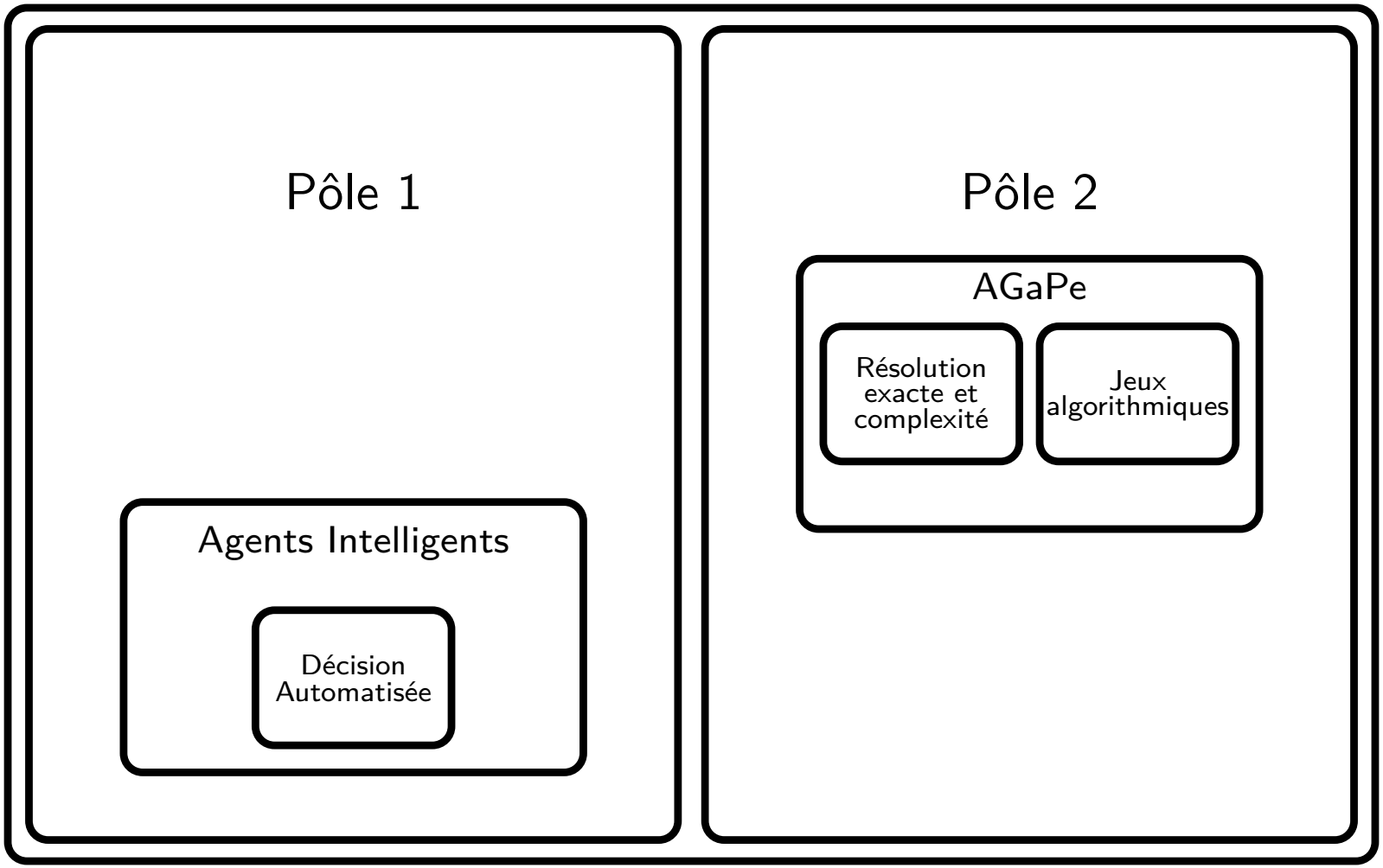
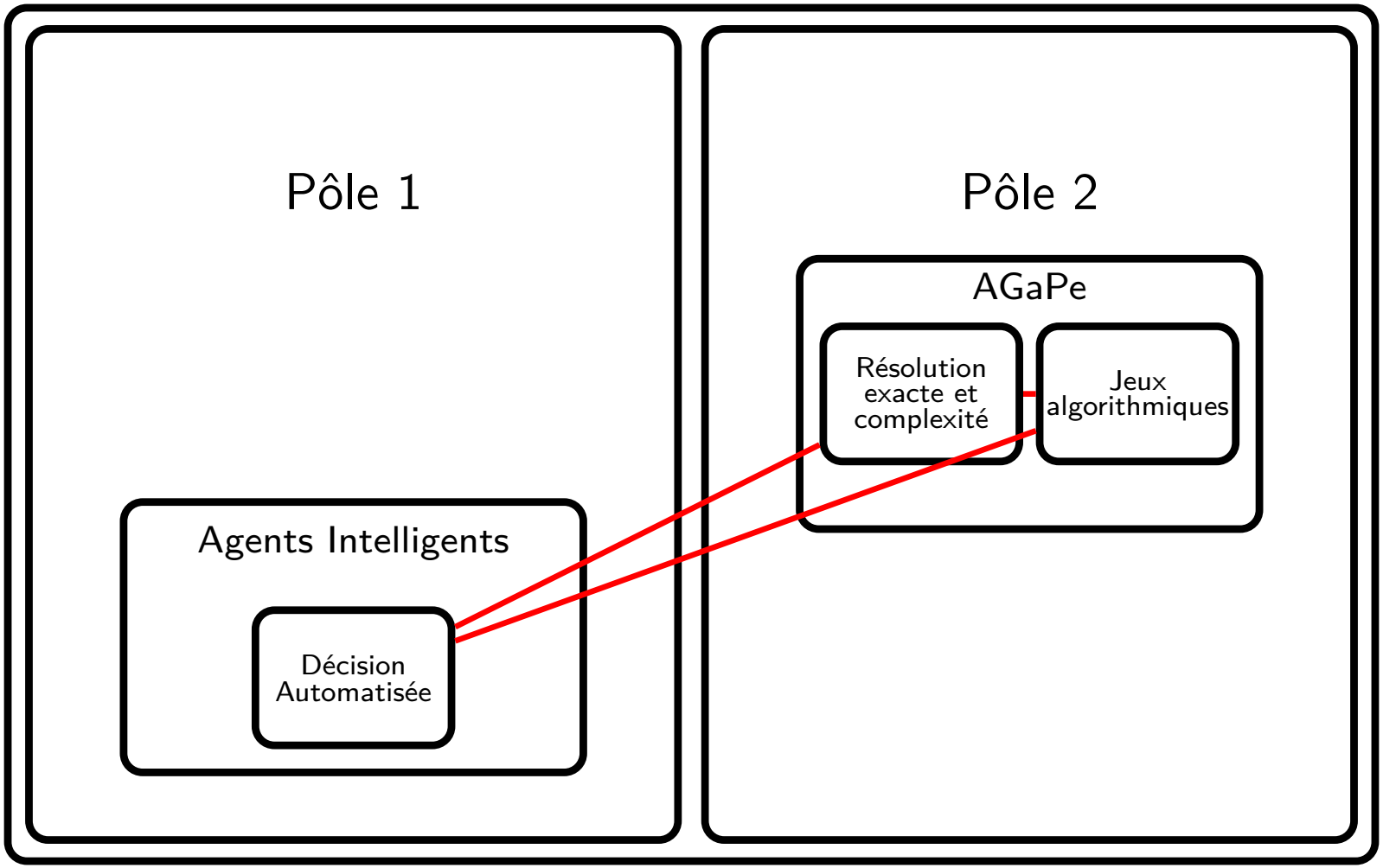
Complexité des jeux de cartes

