n2 \rangle} P$

process $Test51 \mathrel{\widehat{=}} P \triangle_{\langle f \rangle} P$

process $Test52 \mathrel{\widehat{=}} P \triangle_{\langle \theta\, S \rangle} P$

process $Test53 \mathrel{\widehat{=}} P \triangle_{\langle x? \rangle} P$

process $Test54 \mathrel{\widehat{=}} P \triangle_{\langle letExpr \rangle} P$

process $Test55 \mathrel{\widehat{=}} P \triangle_{\langle muExpr1 \rangle} P$

process $Test56 \mathrel{\widehat{=}} P \triangle_{\langle muExpr2 \rangle} P$

process $Test57 \mathrel{\widehat{=}} P \triangle_{\langle condExpr \rangle} P$

process $Test58 \mathrel{\widehat{=}} P \triangle_{\langle bindExpr \rangle} P$

process $Test59 \mathrel{\widehat{=}} P \triangle_{\langle tupleExpr.1 \rangle} P$

process $Test60 \mathrel{\widehat{=}} P \triangle_{\langle 1..20 \rangle} P$

process $Test61 \mathrel{\widehat{=}} P \,;\, P \triangle_{\langle 10+outside \rangle} P$

process $Test62 \mathrel{\widehat{=}} P \triangle_{\langle 10+outside \rangle} P \setminus \{\!|\, c \,|\!\}$

process $Test63 \mathrel{\widehat{=}} P \,\mathrm{J}\, \{\!|\, c \,|\!\}\, \mathrm{K}\, P \triangle_{\langle outside \rangle} P$

process $Test64 \mathrel{\widehat{=}} P \,\mathrm{J}\, \{\!|\, c \,|\!\}\, \mathrm{K}\, P \triangle_{\langle outside \rangle} P \triangle_{\langle outside \rangle} P$