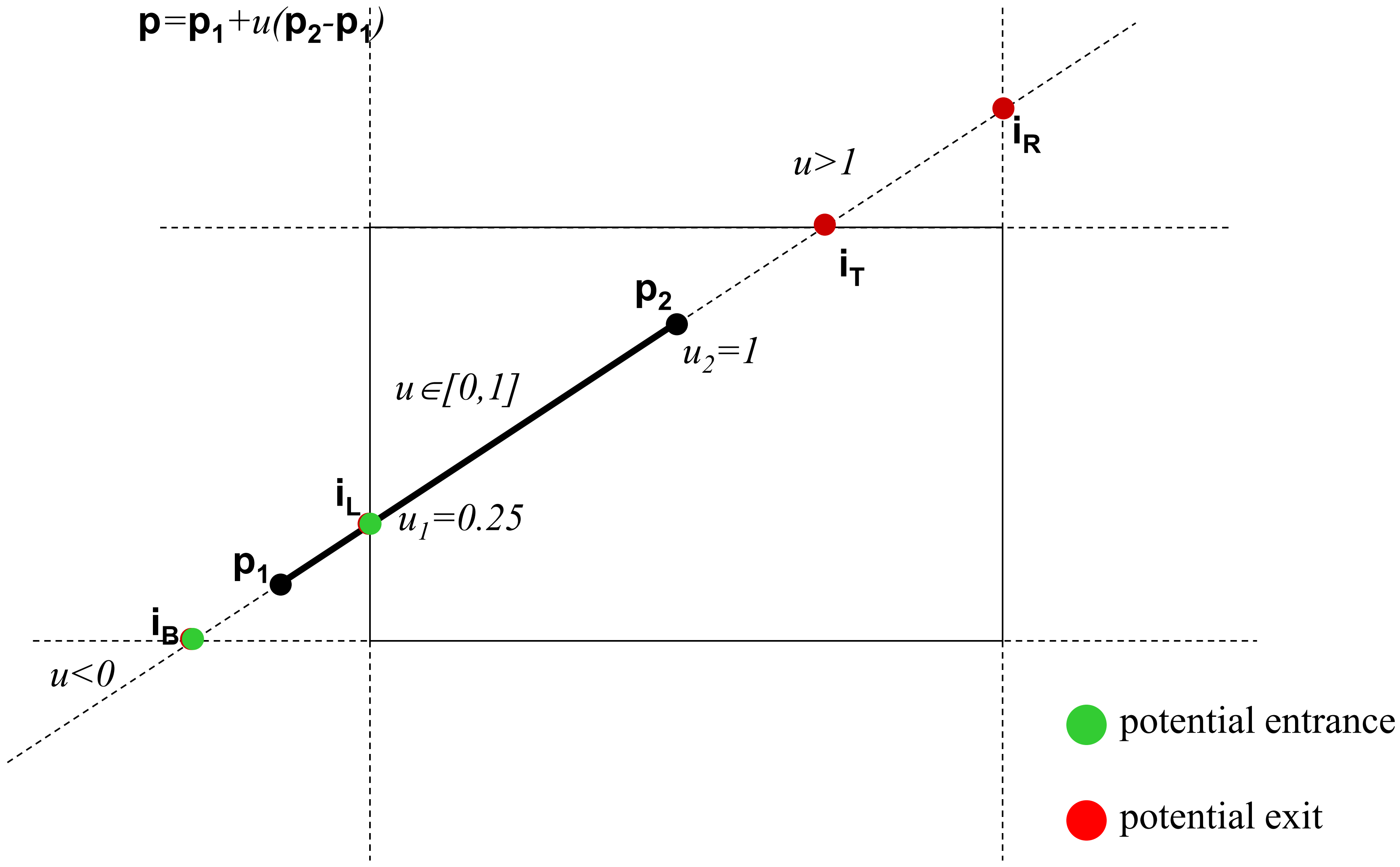
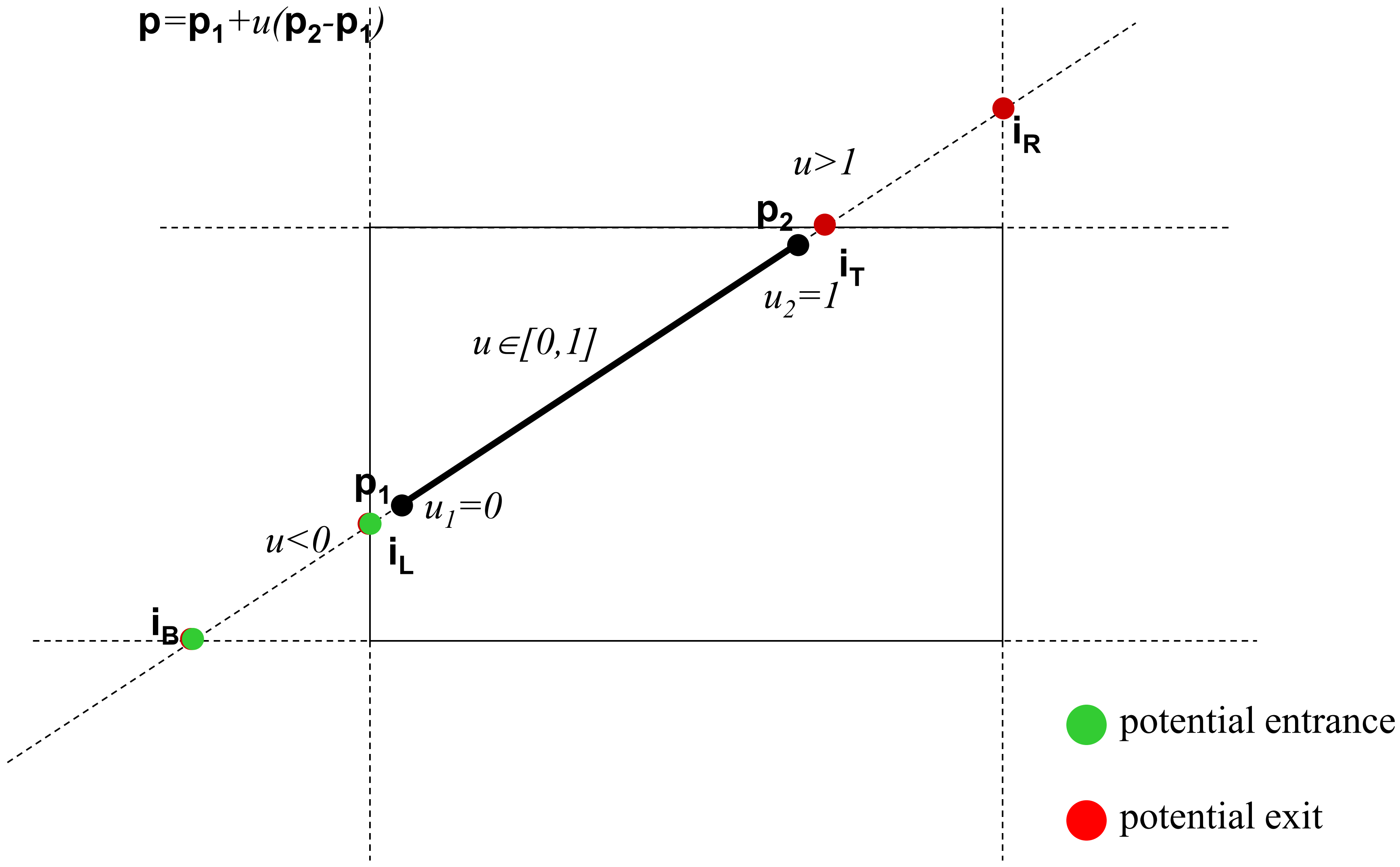