Edouard Bonnet, Florian Jamain, Abdallah Saffidine

Avril 2013


LAMSADE
Pôle 1
Agents Intelligents
Décision Automatisée
Pôle 2
AGaPe
Résolution exacte et complexité
Jeux algorithmiques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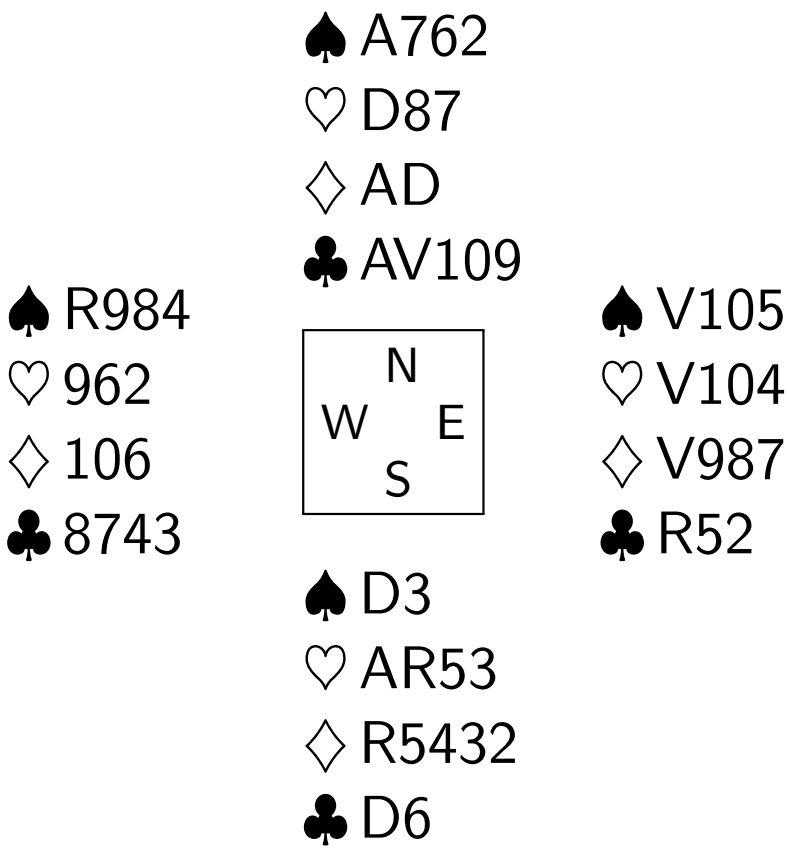
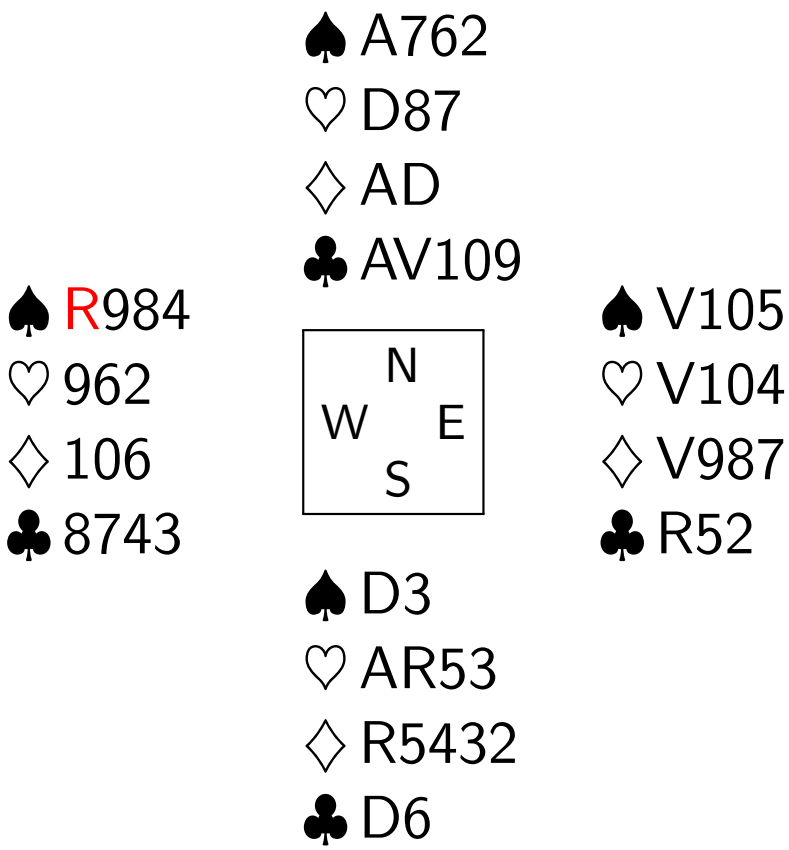


