Computational Aerodynamics Questions & Answers

Question by Student 201427102

Professor, I'm confused. For finding $F^-_{i+1/2}$, you used below form.

$$r_i^- = \frac{F_i^- - F_{i+1}^-}{F_{i+1}^- - F_{i+2}^-}$$

According to table, this form for alpha < 0. But alpha > 0 at Q#2 of assign.#8.

What does "alpha" mean? I didn't use this in class. You need to rephrase your question and use the same symbols as used in class. Or, define clearly a new symbol you are introducing.

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According to table, this form for a< 0. But a>0 at Q#2 of assign .

Node	u, m/s	a, m/s
$i-1$	0	100
i	10	110
$i+1$	9	105
$i+2$	-10	100

Now I see what you mean. When dealing with a system of equations, the wave speeds are not necessarily a or u. Rather, the wave speeds are the eigenvalues. So, when determining $F^{\pm}_{i+1/2}$, the wave speeds are within $\Lambda^{\pm}$ (those play the same role as the "a" does for a scalar equation). 1.5 point bonus.

Question by Student 201427564

Professor, I have a question about $\phi(r)$. In the table, $\phi(r) = max(0, min(1, r))$. But last class, you wrote like this. $(\phi^+{}_{i+\frac{1}{2}})_1 = max(0, min(1, 2r^+{}_i))$ Why did you use $2r^+{}_i$ rather than $r^+{}_i$?

Both $\phi = \max(0, \min(1, r))$ and $\phi = \max(0, \min(1, 2r))$ respect the rule of the positive coefficients and reduce to first order at extrema and are hence valid. But $\phi = \max(0, \min(1, 2r))$ is better because it is closer to the second-order stencil. 1.0 point bonus.

Question by Student 201227147

Professor, I have a question about assignment 8 question #2-(b). Last class, you calculated r_i^- *to find out* $\phi_{i+1/2}^-$ *because you used this relationship I guess:*

$\phi_{i+1/2}^- = max(0, min(1, 2r_i^-))$

However, I think r_i^- *should be* r_{i+1}^- *because* $\phi_{i+1/2}$ *is* $\phi_{i+1/2}^-$*. Is it right? or is there some reasons you calculated* r_i^- *?*

Hm no, if we set $\phi_{i+1/2}^- = \max(0, \min(1, 2r_{i+1}^-))$ then we should define $r_{i+1}^- \equiv \frac{u_i - u_{i+1}}{u_{i+1} - u_{i+2}}$. However, because $r_i^- \equiv \frac{u_i - u_{i+1}}{u_{i+1} - u_{i+2}}$ then we have to set $\phi_{i+1/2}^- = \max(0, \min(1, 2r_i^-))$. 1 point bonus.

Question by Student 201227147

I have another question about r_{i+1}^-*. In the table,* $r_i = \frac{u_{i+1} - u_i}{u_i - u_{i-1}}$*. But you calculated* r_i^- *with* $r_{i+1}^- \equiv \frac{u_i - u_{i+1}}{u_{i+1} - u_{i+2}}$*. Does it mean that the equation in the table is assumed positive upwind (from left*$(i-1)$ *to right*$(i+1)$*) so that notations should be from right*$(i+2)$ *to left*(i) *when I apply it in negative upwind case?(it means* $i-1$*->*$i+2$*,* i*->*$i+1$*, and* $i+1$*->*i*)*

By the way, Does your answer about previous question mean that there's just difference in notating r *and use same equation?*

I guess your concerns are due to the fact you are using an older version of tables.pdf.. The tables have changed slightly in the last few days. After downloading the latest version, if you still have some concerns, ask the question again below.

Question by Student 201238707

Professor, I have a question about subsonic inflow's velocity angle. Why those are same?

$\theta_1^{n+\frac{1}{2}} = \theta_1^{n+1}$

because we assumed steady-state?

I don't recall this step. You need to put your question into context so I can recall

why we did this.