

# A spherize deformer for Maya

Nagaraj Raparthi

MS Visualization, Texas A&M University

## Problem

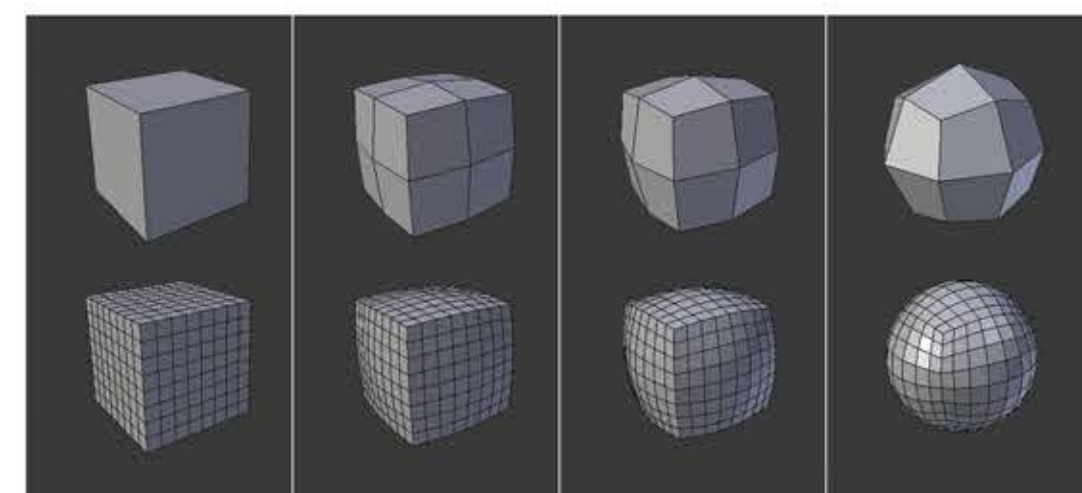
Spherical deformations where 3D models deform into balloon like shapes is a commonly occurring phenomena in many types of media. While many studios might incorporate in house scripts and tools, maya does not have an inbuilt deformer for this.

A scene where a character deforms into a balloon in the movie *Harry Potter And The Prisoner Of Azkaban*. Directed by Alfonso Cuarón, Warner Bros. Pictures. 2004.Film.