carte, couleur, main, joueur, lancer, fournir, levée.



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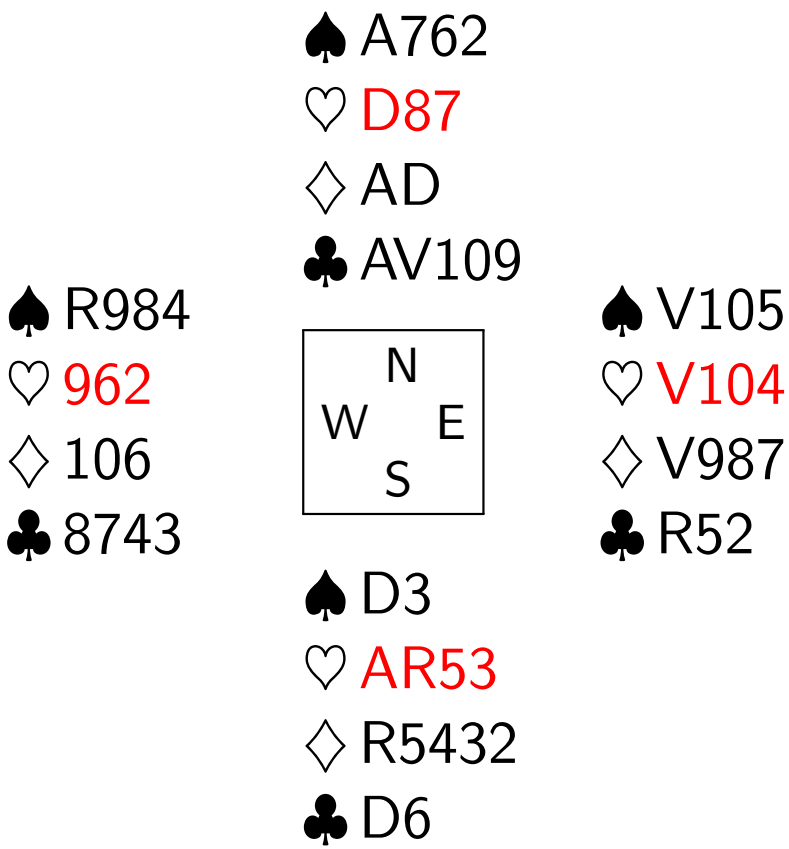

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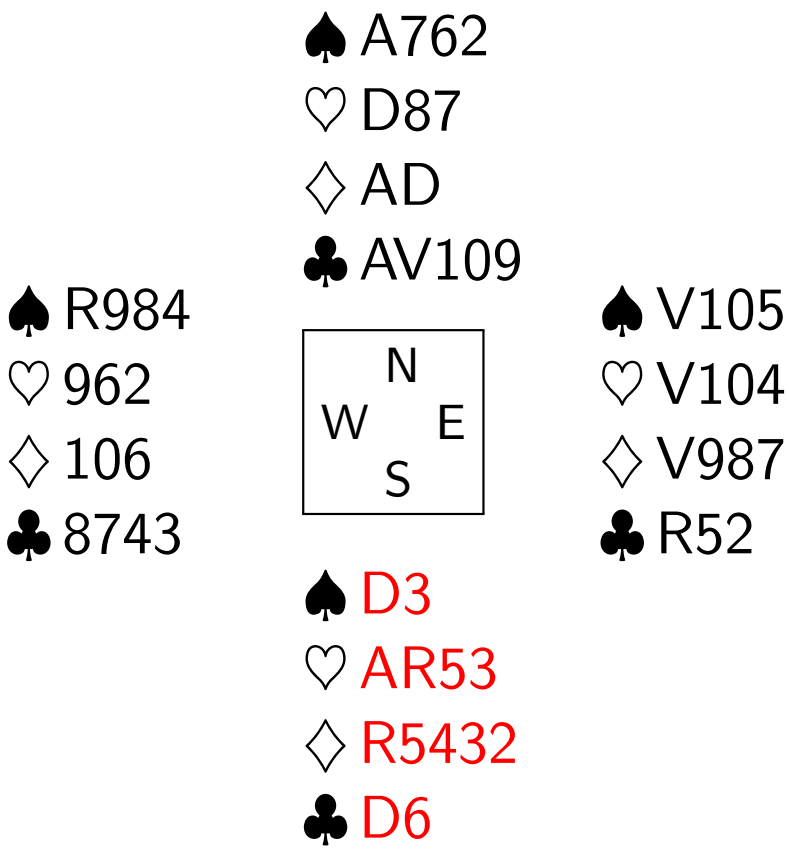

