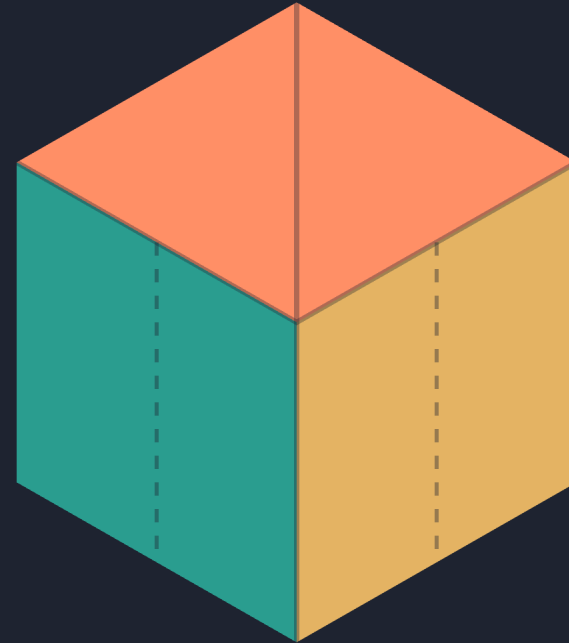


CONFERENCE PAPER

Origami-Inspired Modular Hinge Rigging for Real-Time Cube-to-Character Transformation in Unreal Engine

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MOTIVATION AND CORE IDEA

Fold, don't deform

The problem

- Rigs are built for one character
- Transformations need many hand-made keyframes
- Little reuse for the next character

The idea

Split the character into rigid body modules joined by hinge joints. Transformation is joint rotation around fixed pivots, as in origami. A new character only needs a new target pose.

PROPOSED METHOD · PIPELINE

Six stages, from Maya to runtime

1

Maya

Generate a modular cube structure

2

Maya

Separate the cube into rigid body modules

3

Maya

Create hinge-based skeletal connections

4

Maya

Build Python transformation logic

5

FBX

Export the rig to Unreal Engine

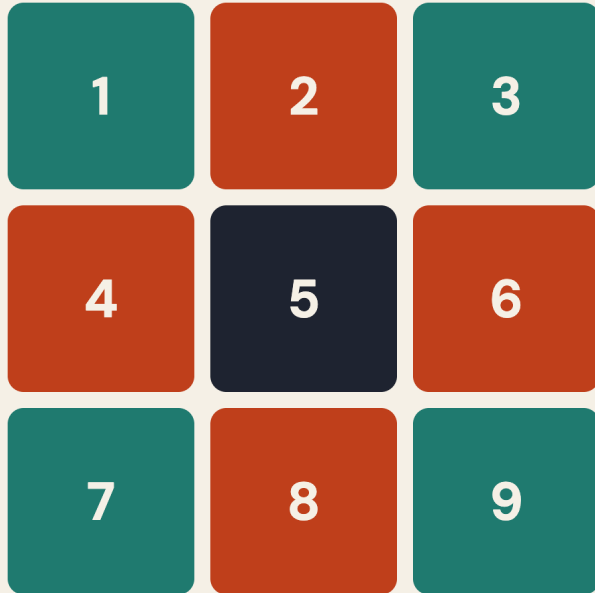
6

Unreal

Run the transformation at runtime with Control Rig

PROPOSED METHOD · HINGE RIGGING

Nine rigid modules, one hinge equation



EQUATION 1 · HINGE ROTATION INTERPOLATION

$$\theta_i(t) = (1 - t) \cdot \theta_{i,0} + t \cdot \theta_{i,1}$$

$\theta_{i,0}$ hinge angle in **cube_start**

$\theta_{i,1}$ hinge angle in **Crab_Target**

t transformation parameter, 0 to 1

IMPLEMENTATION AND CURRENT STATUS

A Python controller drives the modules

```
for module in modules:  
    source = "cube_start|" + module  
    target = "Crab_Target|" + module  
    pos = cmds.xform(target, q=True, ws=True, t=True)  
    cmds.xform(source, ws=True, t=pos)
```

Abridged: rotation is applied the same way.

- ✓ Framework and pipeline designed
- ✓ Cube split into modular body parts
- ✓ Python mapping: initial version
- 🕒 Unreal runtime control with a TransformAmount parameter: planned

CONCLUSION

A foundation for reusable transformation rigs

What we presented

- Origami-inspired modular hinge rigging framework
- Maya pipeline with a Python module-mapping controller
- Planned Unreal runtime control by one parameter

Future work

- Complete the Maya implementation
- Expand to multiple characters
- Evaluate runtime performance in Unreal

SOURCES

References

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Thank you. Questions?

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