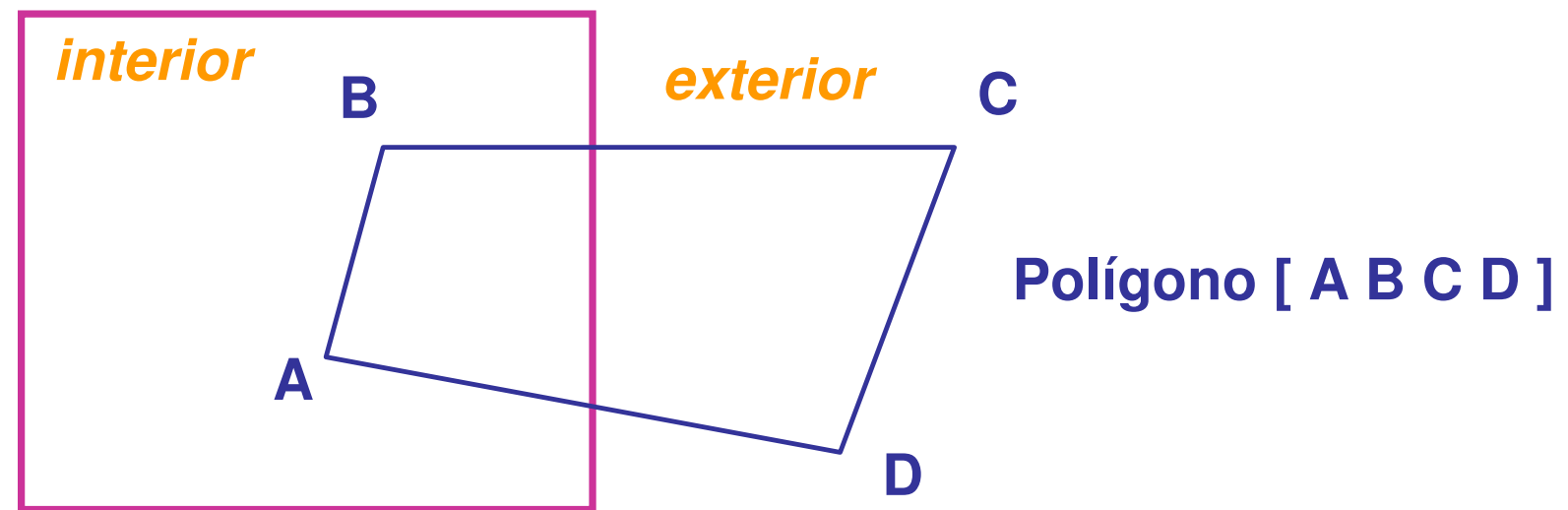


Recorte Polígonos

Recorte de Polígonos

RECORTE de POLÍGONOS por janelas retangulares

Algoritmo de Sutherland-Hodgman *



Inicializações:

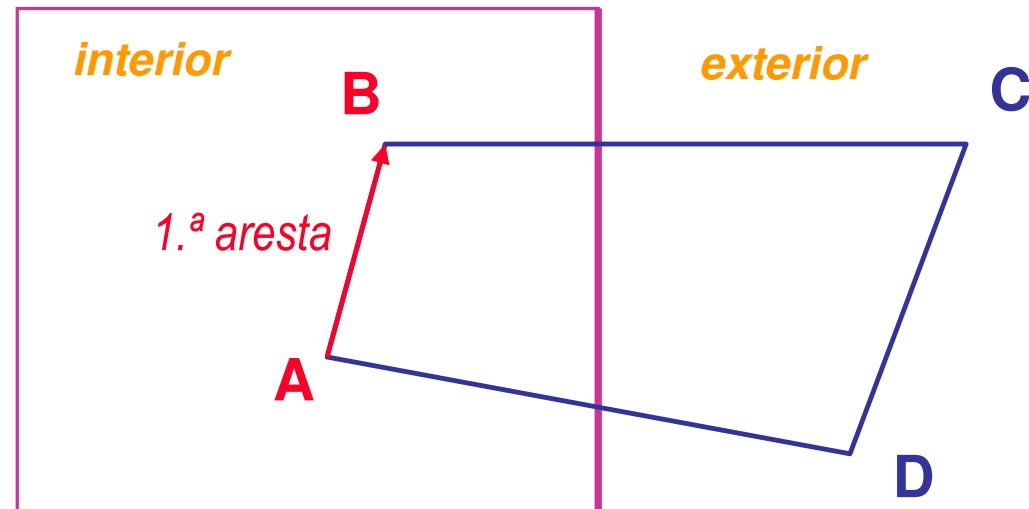
$V_i =$ Lista dos vértices de entrada = [A B C D]

$V_o =$ Lista dos vértices de saída = []