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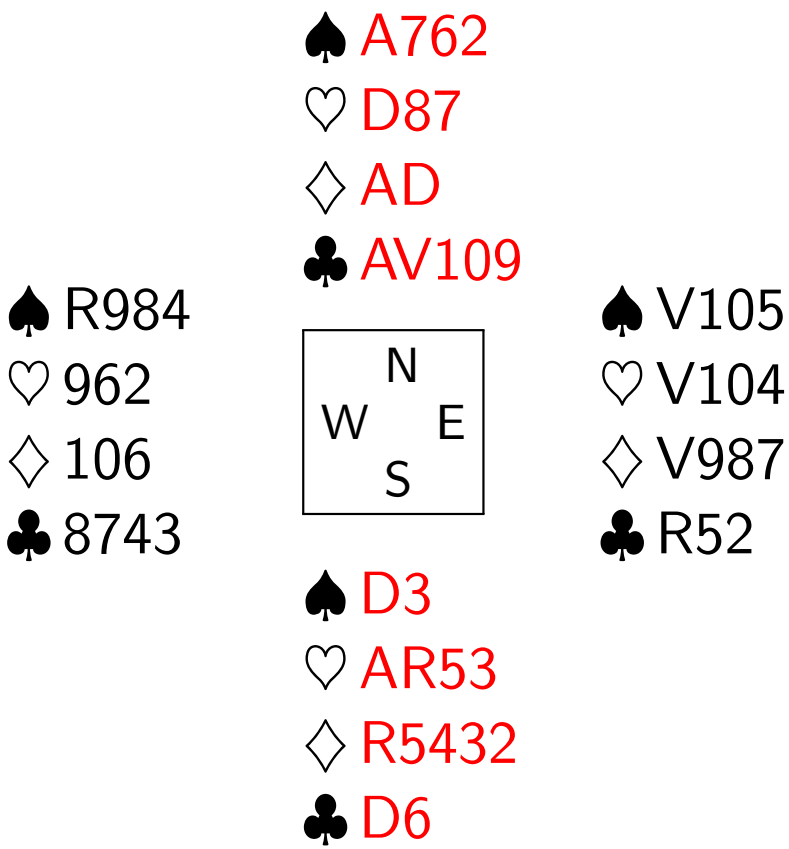

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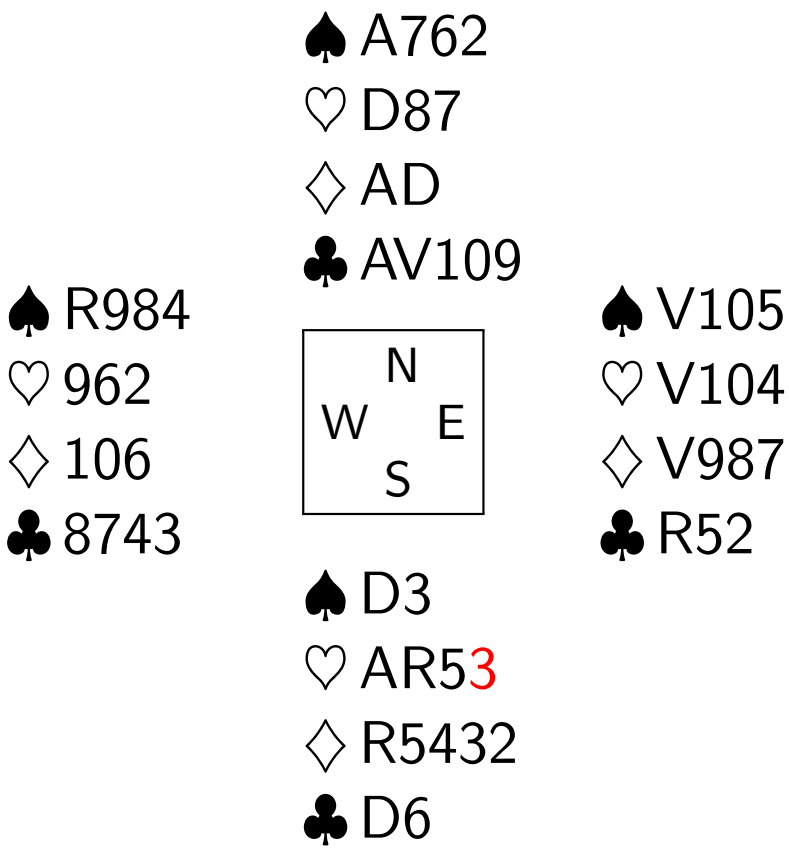