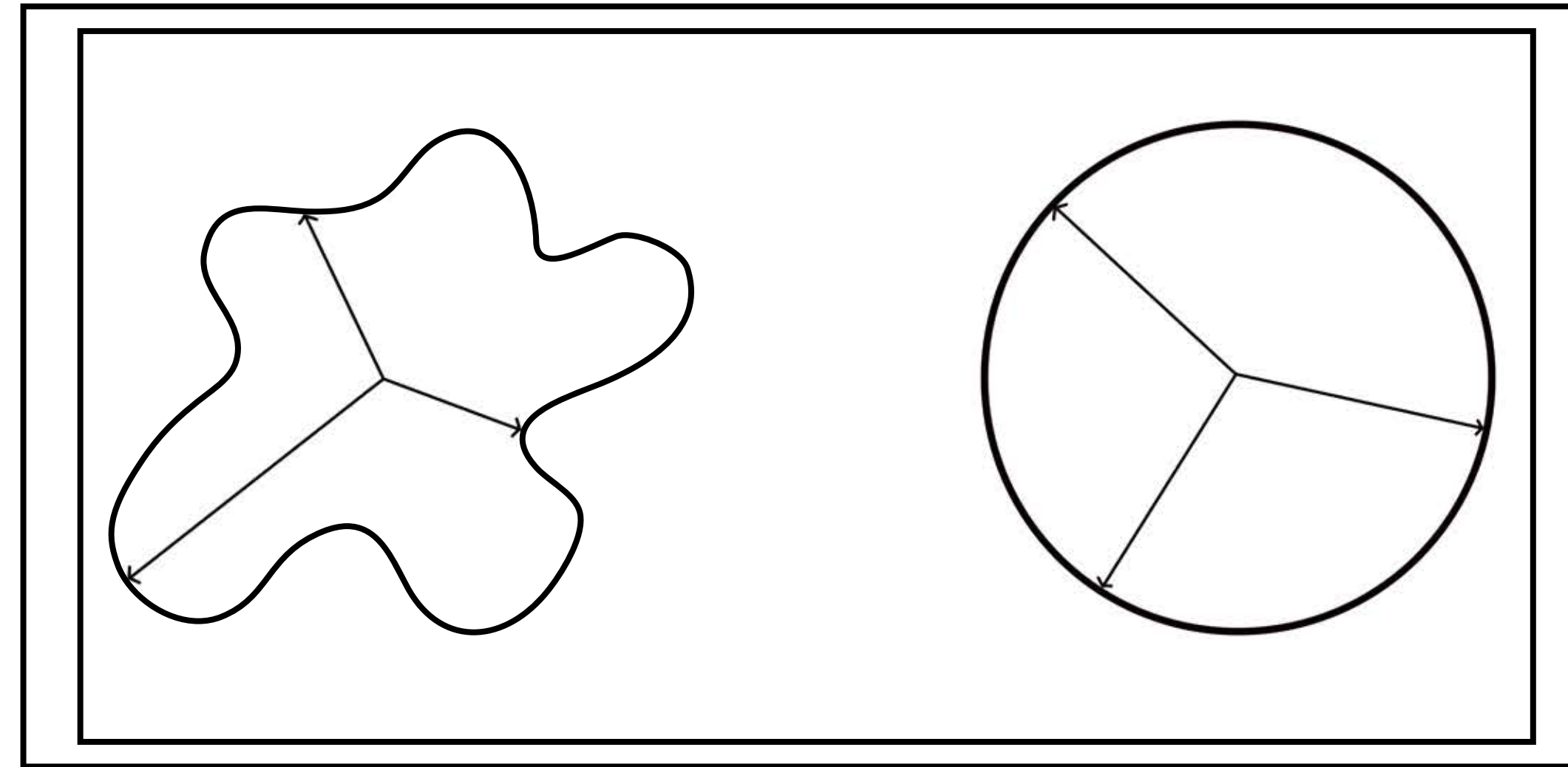
## Motivation

Initial motivation to write this script was from observing the defensive motion of a puffer fish. Blender has a similar tool which can transform a cube into a sphere. But it cannot transform any given mesh into sphere. Maya's transform component does something similar but does not necessarily spherize a mesh.



SphereTransform tool can be found under Mesh>Transform>To-Sphere in the software *Blender*, Blender Foundation.

## Method



Vector from center of the sphere to each vertex.

Magnitude of the vector changed to form a sphere.

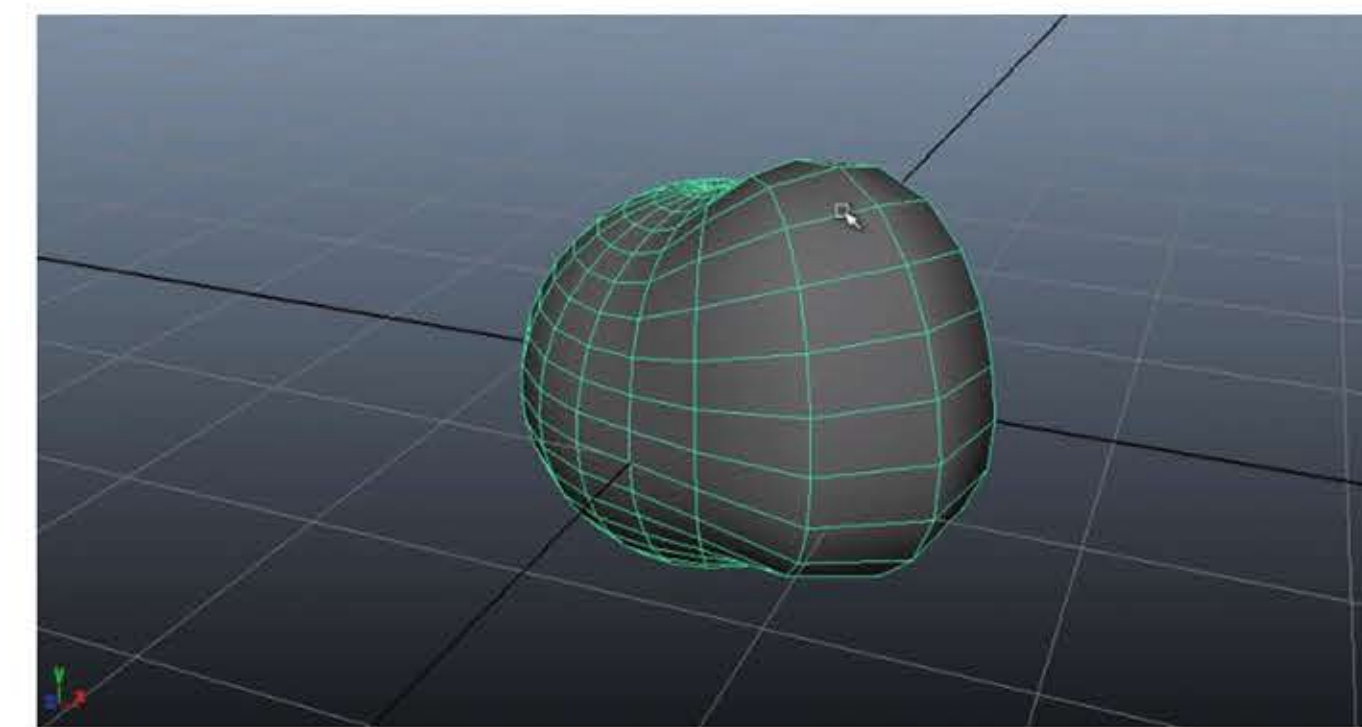
My program loops through the vertices of the mesh and draws a vector from the center of the mesh to the vertex position. The new vertex position is then calculated based on the radius and the amount of deformation which the user specifies. The vertex is then translated along the direction of the vector. The same translation value is given to all the vertices and they translate from the center as opposed to their original position. Thus resulting in a sphere.

