

# POINT COLLOCATION SCHEMES FOR FLUID PROBLEMS BY THE FAST MOVING LEAST SQUARE REPRODUCING KERNEL METHOD

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Recently, new meshfree method was proposed by authors, and named by the fast moving least square reproducing kernel method(FMLSRK)[1]. The main difference of this method compared to other meshfree method is on the derivatives of shape functions. Instead of direct differentiation of shape function, the method adopt hierarchical type shape functions as derivatives of shape function which are obtained from the process of obtaining shape function itself. Hence, one can say that the major advantage of this method over other meshfree methods is computational efficiency. Moreover, one can vary dilation parameter of shape functions with this method. In short, the dilation function[2] can be defined rigorously. A good point of the dilation function can be illustrated by problems which need node concentration.

We solved various fluid problems by point collocation schemes with FMLSRK. The list of problems are the following :

- The potential flow in the 2 dimensional pipe with circular cylinder or planar barrier in it
- The Stokes flow in the 2 dimensional pipe with circular cylinder in it
- The Navier-Stokes flow in the 2 dimensional pipe with circular cylinder in it
- 2 dimensional Stokes driven cavity flow
- 2 dimensional Navier-Stokes driven cavity flow
- 2 dimensional Navier-Stokes backward facing step flow

Through numerical examples, we validate point collocation schemes by FMLSRK.

## References

- [1] DW. Kim, and YS. Kim, "Point collocation methods using the fast moving least square reproducing kernel approximation," *International Journal for Numerical Methods in Engineering*, v. 56, p. 1445-1464, 2003.
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