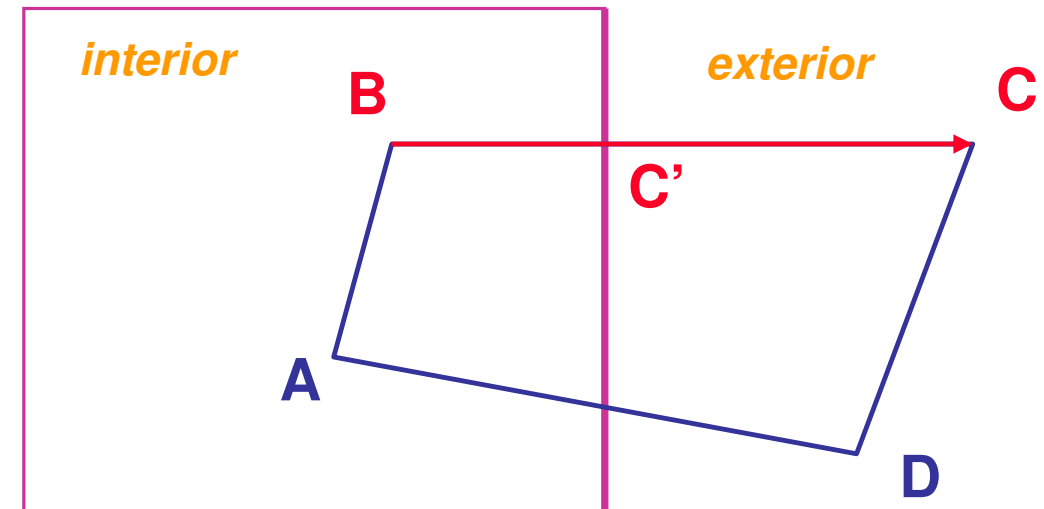
* Este algoritmo pode generalizar-se a qualquer janela poligonal convexa

M.Próspero

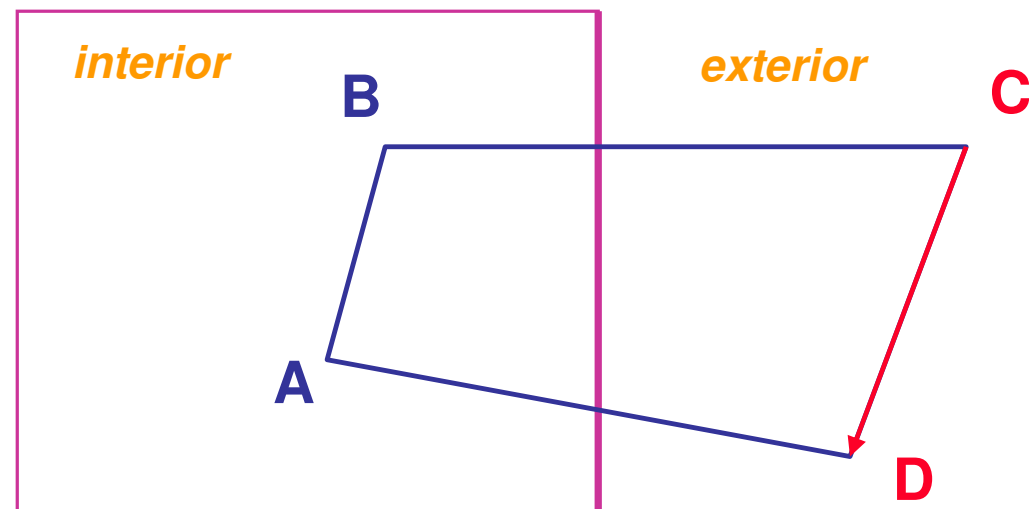
Algoritmo de Sutherland-Hodgman : as 4 regras exemplificadas



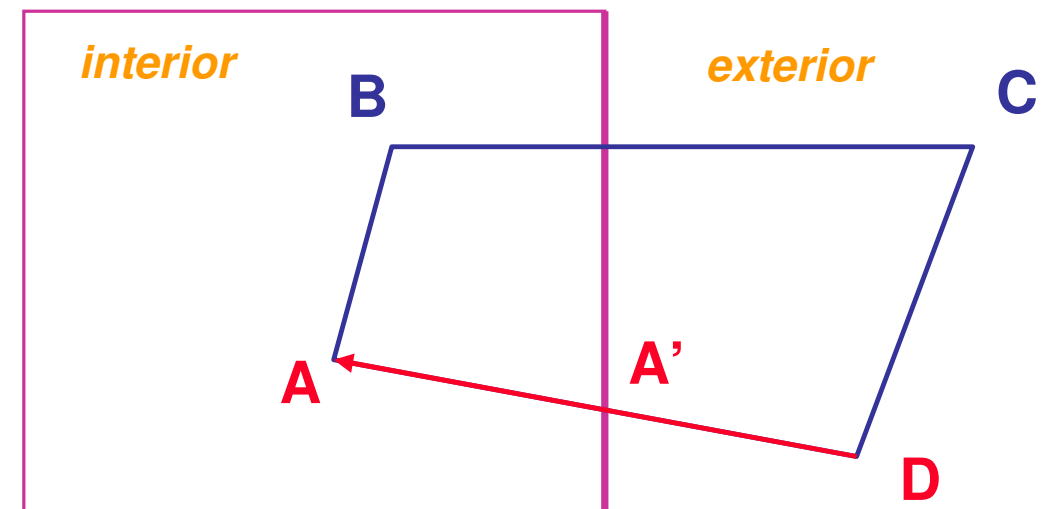
A e B no interior $\Rightarrow$ juntar B a V_o
 $V_o = [B]$



B interior e C exterior $\Rightarrow$ calcular e juntar C'
 $V_o = [B C']$



C e D no exterior $\Rightarrow$ continuar
 $V_o = [B C']$

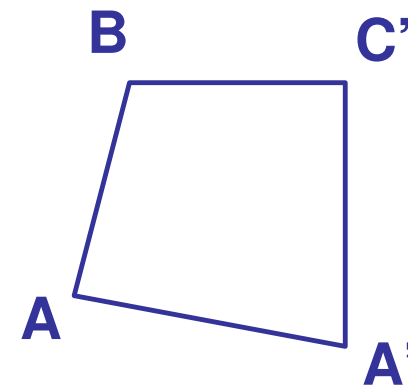


D exterior e A interior $\Rightarrow$ calcular A' e juntar A' e A
 $V_o = [B C' A' A]$