$$\text{point} = \text{cnt} + (\text{direction} * ((\text{bulgeAmount} * r) + ((1 - \text{bulgeAmount}) * \text{length}))) * \text{env} * w;$$

The above equation is the main algorithm to turn the mesh into a sphere. Where,  
 point = the vertex position  
 cnt = center of the mesh, r = radius  
 direction = the vector from center to the vertex  
 length = length from center  
 bulgeAmount = spherize component  
 w = weights, env = envelope control

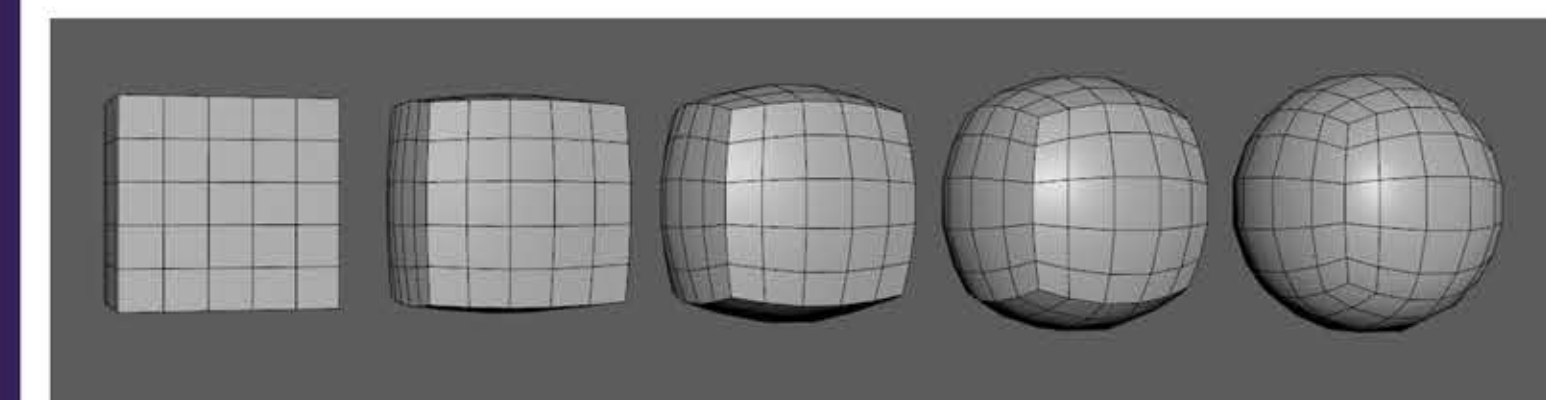
## Prior Work

This tool is based on the works of Chad Vernon from CGI circuit. His deformer can deform vertices along the direction of it's normal.