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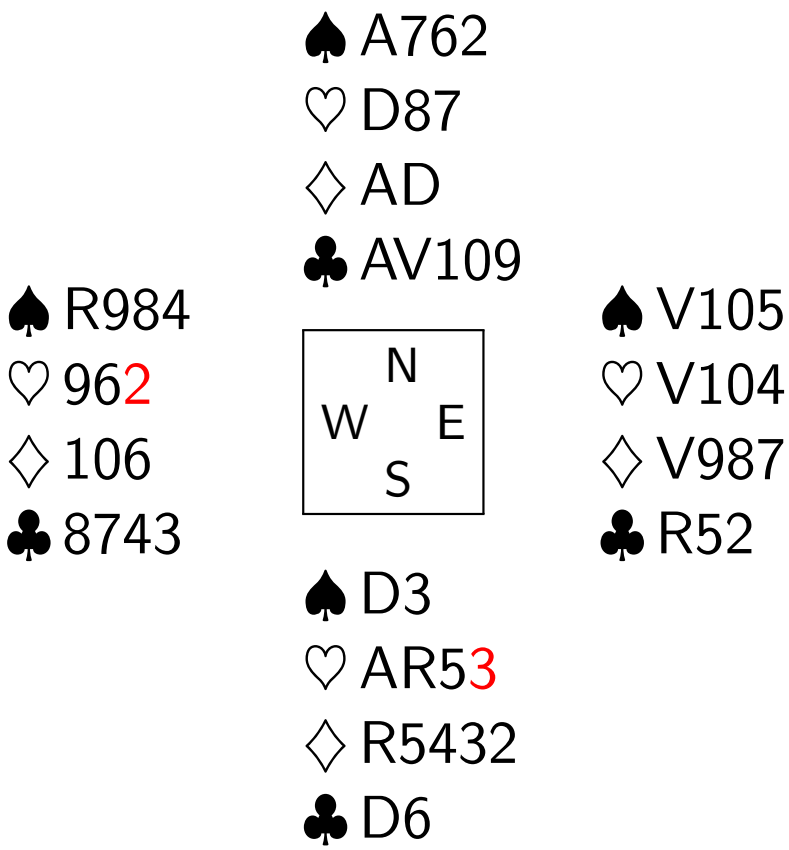

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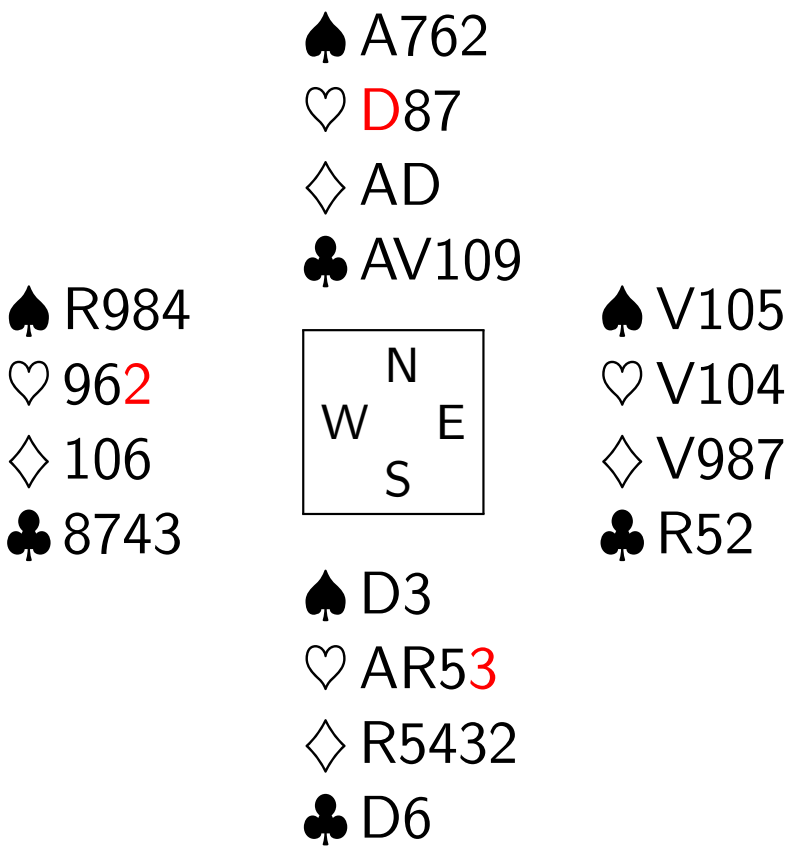

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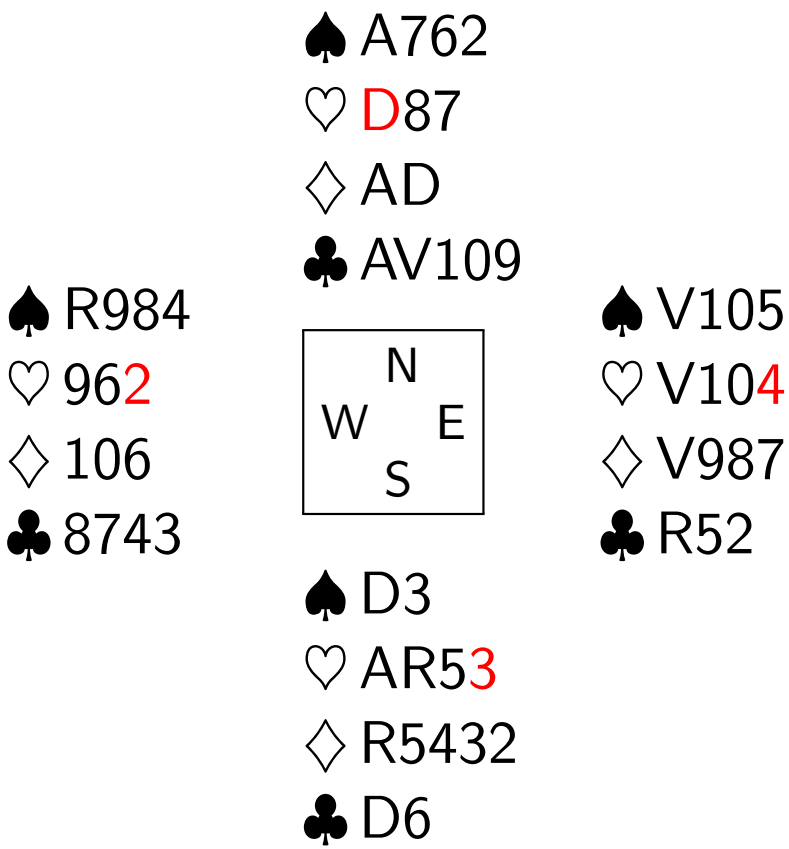

