

**International Workshop on Sign Language Translation and
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**French Sign Language Generation
at LIMSI/CNRS**

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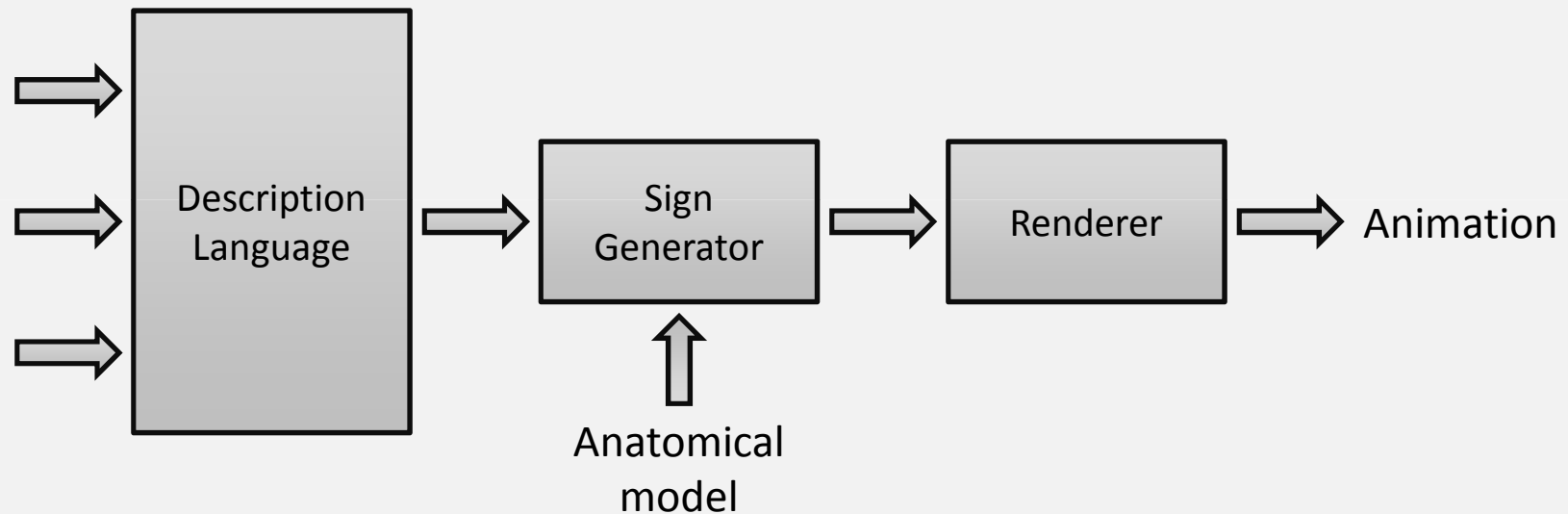


