Research Report（April, 2021- March, 2022）

Enrollment from April 2020

Department of Modern Mechanical Engineering

LIU YANG

I. List of Papers

1. 山崎 智司，劉 洋,張 雨菲，倉石 孝，滝沢 研二，Tayfun E. Tezduyar，"複数風車の後流解析のための効率的な計算手法の構築"，計算工学講演会論文集 Vol. 25 (2020 年 5 月)

2. 劉 洋，山崎 智司，張 雨菲，倉石 孝，張 福林，滝沢 研二，Tayfun E. Tezduyar，"Multi-Domain Computation of Wind Turbine Wake Flows" [No.20-1] 日本機械学会 2020 年度年次大会 講演論文集〔2020.9.13-16，名古屋〕

II. List of Talks

日本機械学会 2020 年度年次大会, (Zoom online talk).

III. Research Results in AY2021

We developed a computational framework to reduce the computation costs for predicting long wake flows. The computation framework consists of space–time variational multiscale method (ST-VMS), ST isogeometric discretization, and the carrier-domain method (CDM) (see Fig. 1) to study the long wake flow behind a circular cylinder. The CDM is accurate enough to capture the second phrase vortex shedding as wake marching far downstream (see Fig. 2).
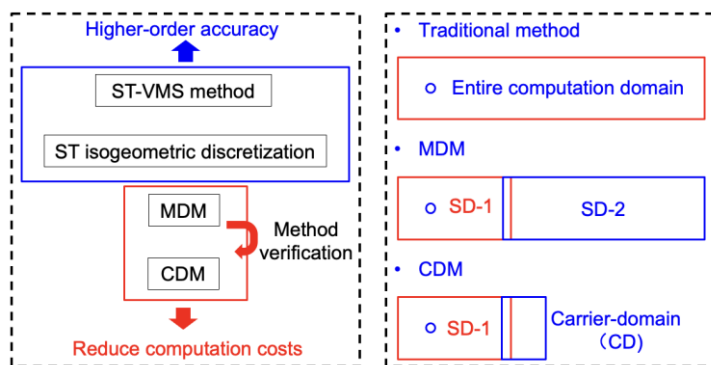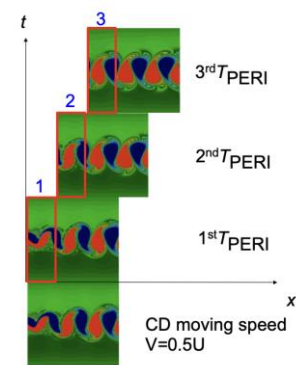

Fig. 1 Computational framework

Fig. 2 Illustration of the CDM

IV. Research Plan for AY2022

In year 2022, we will apply the new method to two back-to back horizontal wind turbines computation, predicting the long wake flow generated by upstream wind turbine and study its influence on downstream wind turbine.

We will do the wind turbine research according to the follow sequence:

① Conduct isogeometric analysis (IGA) on upstream windturbine

② SD-2 computation analysis of wake evolution in with MDM, as a verification example

③ CD computation analysis of wake evolution with the CDM

④ Conduct IGA on downstream wind turbine and wake influence study