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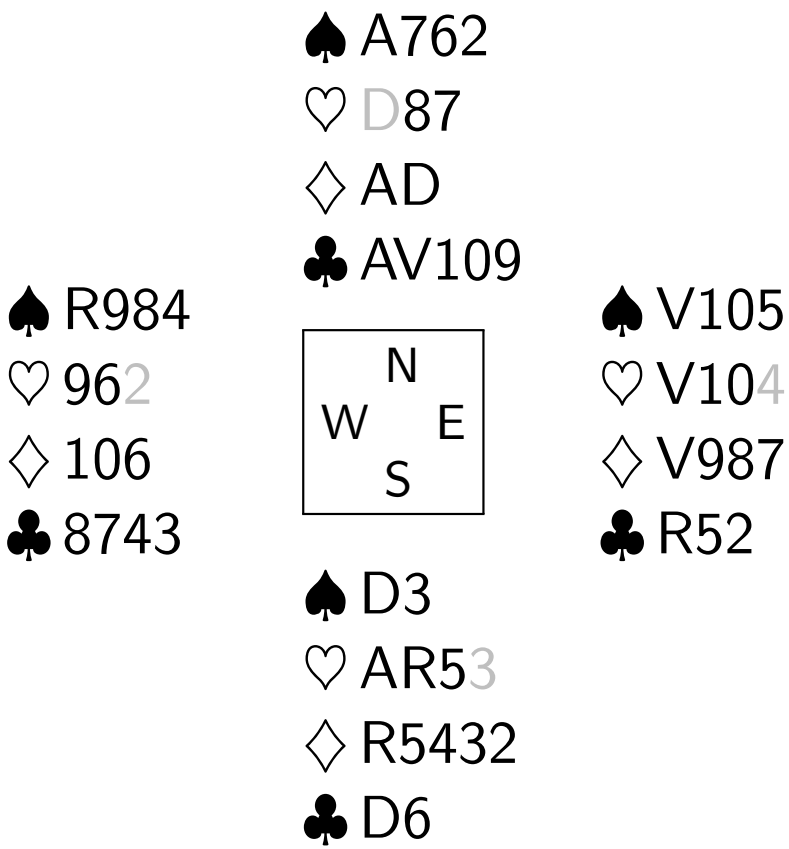
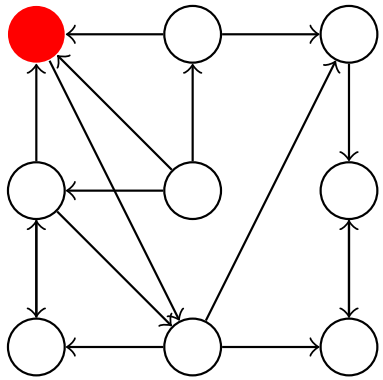


carte, couleur, main, joueur, lancer, fournir, levée.

1 main par joueur
et couleurs miroirs
est dans P

Il n'y a pas de structure géométrique naturelle à exploiter au Bridge

- QBF : $\forall x_1 \exists x_2 \forall x_3 \exists x_4 \ldots \forall x_{2n-1} \exists x_{2n} \phi(x_1, \ldots, x_{2n})$
- GENERALIZED GEOGRAPHY :



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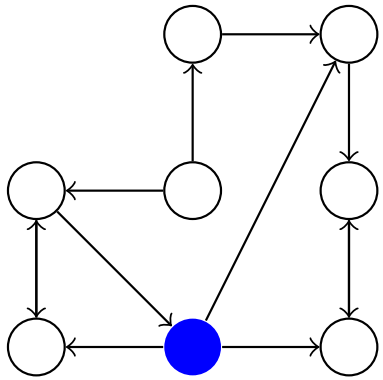

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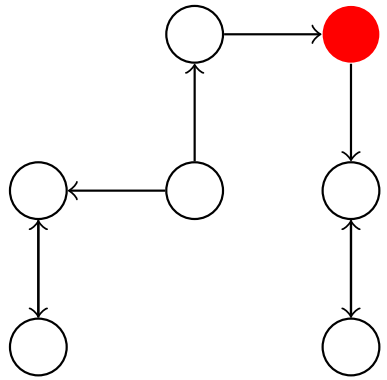

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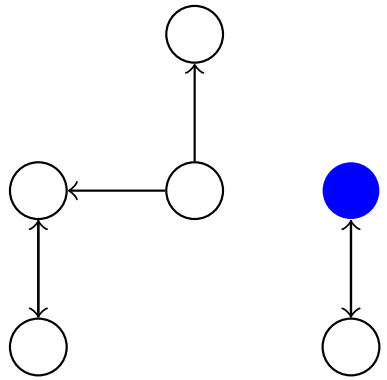