Outline

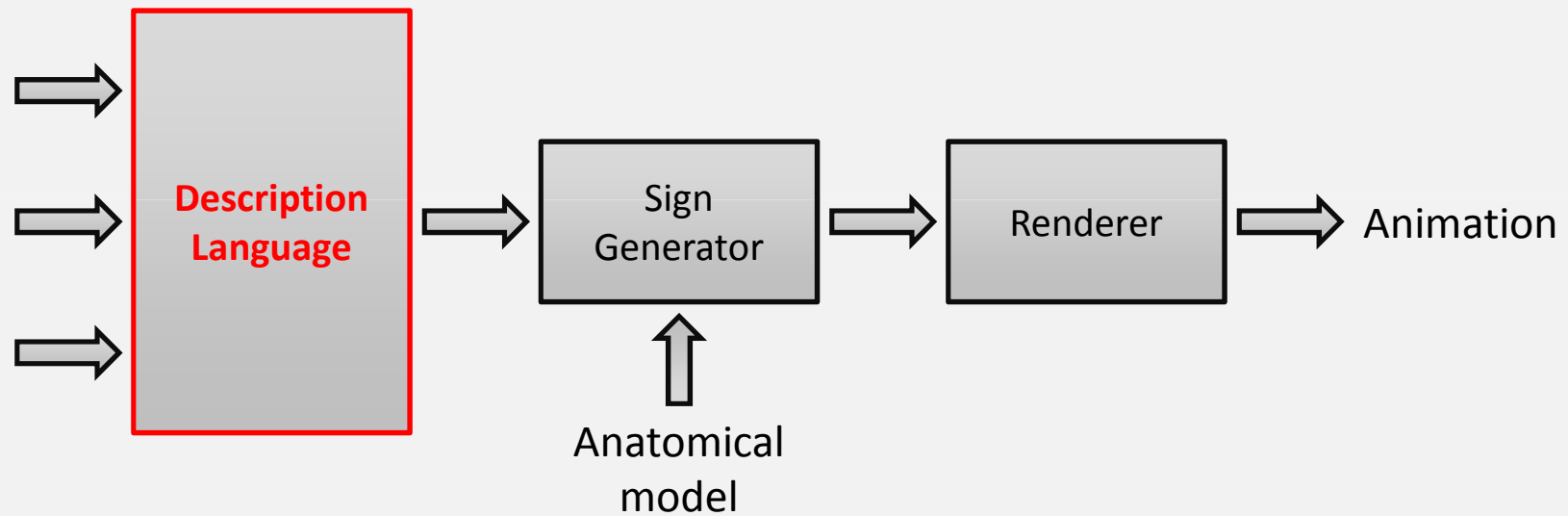
- Generic sign generation system
- Description language
- Anatomical models
- Sign generator
- Rendering process
- Final animation and evaluation

Automatic Generation of French Sign Language

An “isolated signs” based generic pipeline



Automatic Generation of French Sign Language



Description language : What we need

- Necessary and sufficient constraints for the skeleton
 - Spatial organization : What and How ?
 - Temporal organization : When ?
- But not too much information
 - No coverbal information
 - No ambient movements

