QO - Week 08

January 17, 2021

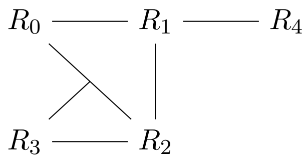
Exercise 1

Step 1

We have the following ordering benefits:

$\bowtie_1$	$\bowtie_2$	orderingBenefit($\bowtie_1$, $\bowtie_2$)
$R_0 \bowtie R_3$	$R_0 \bowtie R_1$	$\frac{150}{101} = \frac{C_{out}((R_0 \bowtie R_3) \bowtie R_1)}{C_{out}((R_0 \bowtie R_1) \bowtie R_3)} = \frac{10*500*0.2+10*20*0.2*500*0.2}{10*20*0.1+10*20*0.2*500*0.2}$
$R_1 \bowtie R_2$	$R_1 \bowtie R_0$	$\frac{5}{3} = \frac{C_{out}((R_1 \bowtie R_2) \bowtie R_0)}{C_{out}((R_1 \bowtie R_0) \bowtie R_2)} = \frac{20*50*0.1+20*50*0.1*10*0.1}{20*10*0.1+20*50*0.1*10*0.1}$
$R_3 \bowtie R_0$	$R_3 \bowtie R_2$	$2 = \frac{C_{out}((R_3 \bowtie R_0) \bowtie R_2)}{C_{out}((R_3 \bowtie R_2) \bowtie R_0)} = \frac{10*500*0.2+10*500*0.2*50*0.01}{500*50*0.01+10*500*0.2*50*0.01}$
$R_2 \bowtie R_3$	$R_2 \bowtie R_1$	$\frac{5}{4} = \frac{C_{out}((R_2 \bowtie R_3) \bowtie R_1)}{C_{out}((R_2 \bowtie R_1) \bowtie R_3)} = \frac{10*500*0.2+10*500*0.2*50*0.01}{500*50*0.01+10*500*0.2*50*0.01}$
$R_1 \bowtie R_4$	$R_1 \bowtie R_0$	$\frac{500}{251} = \frac{C_{out}((R_1 \bowtie R_4) \bowtie R_0)}{C_{out}((R_1 \bowtie R_0) \bowtie R_4)} = \frac{20*5000*0.05+10*20*0.1*5000*0.05}{10*20*0.1+10*20*0.1*5000*0.05}$
$R_1 \bowtie R_4$	$R_1 \bowtie R_2$	$\frac{300}{251} = \frac{C_{out}((R_1 \bowtie R_4) \bowtie R_2)}{C_{out}((R_1 \bowtie R_2) \bowtie R_4)} = \frac{20*5000*0.05+20*5000*0.05*50*0.1}{20*50*0.1+20*5000*0.05*50*0.1}$

We choose to run $R_3 \bowtie R_2$ before $R_3 \bowtie R_0$, because the benefit of this approach is the max with the value 2.
This step has the result graph, which is added with a hyper-edge $\{R_2, R_3\} - \{R_0\}$ and removed with edge $R_3 - R_0$:



$$\{R_2, R_3\} = R_3 \bowtie R_2 = R_2 \bowtie R_3$$

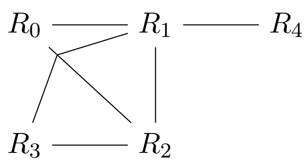
Step 2

Update the table:

$\bowtie_1$	$\bowtie_2$	orderingBenefit($\bowtie_1$, $\bowtie_2$)
$R_1 \bowtie R_2$	$R_1 \bowtie R_0$	$\frac{5}{3}$
$R_2 \bowtie R_3$	$R_2 \bowtie R_1$	$\frac{5}{4}$
$R_1 \bowtie R_4$	$R_1 \bowtie R_0$	$\frac{500}{251}$
$R_1 \bowtie R_4$	$R_1 \bowtie R_2$	$\frac{300}{251}$
$R_0 \bowtie \{R_2, R_3\}$	$R_0 \bowtie R_1$	$\frac{85}{37} = \frac{C_{out}((R_0 \bowtie (R_3 \bowtie R_2)) \bowtie R_1)}{C_{out}((R_0 \bowtie R_1) \bowtie (R_3 \bowtie R_2))} = \frac{500*50*0.01+500*50*0.01*10*0.2+500*50*0.01*10*0.2*20*0.1}{500*50*0.01+10*20*0.1+500*50*0.01*10*0.2*20*0.1}$

We chose to order $R_0 \bowtie R_1$ before $R_0 \bowtie \{R_2, R_3\}$, because the benefit of this approach is the max with the value $\frac{85}{37}$.

This step has the result graph, which is added with a hyper-edge $\{R_0, R_1\} - \{R_2, R_3\}$ and removed with hyper-edge $\{R_2, R_3\} - \{R_0\}$:



$$\{R_0, R_1\} = R_0 \bowtie R_1 = R_1 \bowtie R_0$$

Exercise 2

Join	SES	TES
$\bowtie_{A.x=B.y}$	{A, B}	{A, B}
$\bowtie_{B.x=C.y}$	{B, C}	{B, C}
$⟕_{C.x=E.y}$	{C, E}	{C, E, F} s
$\bowtie_{C.y=D.x}$	{C, D}	{C, D}
$\bowtie_{E.x=F.y}$	{E, F}	{E, F}

The result Graph: