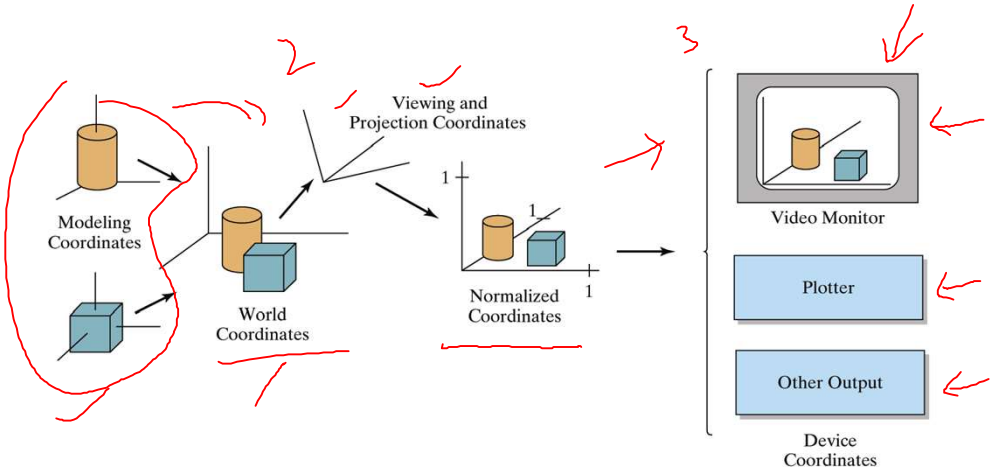
Two-Dimensional Viewing
&
Polygon Clipping

1

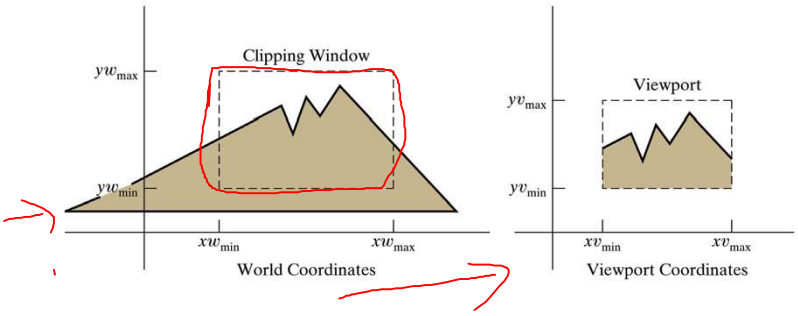
Viewing Pipeline



2

Two-Dimensional Viewing

- The two dimensional viewing is a transformation process of real world object into position point which is relative to the viewing volume
- Two dimensional viewing transformation
  - From world coordinate scene description to device (screen) coordinates



3

Clipping

- Remove portion of line outside viewport or screen boundaries
- Two approaches:
  - Clip during scan conversion: per-pixel bounds check, or span endpoint tests.
  - Clip analytically, then scan-convert the modified primitive.

4

Two-Dimensional Clipping

- Point clipping – trivial
- Line clipping
- Polygon clipping

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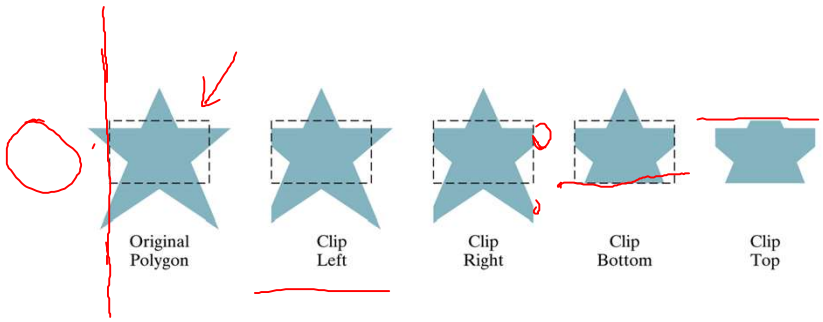
Polygon clipping

- Sutherland-Hodgeman Algorithm
  - clip against 4 infinite clip edge in succession



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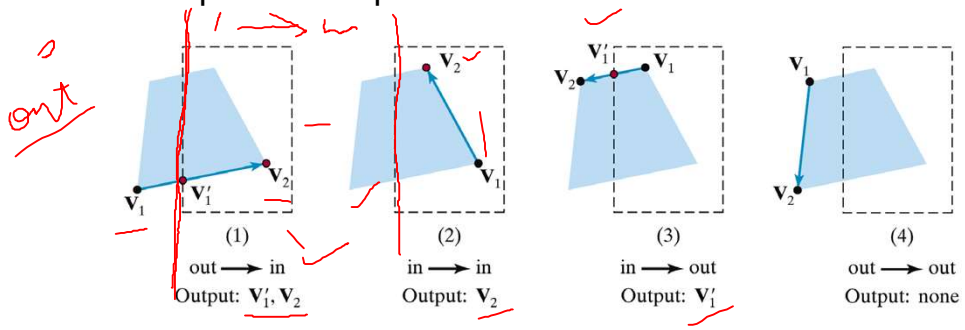
Sutherland-Hodgeman Algorithm

- Accept a series of vertices (polygon) and outputs another series of vertices
- Four possible outputs



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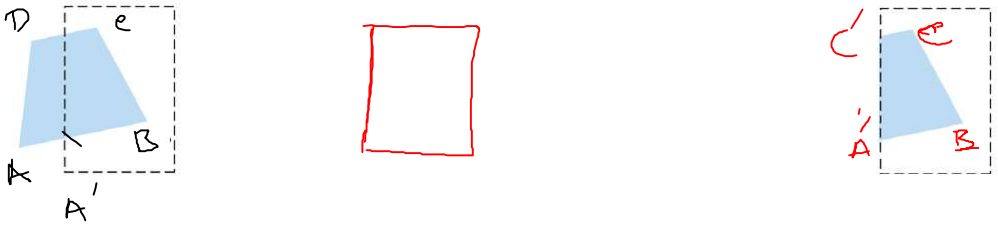

Vertex | Case | Output

AB | out - in | A' B

BC | in - in | C

CD | in - out | e'

DA | out out | none

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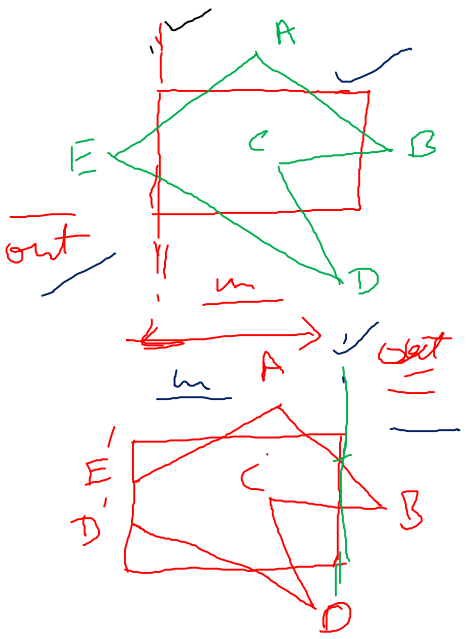

Vertex	Case	output
A B	in - in	B
B C	in - in	C
C D	in - in	D
D E	in out	D'
E A	out in	E' A

vertex	Case	output
A B	in - out	A'
B C	out - in	B' C
C D	in - in	D
D D'	in - in	D'
D' E'	in - in	E
E' A	in - in	A

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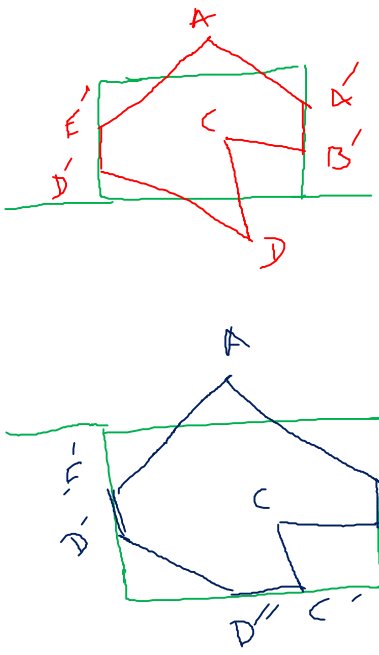

Vertex	Case	output
A A'	in - in	A'
A' B'	in - in	B'
B' C	in - in	C
C D	in - out	C'
D D'	out - in	D'' D'
D' E'	in - in	E'
E' A	in - in	A

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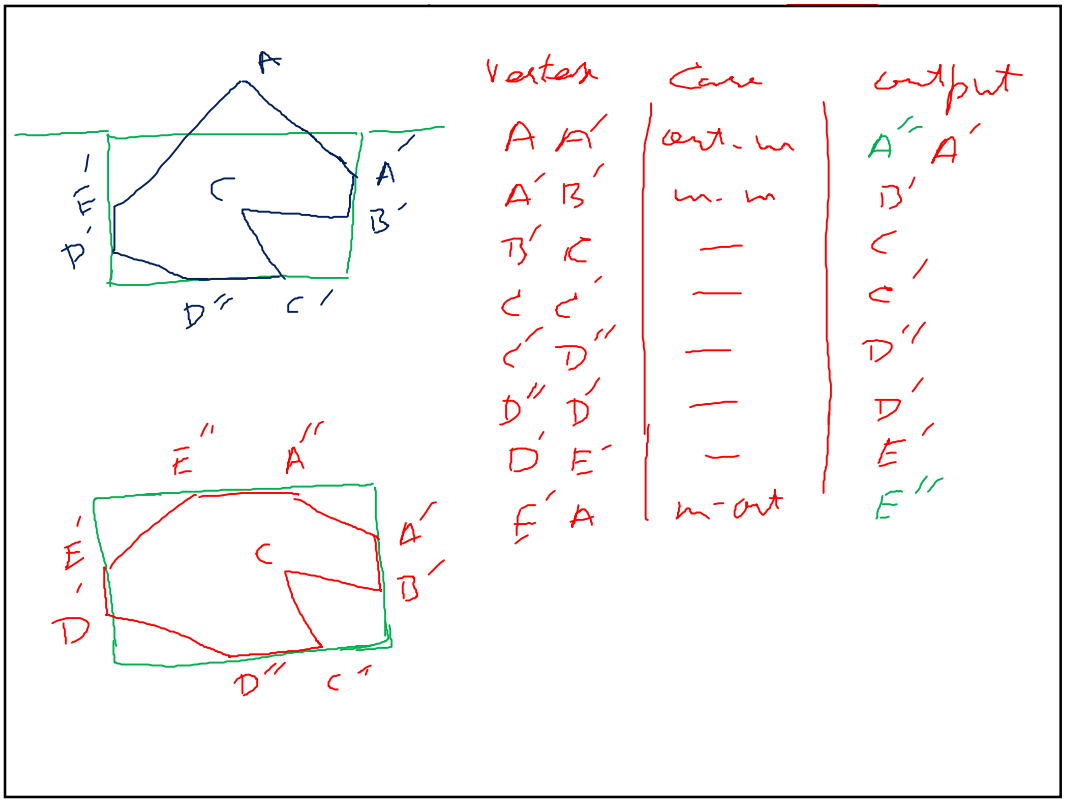
A
A'
B'
C
C'
D''
D'
E'
Vertex
Case
output
A A'
out - in
A''
A'
A' B'
in - in
B'
B' C'
—
C'
C C'
—
C'
C' D''
—
D''
D'' D'
—
D'
D' E'
—
E'
E' A
in - out
E''
E''
A''
A'
B'
C
D''
C'
D

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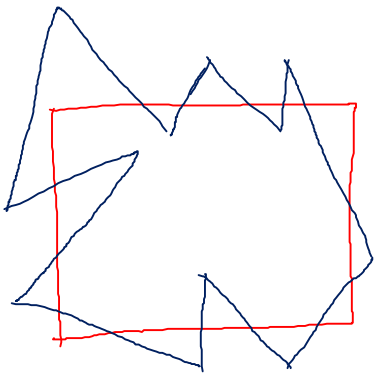

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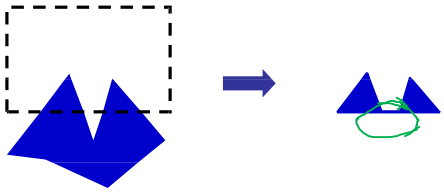
Sutherland-Hodgeman Algorithm

- The algorithm correctly clips convex polygons, but may display extraneous lines for concave polygons.



  - How clip?

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