Concurrent System Design
Introduction to FSP/LTSA

Valentín Cassano

`cassanv@mcmaster.ca`

Department of Computing and Software
McMaster University

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FSP constructs: their syntax and meaning

Definition (process)

```
PROCESS = ( action -> PROCESS ).
```

Example (A human heart)

```
HEART = ( beat -> HEART ).
```

Excercise

Define the HEART process in LTSA.

FSP constructs: their syntax and meaning

Definition (action choice)

```
PROCESS = ( action_1 -> PROCESS_1
          | ...
          | action_n -> PROCESS_n ).
```

Example (A "more accurate" human heart)

```
HEART = ( beat -> HEART
        | stop -> HEART ).
```

Excercise

Define the HEART process in LTSA.

FSP constructs: their syntax and meaning

Definition (relabeling and hiding)

```
PROCESS =   ( action -> PROCESS )
            | ...
            | action_n -> PROCESS_n )
            /{ new_label/old_label }
            \{ label_to_hide }.
```

Example (An even more accurate human heart)

```
HEART =  ( beat -> HEART
         | stop -> STOP )
         /{ die/stop }
         \{ die }.
```

FSP constructs: their syntax and meaning

Definition (action indexing and process parameters)

```
PROCESS =  ( action[i:0..N] -> PROCESS[i] ).
```

Example

```
HEART = ( beat -> HEART
        | fail[i:0..N] -> HEART_FAILURE[ i ]
        | stop -> STOP )
        /{ die/stop }
        \{ die }.
```

FSP constructs: their syntax and meaning

Definition (action guards)

```
PROCESS = ( when condition action -> PROCESS ).
```

Example

```
HEART_FAILURE[i:  0..N] = (
 when i <= 1 becalm -> HEART
 when i > 1 worry -> HEART_FAILURE[ i ] ).
```

FSP constructs: their syntax and meaning

Definition (process composition)

`||COMPOSED = ( PROCESS`$_1$ `|| ... || PROCESS`$_n$ `).`

Example

`||PATIENT = ( HEART || PACEMAKER ).`

Synchronization is carried via action relabeling.

Summary:

- Overview of some FSP constructs
  - Process definition.
  - Action prefixing.
  - Action choice.
  - Action relabeling and hiding.
  - Action and process indexing.
  - Action guards.
  - Process composition.
  - Process synchronization.

Questions/Comments ?

Where to get LTSA

http://www.doc.ic.ac.uk/ltsa/

Bibliography

📄 J. Magee, J. Kramer. *Concurrency: States, models and Java programs.* 2nd Edition. John Wiley & sons, 2006.