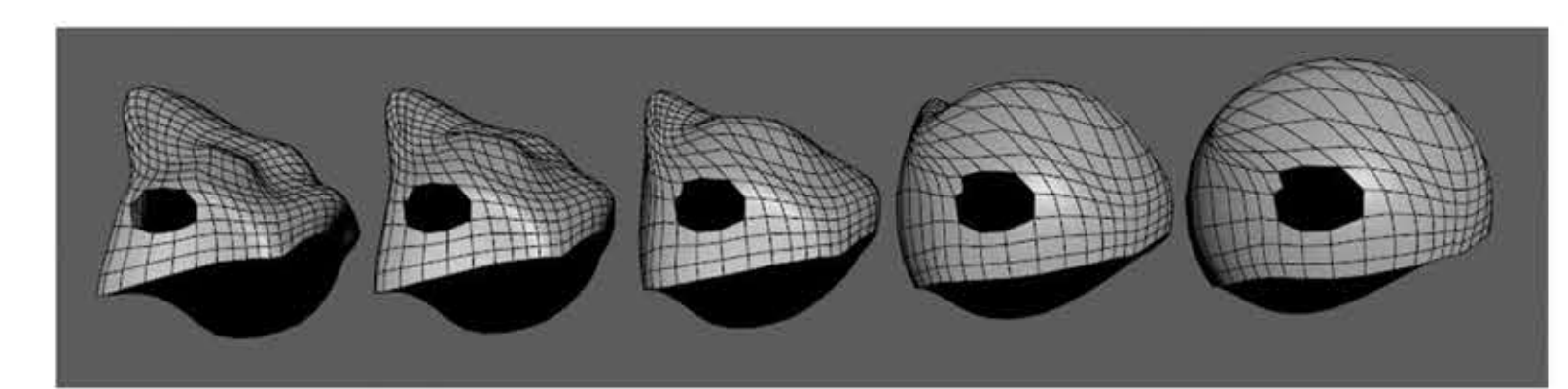


Chad Vernon. <https://www.cgicircuit.com/tutorial/introduction-to-the-maya-api>

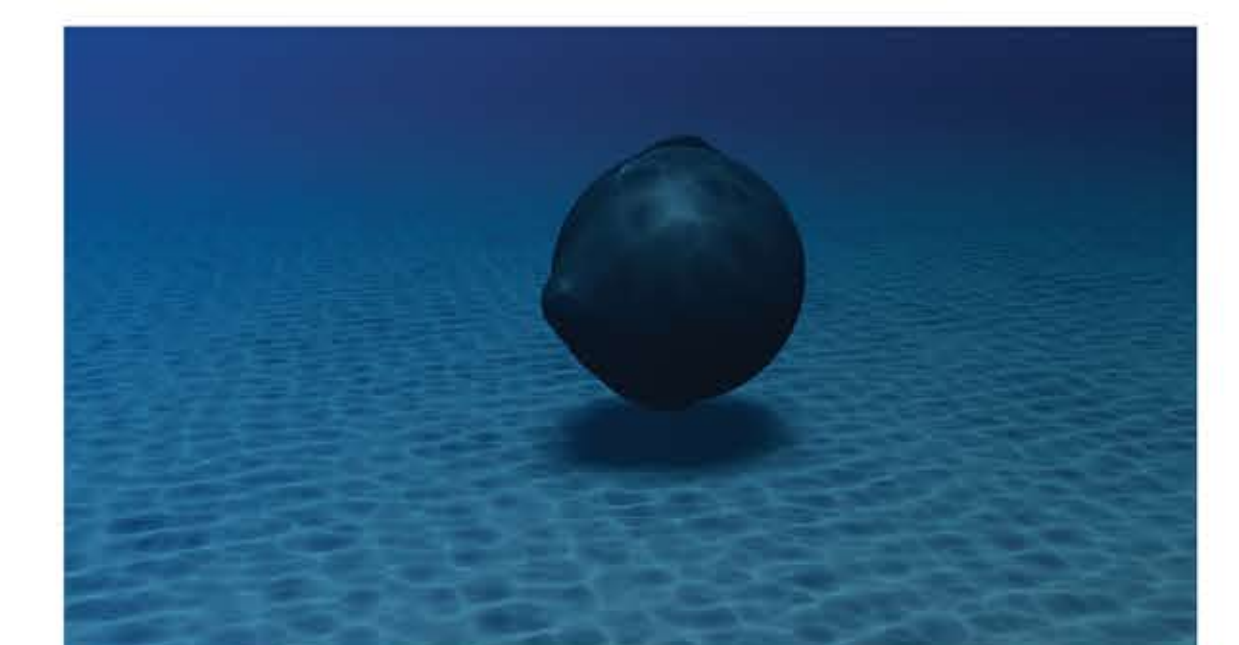
## Results



Deformation of a cube into sphere.



Deformation of an 3D model with holes



Possible application of the tool on a puffer fish. Left image is before applying the deformer and right one is after. The user can set keys for the deformation amount, thus enabling him to animate the fish using keyframes.

## My Solution

My deformer can take any 3D geometry as an input and deform it into a sphere. The user can set the radius, amount of deformation and can also paint weights to control the amount of deformation.

## Limitations and Future Work

Because of how the script is written, painted weights do not deform the vertices smoothly as we propagate through the deformation. When there are faces which are very close to each other, the script does not maintain their distance when it reaches the end of deformation. In the future, I would like to take this approach to deform the mesh into other complicated shapes with more user control on the attributes.