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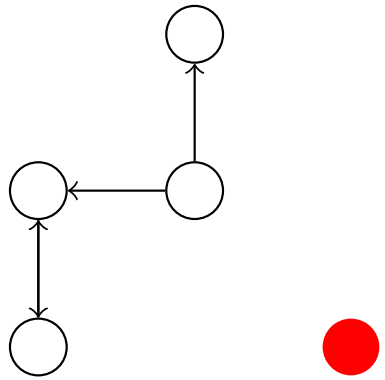

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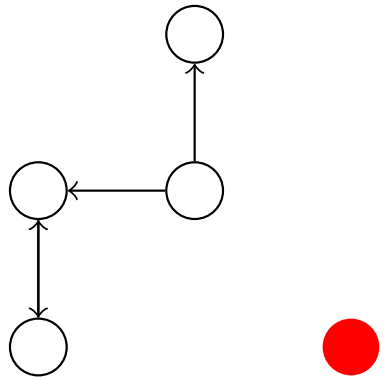
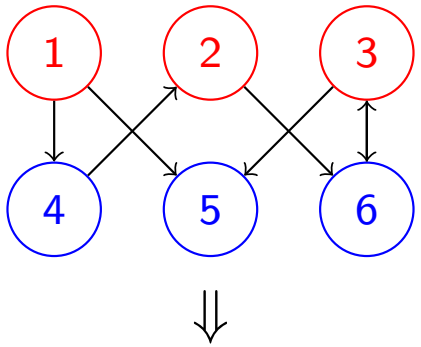


même sur les graphes bipartis



	h1
c_b	x
$c_{1,4}$	RDV1098...
$c_{1,5}$	RDV1098...

	h2
c_b	x
$c_{2,6}$	RDV1098...
$c_{4,2}$	A

	h3
c_b	x
$c_{3,5}$	RDV1098...
$c_{3,6}$	RDV1098...
$c_{6,3}$	A

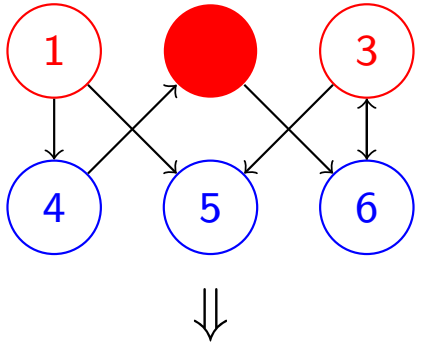
	h4
c_r	x
$c_{1,4}$	A
$c_{4,2}$	RDV1098...

	h5
c_r	xxx...
$c_{1,5}$	A
$c_{3,5}$	A

	h6
c_r	x
$c_{2,6}$	A
$c_{3,6}$	A
$c_{6,3}$	RDV1098...

	h_r
c_r	ARDV109...

	h_b
c_b	ARDV109...



h1	
c_b	x
$c_{1,4}$	RDV1098...
$c_{1,5}$	RDV1098...

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$c_{3,6}$	RDV1098...
$c_{6,3}$	A

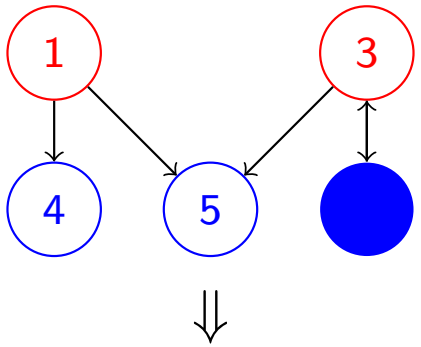
h4	
c_r	x
$c_{1,4}$	A
$c_{4,2}$	RDV1098...

h5	
c_r	xxx...
$c_{1,5}$	A
$c_{3,5}$	A

h6	
c_r	x
$c_{2,6}$	A
$c_{3,6}$	A
$c_{6,3}$	RDV1098...

h_r	
c_r	ARDV109...

h_b	
c_b	ARDV109...



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$c_{2,6}$	RDV1098...
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h3	
c_b	x
$c_{3,5}$	RDV1098...
$c_{3,6}$	RDV1098...
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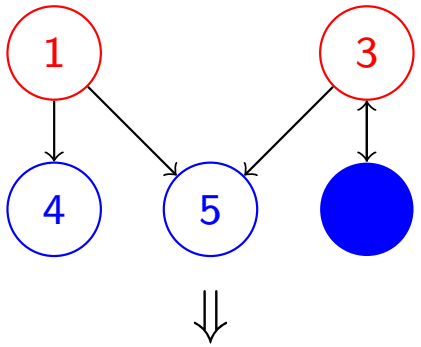
$c_{4,2}$	RDV1098...

h5	
c_r	xxx...
$c_{1,5}$	A
$c_{3,5}$	A

h6	
c_r	x
$c_{2,6}$	A
$c_{3,6}$	A
$c_{6,3}$	RDV1098...

h_r	
c_r	ARDV109...

h_b	
c_b	ARDV109...



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h6	
c_r	x
$c_{2,6}$	A
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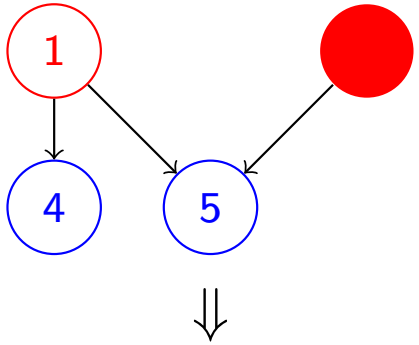
$c_{6,3}$	RDV1098...

h_r	
c_r	ARDV109...

h_b	
c_b	ARDV109...



