In this thesis, we address the problem of smooth interpolatory subdivision of triangle meshes. This problem is more challenging than general smooth subdivision as the original vertices of the mesh cannot be moved to produce smoother surfaces. There are also not that many existing works that cover this problem. As a solution, we use the minimization of a global fairness energy to compute the positions of newly added vertices of the mesh. This approach results in smoother surfaces than the widely used butterfly subdivision scheme, but at the cost of increased computational complexity and potential volume loss in the resulting mesh. We analyze the sources of volume loss and implement a solution to prevent it. Our algorithm also preserves sharp edges and points on the mesh surface. While our solution performs well for basic objects, it may produce artifacts for more complex ones. As a future work, we suggest ways to improve our algorithm to address the artifact occurrences.