CFD development in Passenger Car Aerodynamics with Prof. Kuwahara at ISAS and Nissan

Ryutaro Himeno, Susumu Shirayama RIKEN, University of Tokyo The original version was presented at Nobeyama workshop cerebrating Prof. Kuwahara's 60-year-old birthday In 1984, I visited Prof. Kuwahara at the Institute of Space and astronautical Science

#To replace wind tunnel exp. with CFD



Two approaches at the beginnings (1984-86)

2D simulation of car shape Bevelopment of 3D KK-scheme solver on 3D generalized coordinate





The first results of 3D KK solver



Next,



(c) Top view

Cylinder with a slanted base

most simplified passenger tail shape in aerodynamic point of view

Calulated results by Dr. Kamo and Dr. Shirayama, who were postgraduate students at that monent







Simple model with 40x30x20 grids



Nissan 1987

Accuracy (Nissan 1987)



•24,000grid points

Whether it is calculate or not, is determined if we can generate mesh or not

Hulti-block approach is best for passenger car analysis



Shirayama et al.

Model without wheels (1988)



•600,000 grid points

Z32(Nissan 1988)



•Looks nice but ...

Roughness of underfloor(1990)



Model with wheels and roughness (1990)



Eng. Comp. (1992)



•2 million grid points

Improvement of accuracy (1993)



Door mirror (1997)



Simulation of aerodynamic noise



Cartesian approach for Eng. Comp.



Aircondisioning



Summary



















CFD in car aerodynamics

∺At the beginning, engineers did not believe CFD results.

They gradually changed their mind and rely on CFD.

Prof. Kuwahara said,

The most important thing is to show it possible. Then they will follow us.

What I am challenging now: Grand Challenge in Biomedical

Research

Total Simulation of Living Matter

Budget:1.5 billion yen/year 2006-2012 Part of Supercomputer R&D project

Goal

Understand the life phenomena: reproducing life program on computer Develop new medicine and medical equipment

Approach

combination of analytical approach and Data-driven approach on Peta-scale computer

