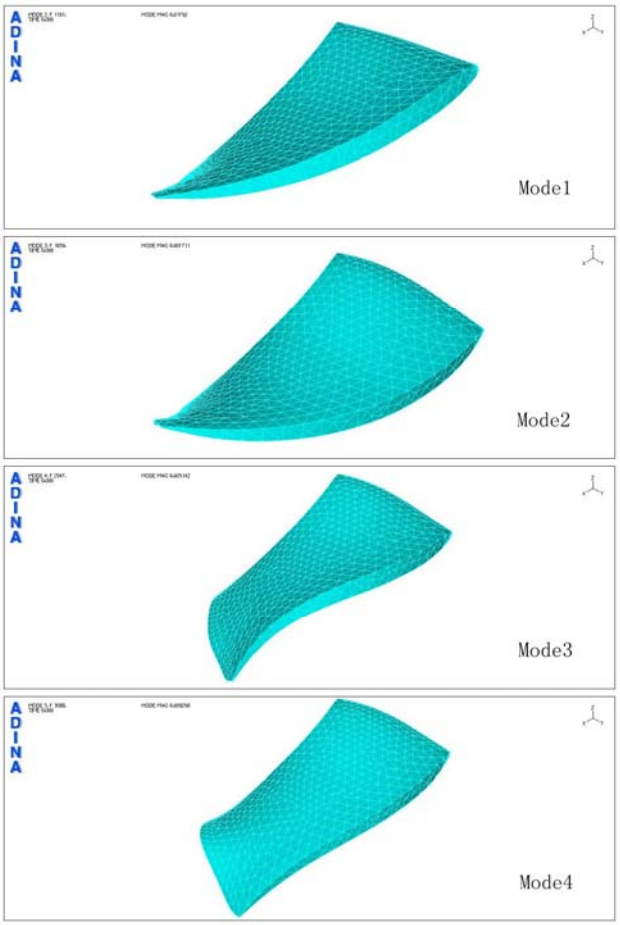

Figure 5. the blade's modal shapes of the top four orders in water

What the results show is that ,compared with the mode in air, not only the modal frequencies in different orders in water decrease in different degrees, but also the blade's vibration modes in some orders in water are different from that in air. For the nonlinear structure such as the blade, on the one hand the quality of the water will affect the mass matrix of the structure, on the other hand the pressure of the water will affect the stiffness matrix of the structure, so not only the quality of the water but also the pressure of it could affect the natural frequencies of the structure. What's more, the shape and size of the water model could also affect the vibration modes of the blade in water, because not only the water's static pressure but also its dynamic pressure was taken into account during the fluid-structure coupling calculation process by ADINA.

V. Conclusion

Through the analysis above, we have calculated the blade's modes in air and water respectively. The results show that compared with the mode in air, the modal frequencies of the structure in different orders in water decrease in different degrees. It is necessary to avoid these frequencies in the practical application in order to prevent resonance.

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