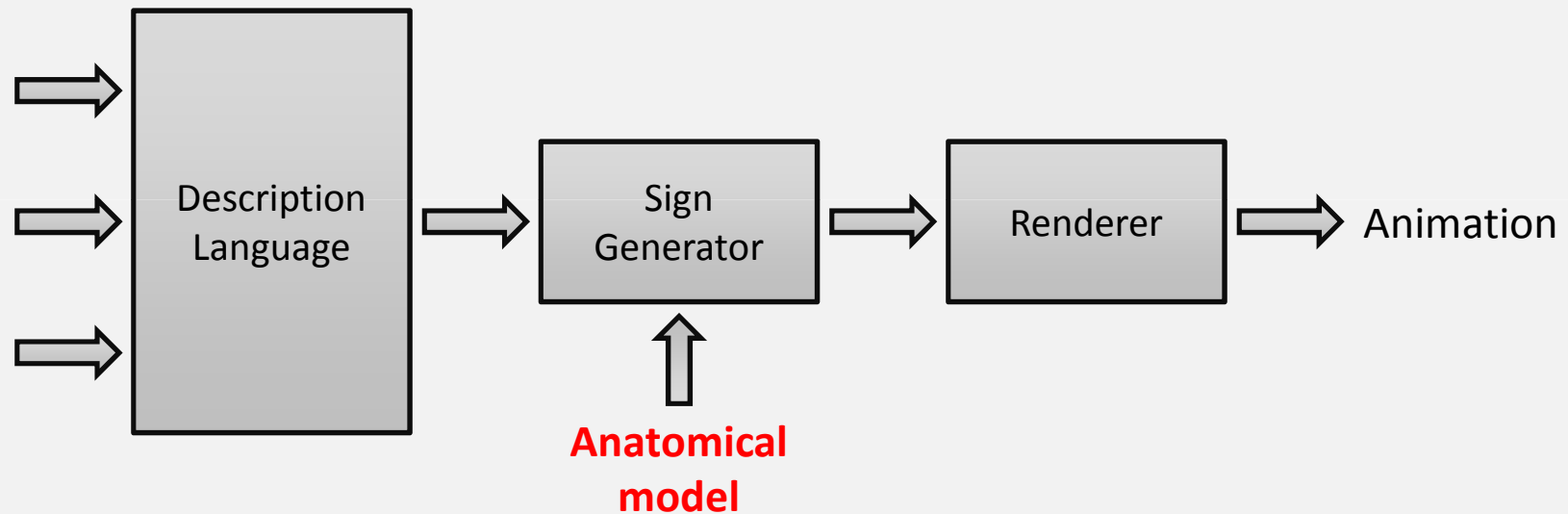
Description language : What we have

- Geometric and temporal approach
- Constraint based model
- Higher level dependencies
- Two forms
 - Plain text
 - XML-friendly
 - Automatic conversion between both

Description language : Example

```
1 SEQUENCE "accident"
2
3 <language=LSF>
4 <numvidlimsi="aucune">
5 <refdico="3-240-4">
6 <described_by="Nadège, Flora">
7
8 DEP loc = @ABST(w) + <FWD | medium>
9
10 KEY_POSTURE(0){
11   KEEP:
12   For Sh=s,w
13     #all4_closed(Sh)
14     Place @T_l(Sh,3) at @R_BACK(Sh,2)
15   End
16
17   Place @PA(w) at [loc]
18   Orient NRM!palm(w) along UP+LAT
19
20   HERE:
21     Place @PA(s) at @PA(w) + <NRM!palm(w) | medium> - <DIR!palm(w) | small>
22 }
23
24 TRANSITION (10){
25   Accel 1
26 }
27
28 KEY_POSTURE(0){
29   HERE:
30     Place @I_BACK(s,2) at @T_INT(w,1)
31     Place @M_KN(s,1) at @PA(w)
32 }
33
34 END "accident"
```

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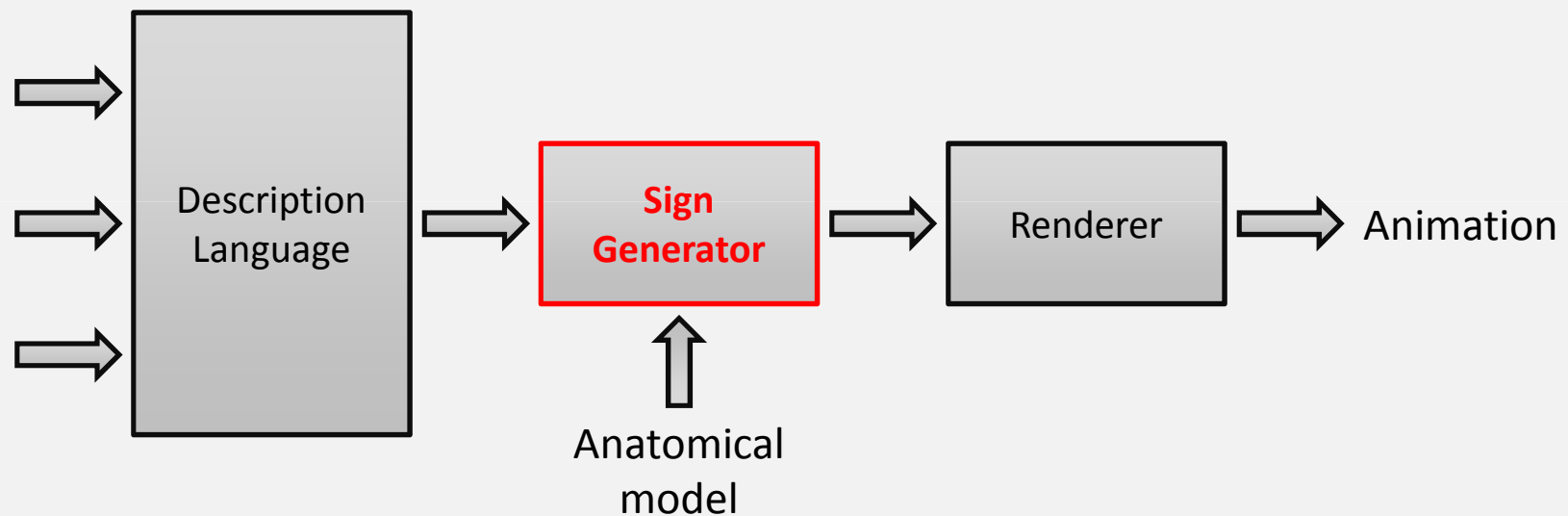
Anatomical Model : What we need