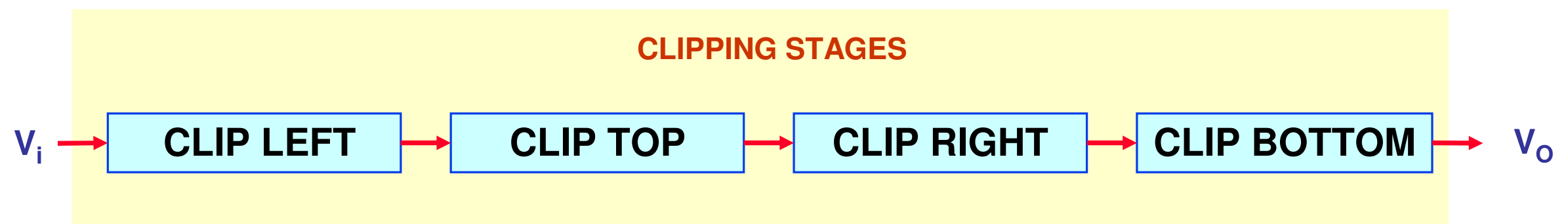
M. Próspero

Algoritmo de Sutherland-Hodgman

O polígono [A B C D] atrás exemplificado foi transformado em [B C' A' A] pela operação de recorte:



Para um polígono arbitrário, o algoritmo aplica-se por fases sequenciais:

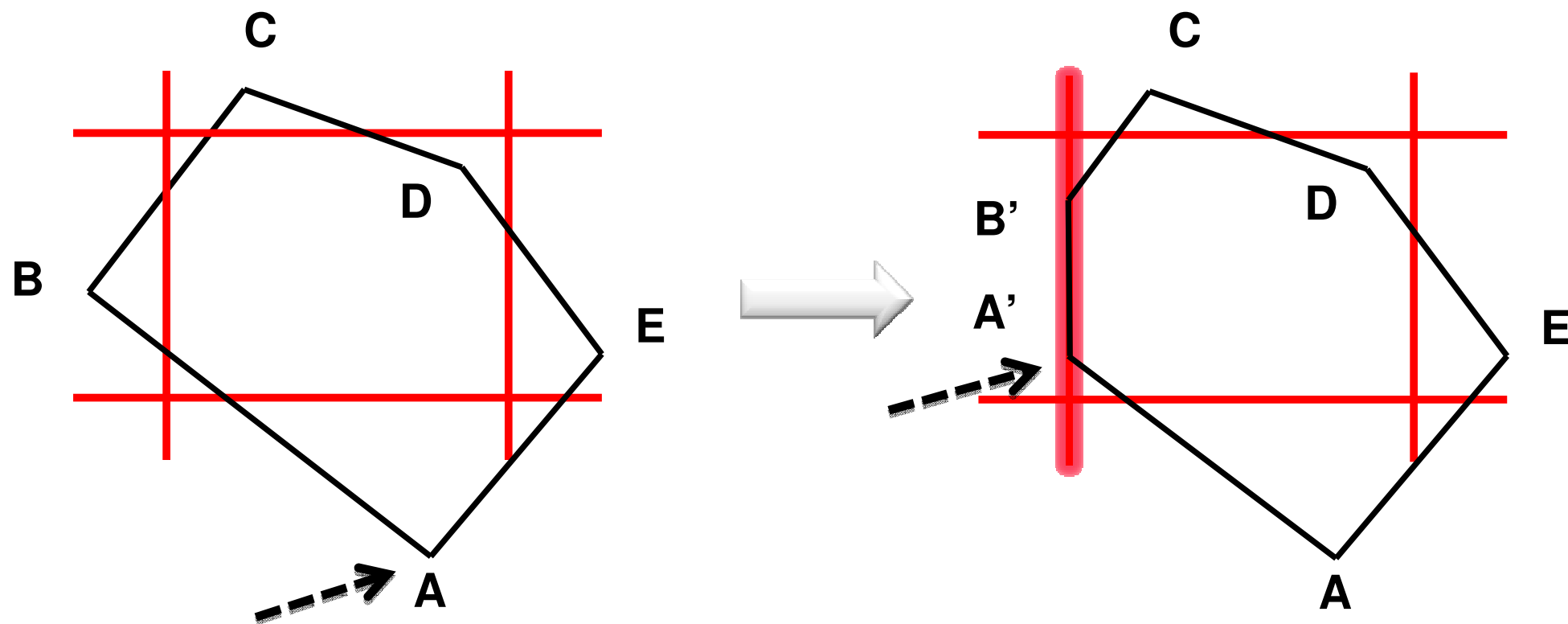


Nota: A ordem destas fases pode ser definida arbitrariamente!

Questão: Como se poderia generalizar este algoritmo aos casos de janelas (convexas) não retangulares?

M.Próspero

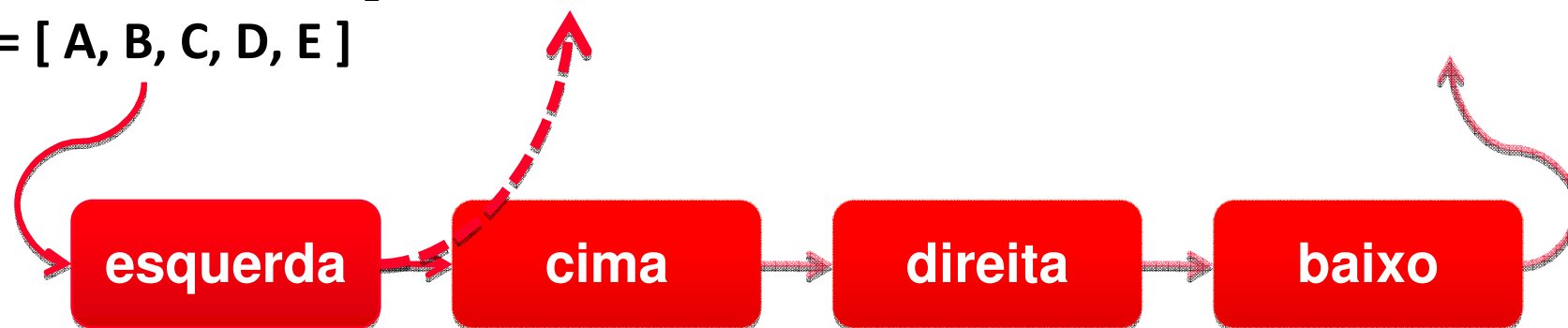
Exemplo



$\text{Vo}_1 = [A, A', B', C, D, E]$

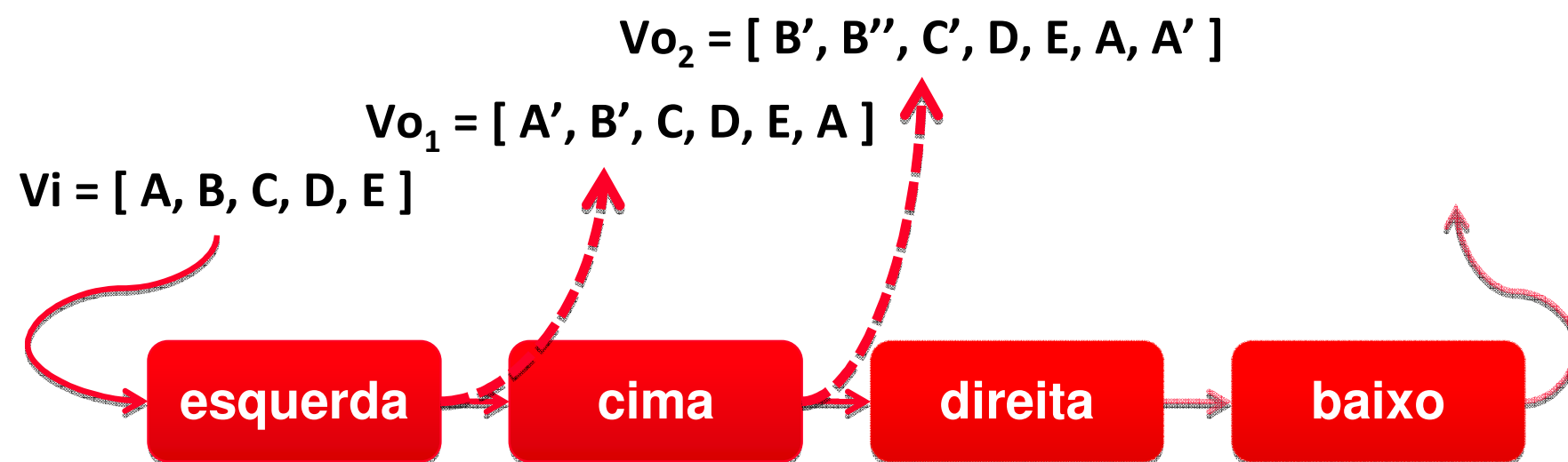
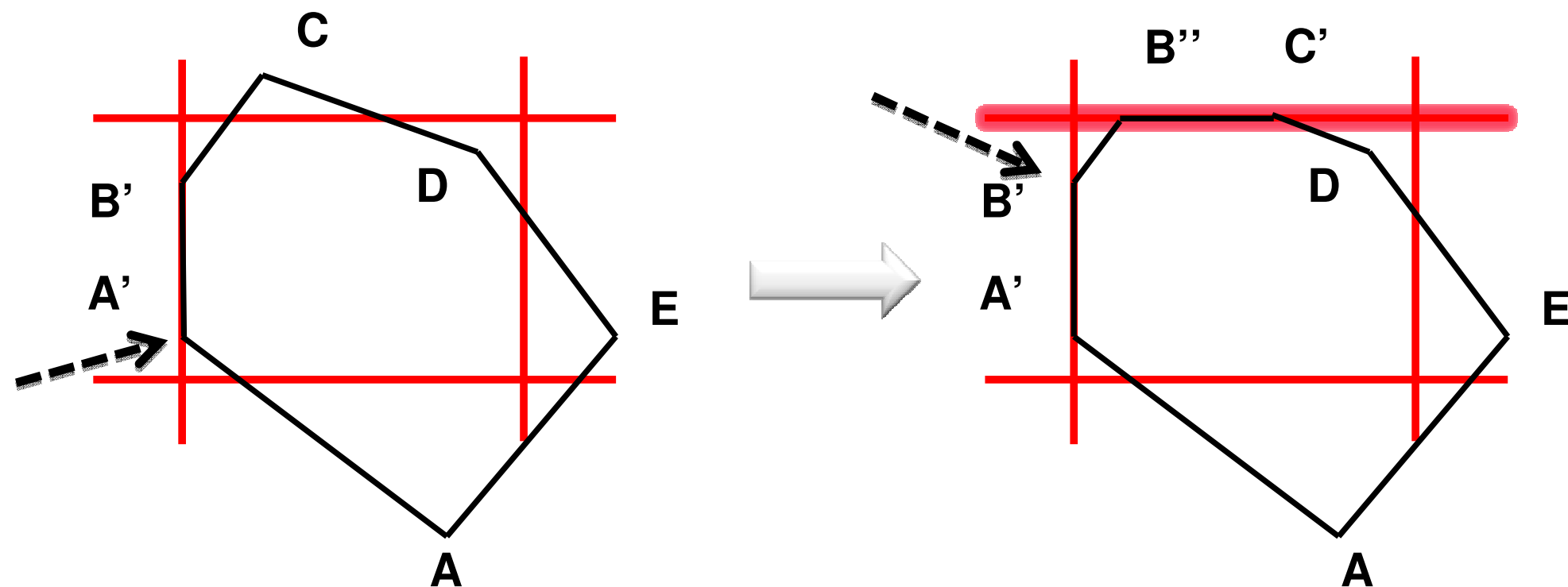
$\text{Vo}_1 = [A', B', C, D, E, A]$