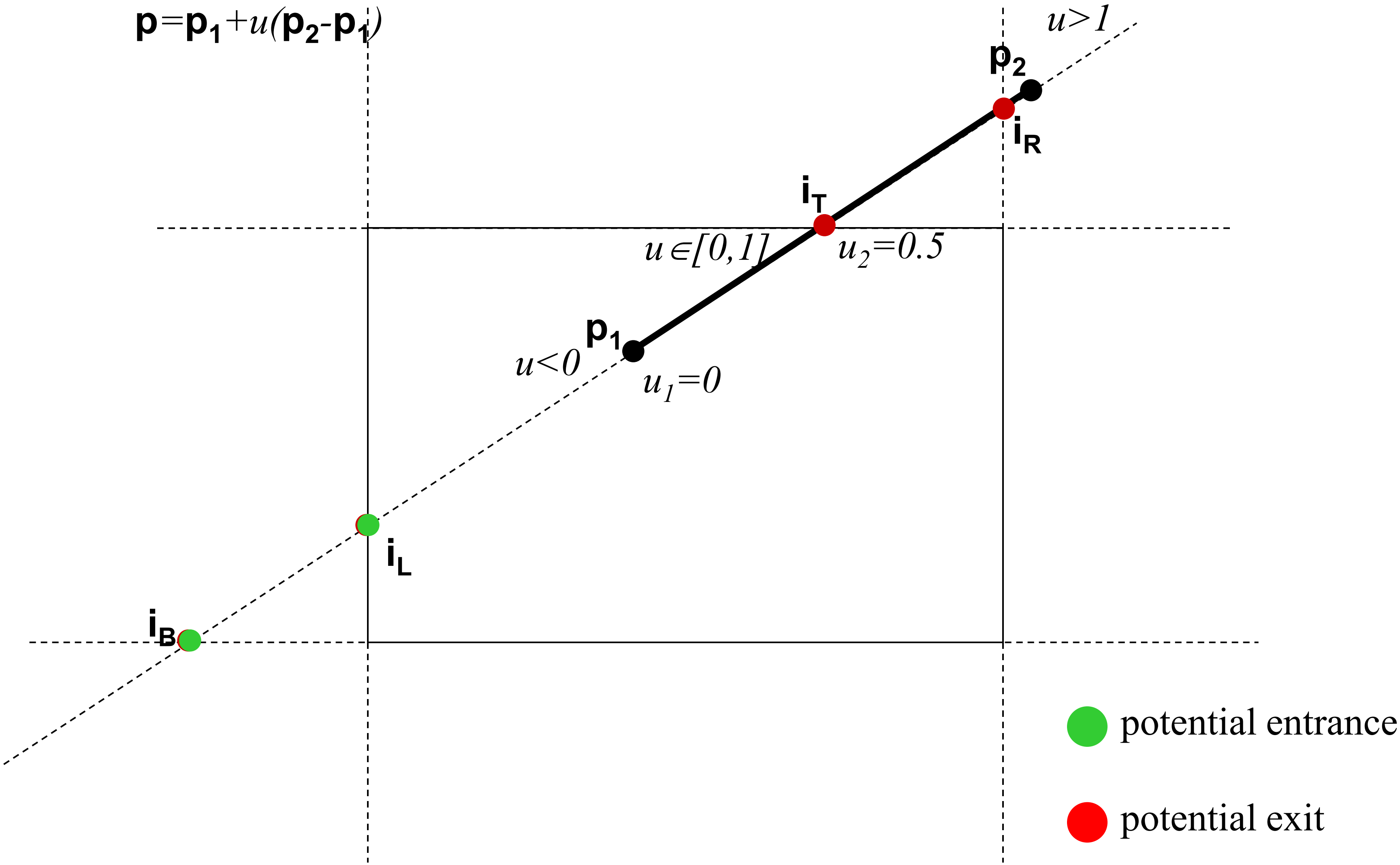
# Liang-Barsky Line Clipping: Observation



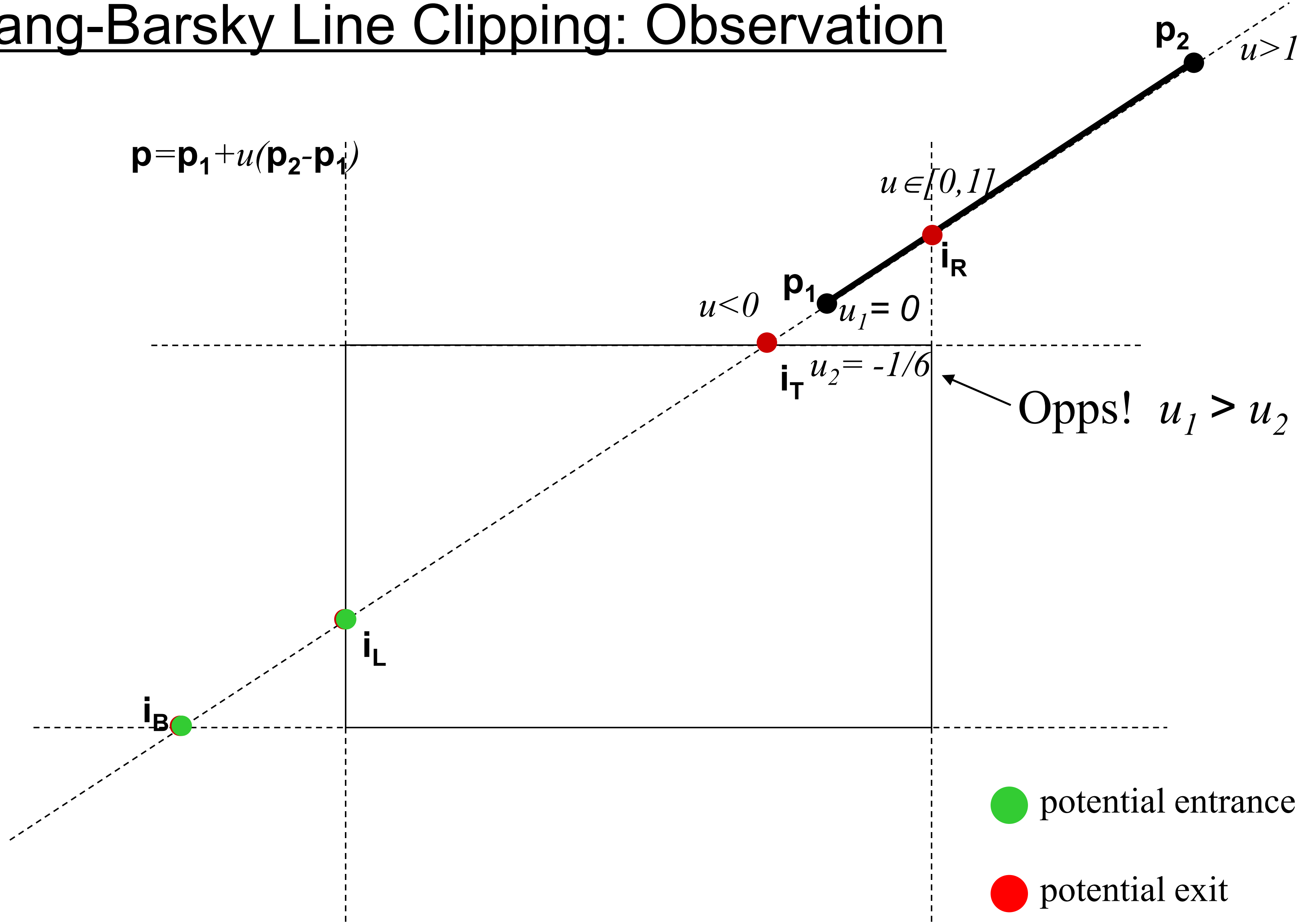
# Liang-Barsky Line Clipping: Observation