- Complementary information :
 - The Signer should be human first
 - Anthropometry measures for skeleton
 - Anatomical limitations
 - Study to humanize the movements
 - The skeleton must be dedicated to animation generation as much as possible !
 - Need to avoid uncanny valley as much as possible

Anatomical Model : What we have

- Skeleton model
 - Basic skeleton information
 - Degree of freedom limitations
 - Additional information for inverse kinematics
 - Comfort study
 - Opposable thumb calibration
 - XML-friendly format

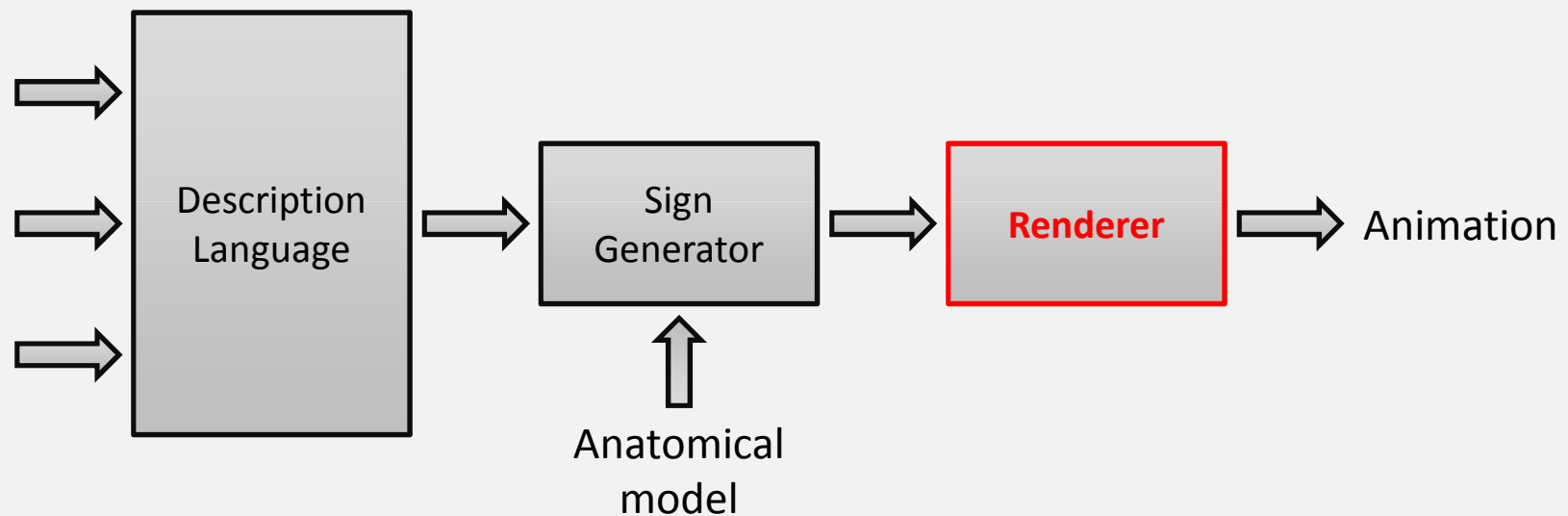
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Sign Generation : What we have