$\text{Vi} = [A, B, C, D, E]$



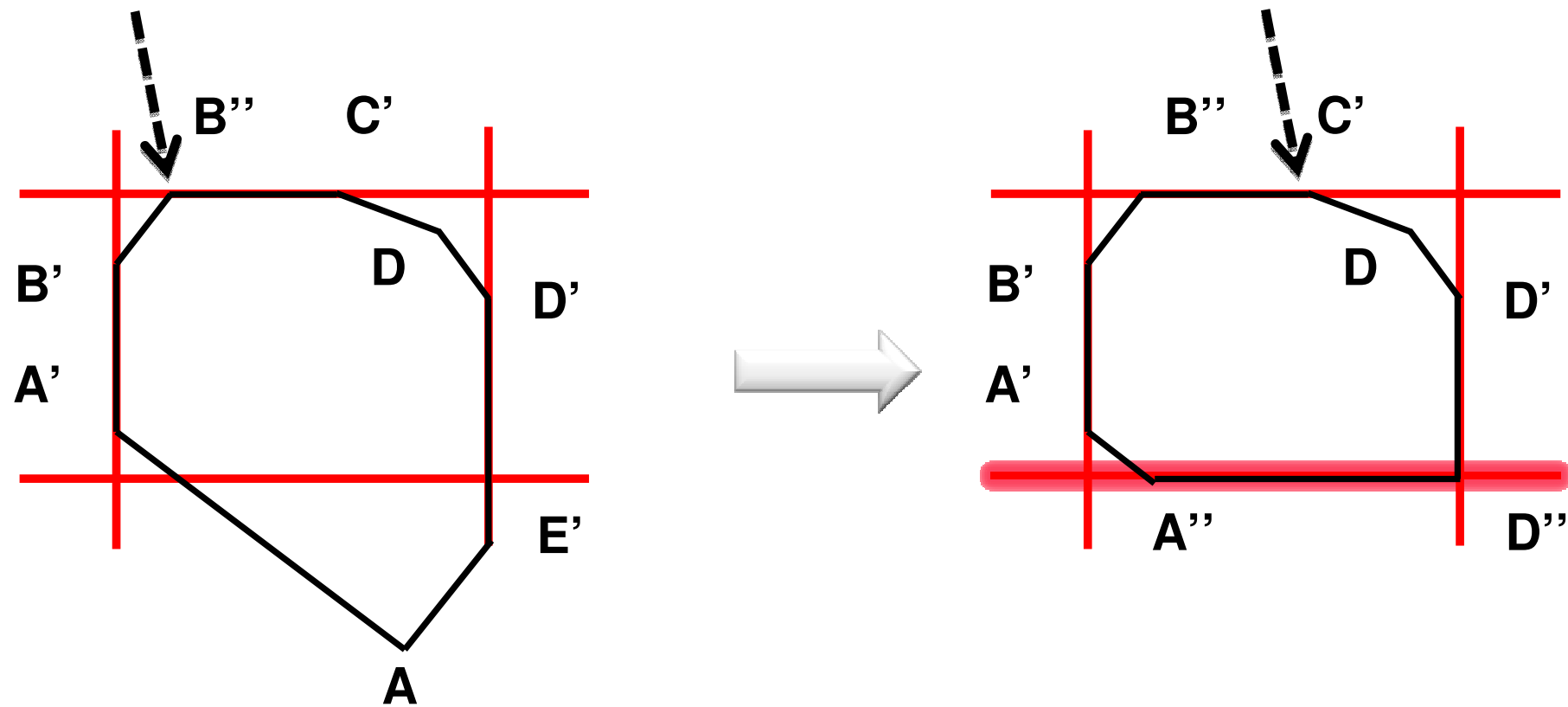
Autor: Adriano Lopes

M. Próspero



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M. Próspero



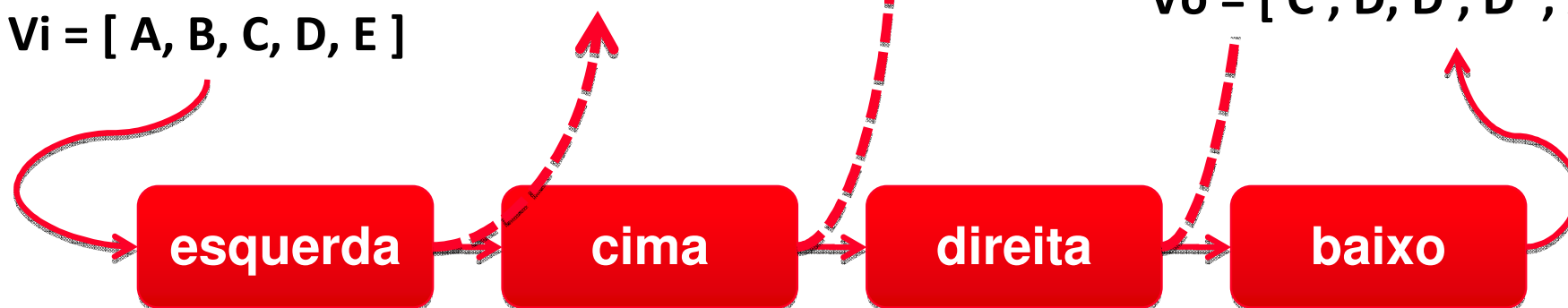
$$Vo_3 = [B'', C', D, D', E', A, A', B']$$