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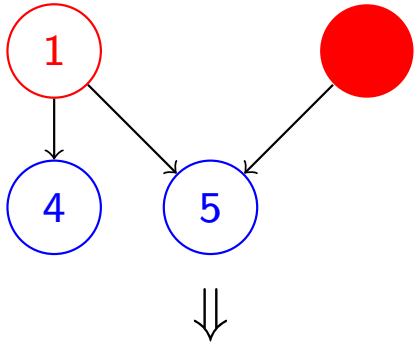
c_r	ARDV109...

h_b	
c_b	ARDV109...



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	h_b
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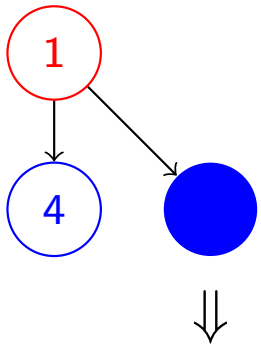

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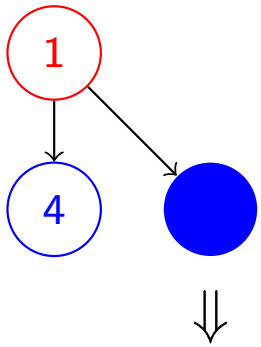
h_r	
c_r	ARDV109...

h_b	
c_b	ARDV109...



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$c_{1,4}$	A
$c_{4,2}$	RDV1098...

h5	
c_r	xxx...
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$c_{3,5}$	A

h6	
c_r	x
$c_{2,6}$	A
$c_{3,6}$	A
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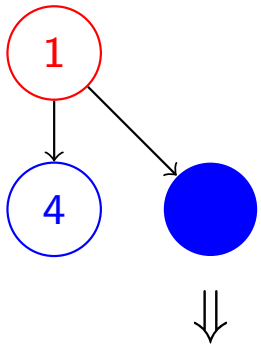
h_r	
c_r	ARDV109...

h_b	
c_b	ARDV109...



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h6	
c_r	x
$c_{2,6}$	A
$c_{3,6}$	A
$c_{6,3}$	RDV1098...

h_r	
c_r	ARDV109...

h_b	
c_b	ARDV109...

h_{r_1} h_{b_2}

c_r AD108... c_r RV97...

h_{r_2} h_{b_1}

c_b a_{3W}...a_1AD108... c_b RV97...

h_r h_b

c_r x c_b x

⋮ ⋮

Si Rouge a W levées d'avance, il gagne en jouant dans c_r.
Si Bleu a $2W$ levées d'avance, il gagne en jouant dans c_b.

h_r h_b

c (W+3)(W+2)(W+1)W...321 c (W+6)(W+5)(W+4)

h_r h_b

c (W+3)(W+2)(W+1)W...321 c (W+6)(W+5)(W+4)

h_r h_b

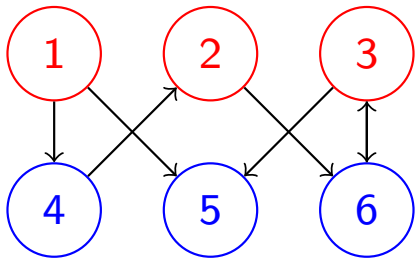
c xxxW c def

h_r h_b

c $3|W$ c def

	h_r	
c_1		...xx Wx x xW x xW...
c_2	...x Wx x xW x xW...	...xx xW x Wx x xW...
c_3	...x xW x xW x xW...	...xx xW x xW x Wx...
	h_b	
c_4	...x Wx x xW x xW...	...xx Wx x xW x xW...
c_5	...x Wx x xW x Wx...	...xx xW x Wx x xW...
c_6	...x xW x Wx x Wx...	...xx xW x xW x Wx...

	h_r	
c_1		...xx Wx x xW x xW...
c_2	...x Wx x xW x xW...	...xx xW x Wx x xW...
c_3	...x xW x xW x xW...	...xx xW x xW x Wx...
	h_b	
c_4	...x Wx x xW x xW...	...xx Wx x xW x xW...
c_5	...x Wx x xW x Wx...	...xx xW x Wx x xW...
c_6	...x xW x Wx x Wx...	...xx xW x xW x Wx...



	h_r	
c_1		$6\|W\ 1\|^{3W/2}\ \mathcal{A}(c_1)\ 1\|^{3W/2}$
c_2	$4\|^{W/2}\ 3\|2W\ \mathcal{C}(c_2)\ 2\|2W$	$6\|W\ 1\|^{3W/2}\ \mathcal{A}(c_2)\ 1\|^{3W/2}$
c_3	$4\|^{W/2}\ 3\|2W\ \mathcal{C}(c_3)\ 2\|2W$	$6\|W\ 1\|^{3W/2}\ \mathcal{A}(c_3)\ 1\|^{3W/2}$
c_4	def	
c_5	def	
c_6	def	

	h_b	
c_1	def	
c_2	def	
c_3	def	
c_4	$5\|W\ 1\|^{3W/2}\ \mathcal{C}(c_4)\ 2\|W$	$4\|W\ 3\|^{3W/2}\ 1\|^{3W/2}\ \mathcal{A}(c_4)\ 1\|W$
c_5	$5\|W\ 1\|^{3W/2}\ \mathcal{C}(c_5)\ 2\|W$	$4\|W\ 3\|^{3W/2}\ 1\|^{3W/2}\ \mathcal{A}(c_5)\ 1\|W$
c_6	$5\|W\ 1\|^{3W/2}\ \mathcal{C}(c_6)\ 2\|W$	$4\|W\ 3\|^{3W/2}\ 1\|^{3W/2}\ \mathcal{A}(c_6)\ 1\|W$