IG3DA

Project PRIM: Pixel Art Manipulation

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Objective (1)

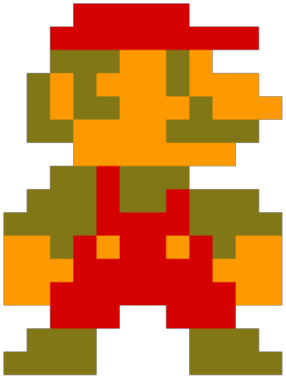

Figure – Mario sprite

- Pixel arts are always fascinating with how much we can express a character with limited number of colors and pixel informations.

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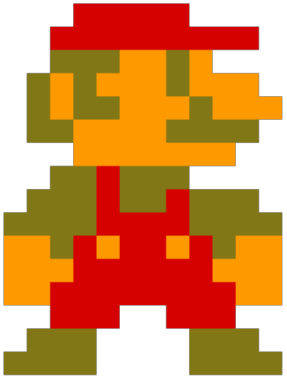

Figure – Mario sprite

- Pixel arts are always fascinating with how much we can express a character with limited number of colors and pixel informations.
- I would like to see how I could manipulate a pixel art character into different poses without having to draw other than initial pose.

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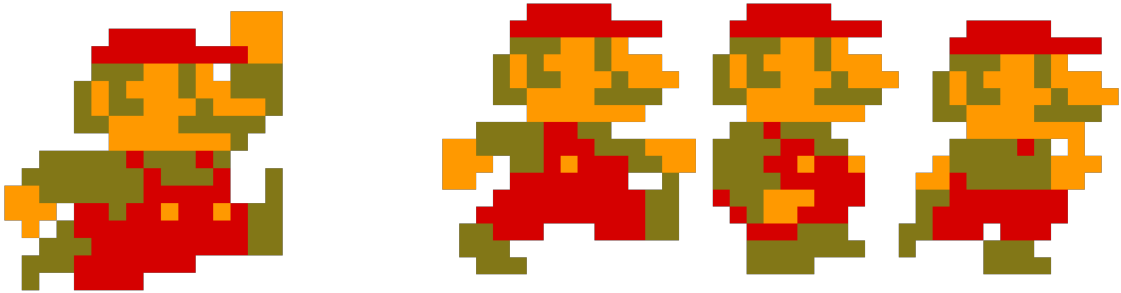

Plan for the project

Figure – 2D Pixel character

Figure – 3D Pixel character

- Create a sample pose with different views of a pixel art character

Plan for the project

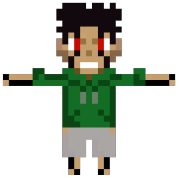

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Figure – 3D Pixel character

- Create a sample pose with different views of a pixel art character
- Construct a 3D voxel model of the character

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- Construct a 3D voxel model of the character
- Manipulate the 3D voxel while respecting pixel art constraint
- Project back to 2D views

How a Voxel should be manipulated

- For each cube, only its center's coordinates are needed
- The manipulation of voxel is considered as the movement of a system of points
- The centers' coordinates must be integer at all time
- It is acceptable if 2 voxel cubes collide in the same position

3D Voxel Construction

Figure – Front view

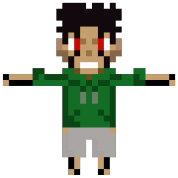
Back view

- 4 views of a 2D pixel art character : Front, Back, Side and Top

Figure – Top view

Side view

3D Voxel Construction



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Side view

- 4 views of a 2D pixel art character : Front, Back, Side and Top
- Start with front and back of the character to give it details
- Sculpt with side and and top view for accurate shapes

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Side view

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- Start with front and back of the character to give it details
- Sculpt with side and and top view for accurate shapes
- Each cube contains only one RGB color

Spring Voxel

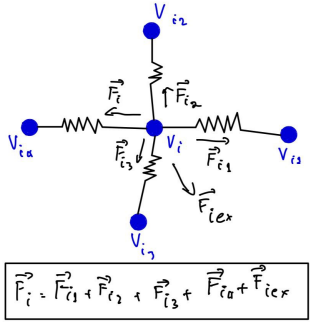

Figure – Forces that affect the cube V_i

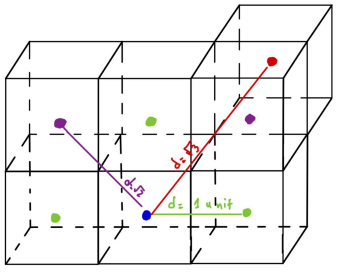

Figure – Rest lengths between neighbors

- Each pair of neighbor cubes is connected by a spring (rest length is constant)
- Using Hook's Law

$$F = -kx$$

Result (1)

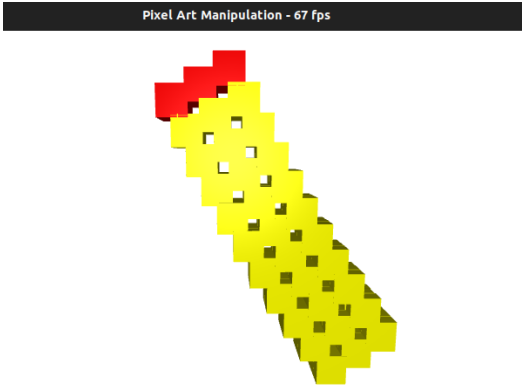

Figure – Problem of applying springs

Some problems come with wanting to generalize every part of the voxel

- Constant rest lengths leads to creating holes when deform
- Computationally expensive

Result (2)

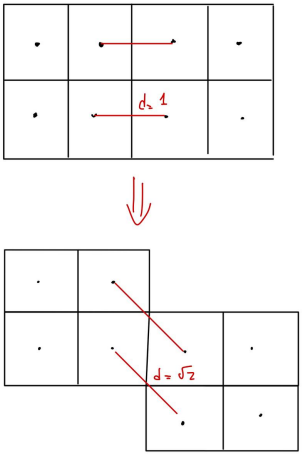

Figure – Constant rest length problem

Skeleton Voxel with Sketch Manipulation

- Same as normal skeleton exept the centered are associated to the bone instead of vertices

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- Compute the transformation matrix for the bone, then use it to calculate local coordinates of each voxel cube
- Draw a curve, take only the start and end point of the sketch for the new direction of the bone.
- Recalculate the transformation matrix of the bone, then update the global coordinates of associated voxel cubes
- Round the results to the nearest integer

Result (2)

Figure – Good angle case

Better result than spring voxel, each limb goes to the direction as I want to. However, other problems occurs

- The limbs only look well in certain angles to every axis (e.g. 90°, 180°)
- On other angles, they become disfigured

Result(2)

Figure – Bad angle case

Conclusion

- The solutions found are unfortunately not working, but it is going to the right direction
- More specific configurations are needed for each character might work
- However, it might be hard for generalization, means it cannot work right of the bat with least inputs possible.