$$Vo_2 = [B', B'', C', D, E, A, A']$$

$$Vo_1 = [A', B', C, D, E, A]$$

$$Vi = [A, B, C, D, E]$$

$$Vo = [C', D, D', D'', A'', A', B', B'']$$



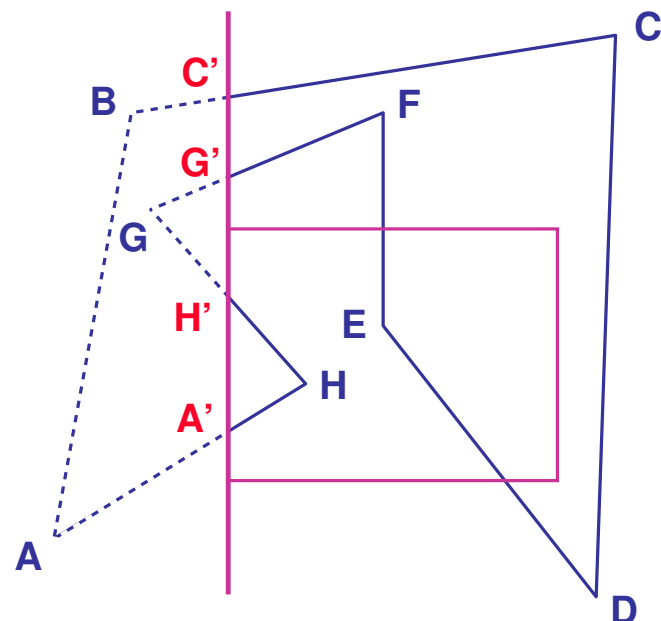
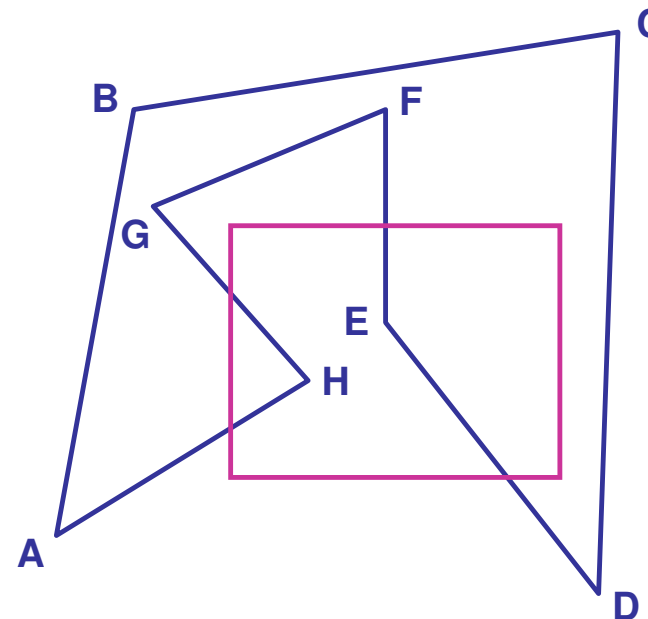
Autor: Adriano Lopes

M. Próspero

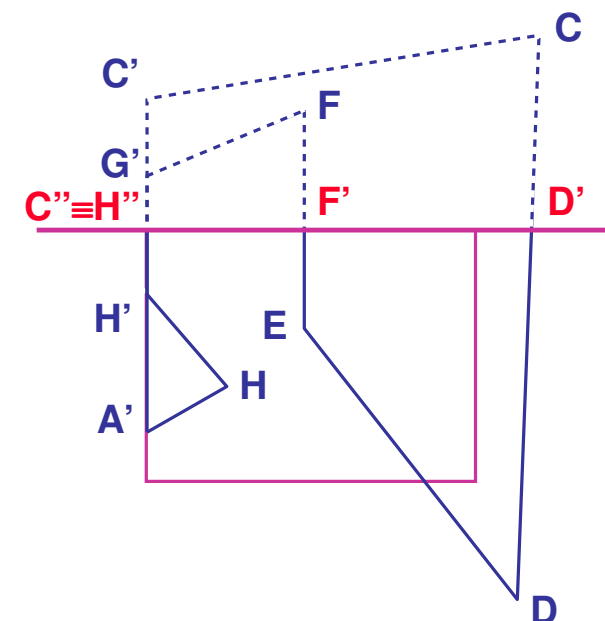
Algoritmo de Sutherland-Hodgman - EXEMPLO MAIS COMPLEXO (Polígono não convexo) :