- Flexible system
 - Can generate for multiple skeleton definitions
 - Allows the integration of additional information
- Standalone program
 - Generation of isolated signs
 - Generation of complete utterances
- Multiple outputs
 - BVH
 - Proper XML format

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Rendering : What we need

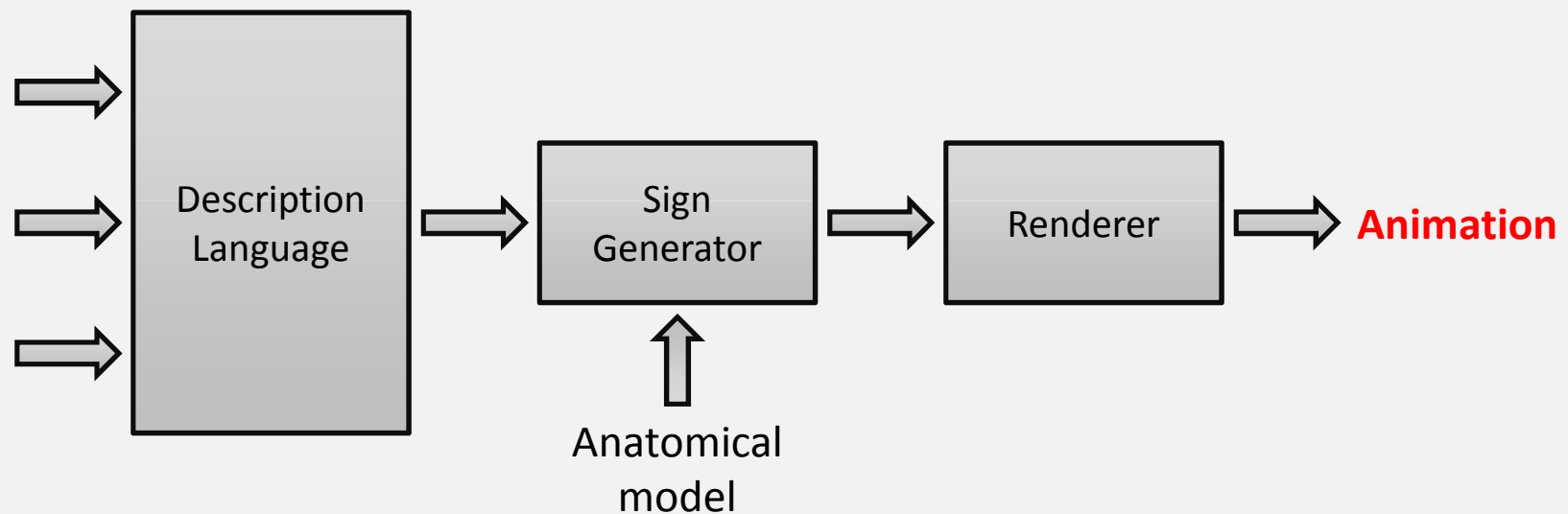
- Photorealism
 - No need for realistic systems.
 - Example : *The Forest (VCOM3D)*
 - Non-photorealistic character
- Scene setup
 - Clothes (no skin coloured)
 - Light setup
 - Camera setup



Rendering : What we have

- Octopus rendering system
 - Input : Proper format (XML-friendly)
 - Can render animations :
 - Automatically generated
 - Hand-made by an animator
 - OpenGL output, directly on screen
 - Coarticulation available between signs
 - No output files yet

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Final Animation and Evaluation

- Each step of the generation should be evaluated
- No strict evaluation method yet
- Some ideas :
 - Evaluation of the understandability and naturalness of signs
 - Statistical matching between generated animations and MoCap data
 - Evaluation of the need of photorealism

Conclusion

- In general
 - Very ambitious project
 - Need to see the whole picture
 - But to proceed by small steps
- Work at LIMSI/CNRS
 - Generation process is complete
 - Need lots of improvements to generate signs and utterances