Os nomes dos novos nós são perfeitamente convencionais

$V_i = [A B C D E F G H]$



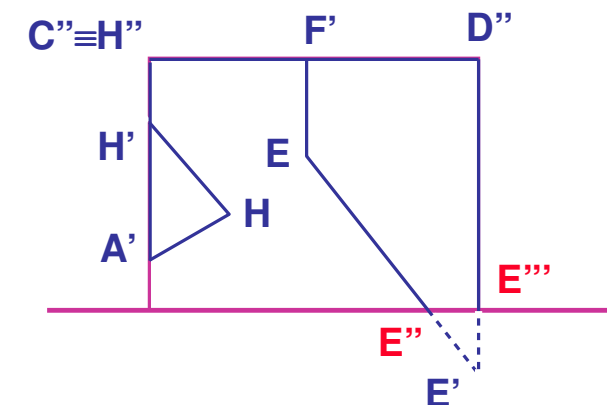
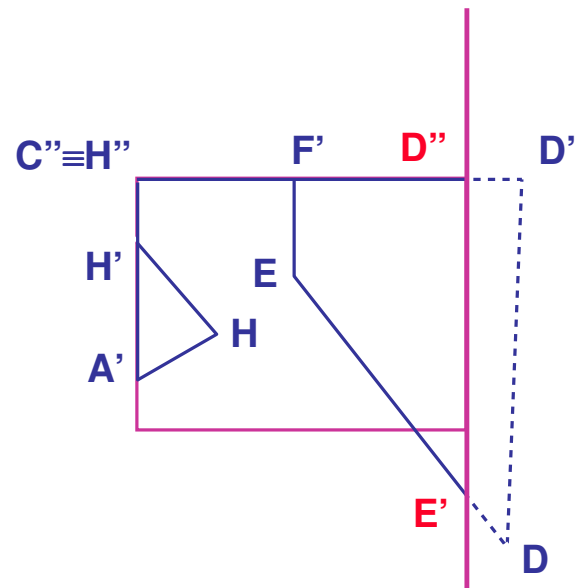
$V_{O1} = [C' C D E F G' H' H A'] = V_{i2}$



$V_{O2} = [D' D E F' H'' H' H A' C''] = V_{i3}$

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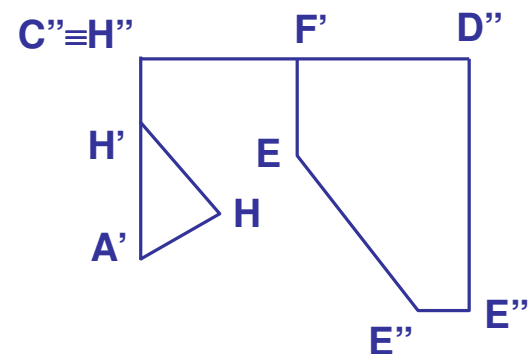
Algoritmo de Sutherland-Hodgman - (conclusão)



$$V_{O3} = [E' E F' H'' H' H A' C'' D''] = V_{i4}$$

$$V_{O4} = [E'' E F' H'' H' H A' C'' D'' E'''] = V_o$$

Polígono recortado:



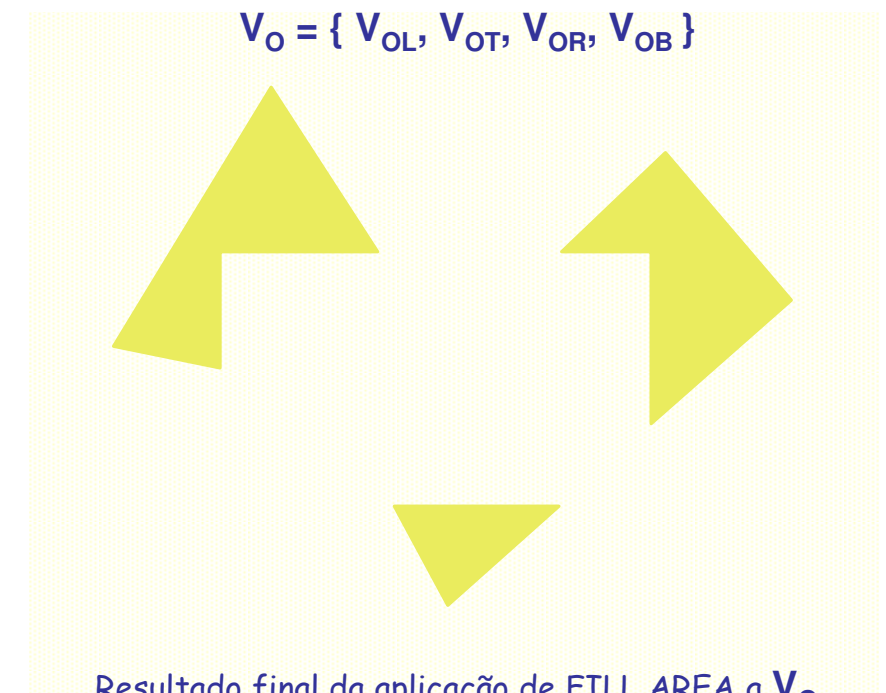
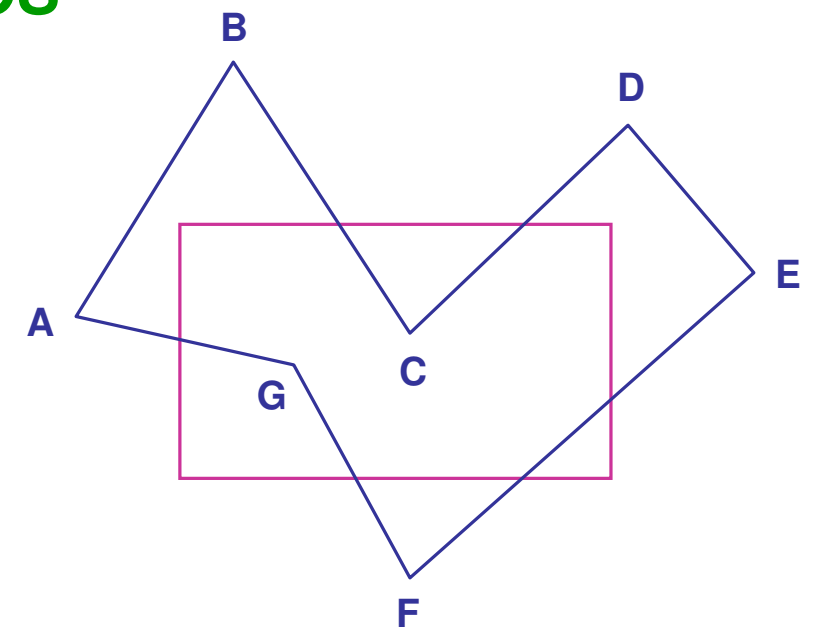
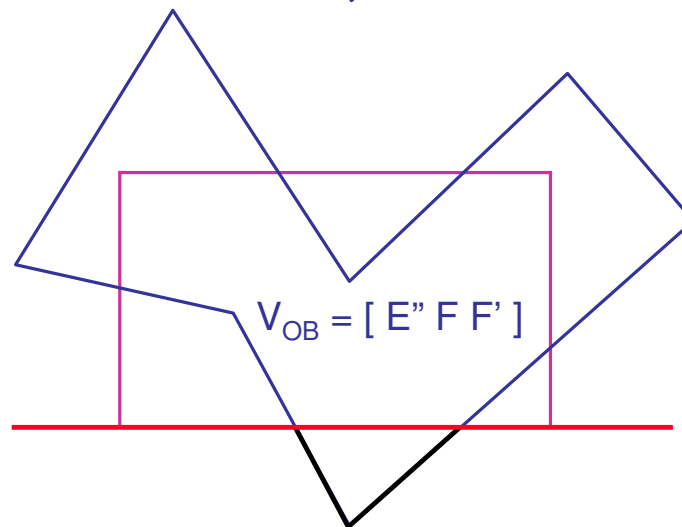
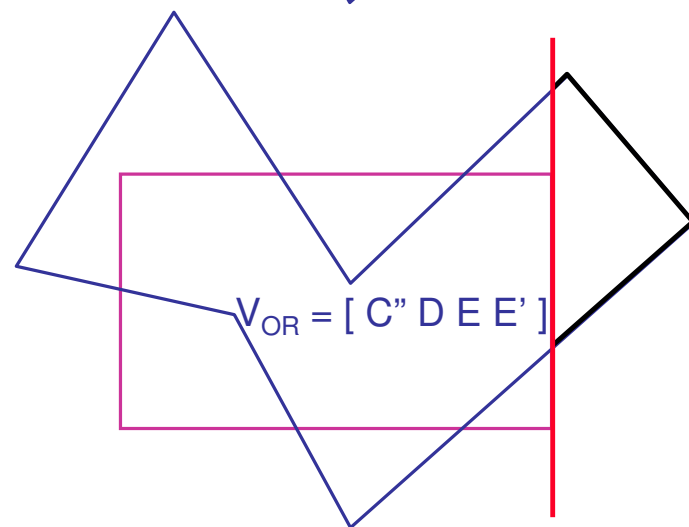
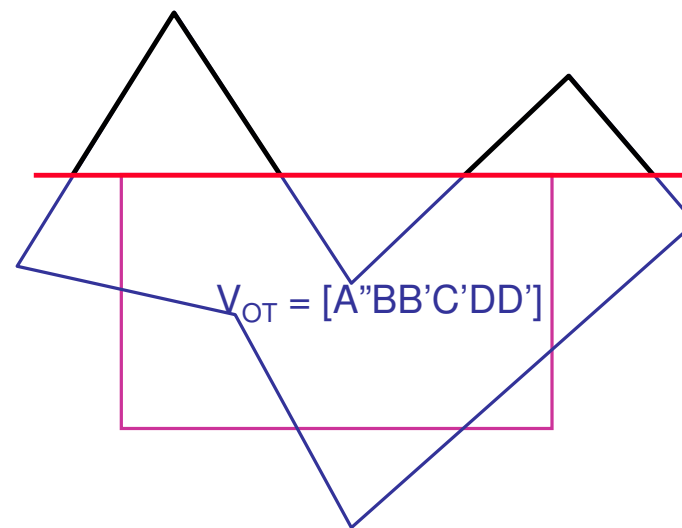
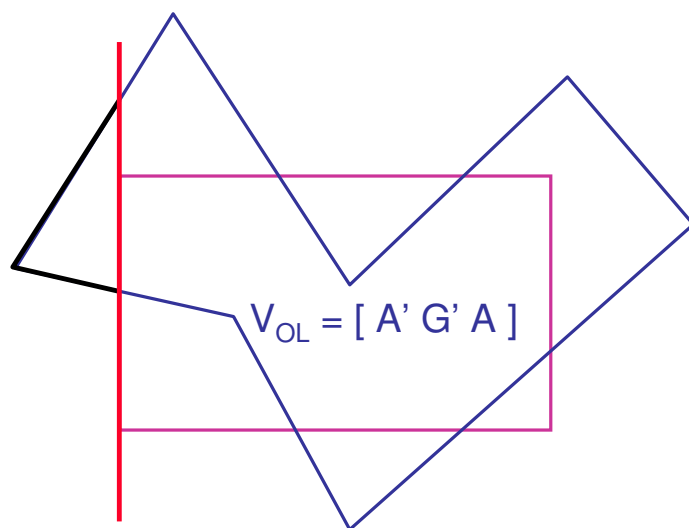
Exercício proposto:
aplicar o algoritmo
de FILL AREA ao
resultado.

O algoritmo de Sutherland-Hodgman pode gerar arestas estranhas (como $F'H''$ ou $H''H'$) aos polígonos não convexos, com possibilidade de serem eliminadas apenas em pós-processamento. No entanto, não haverá problemas desse género se se recortar um qualquer polígono convexo.

M. Próspero

RECORTE de POLÍGONOS

Variante: RECORTE EXTERIOR (SHIELDING *or* BLANKING)



Resultado final da aplicação de FILL AREA a V_o
 (as sobreposições não são evitadas!)

M.Próspero