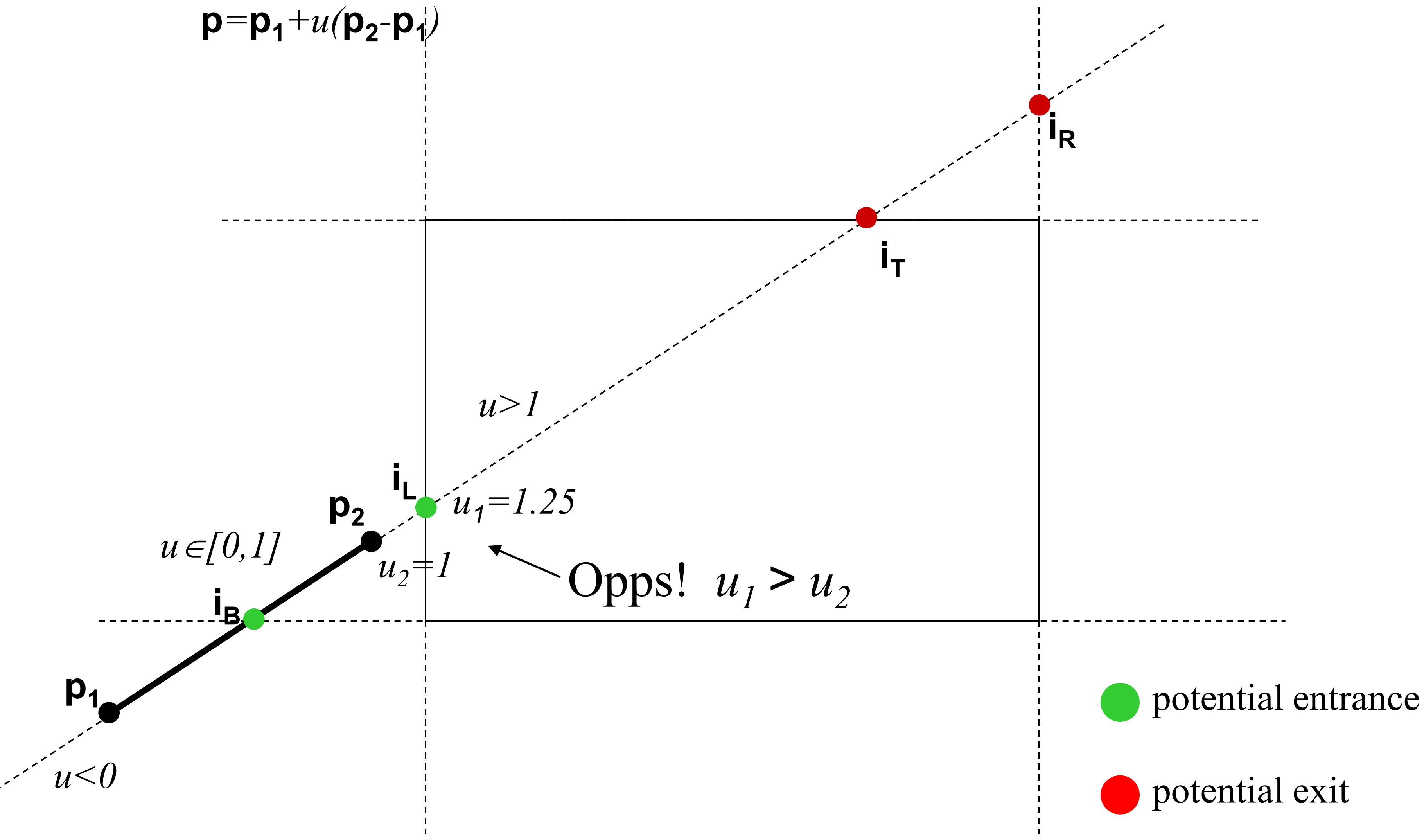
# Liang-Barsky Line Clipping: Observation



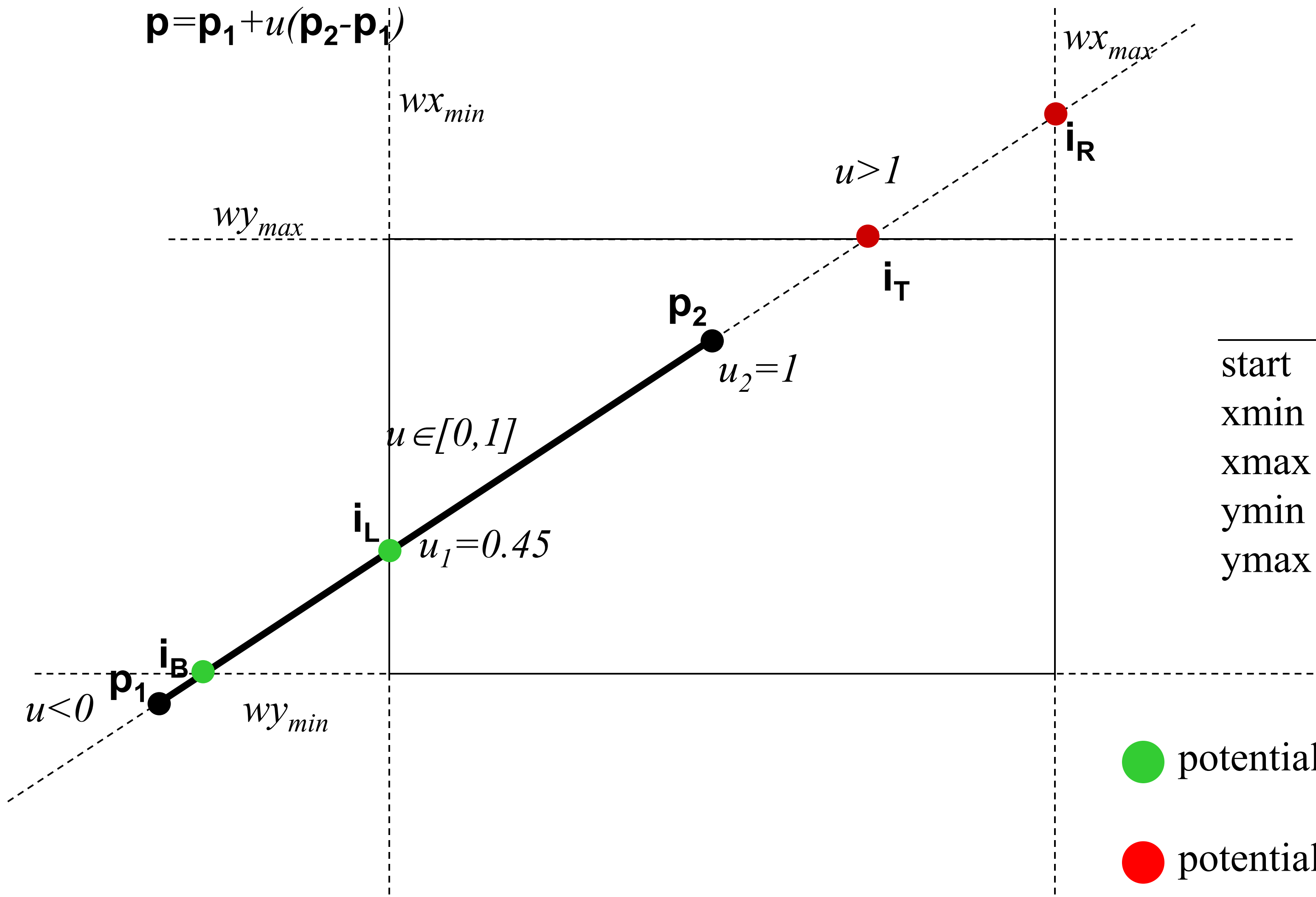
# Liang-Barsky Line Clipping: Observation



# Liang-Barsky Line Clipping: Observation



# Liang-Barsky: Algorithm

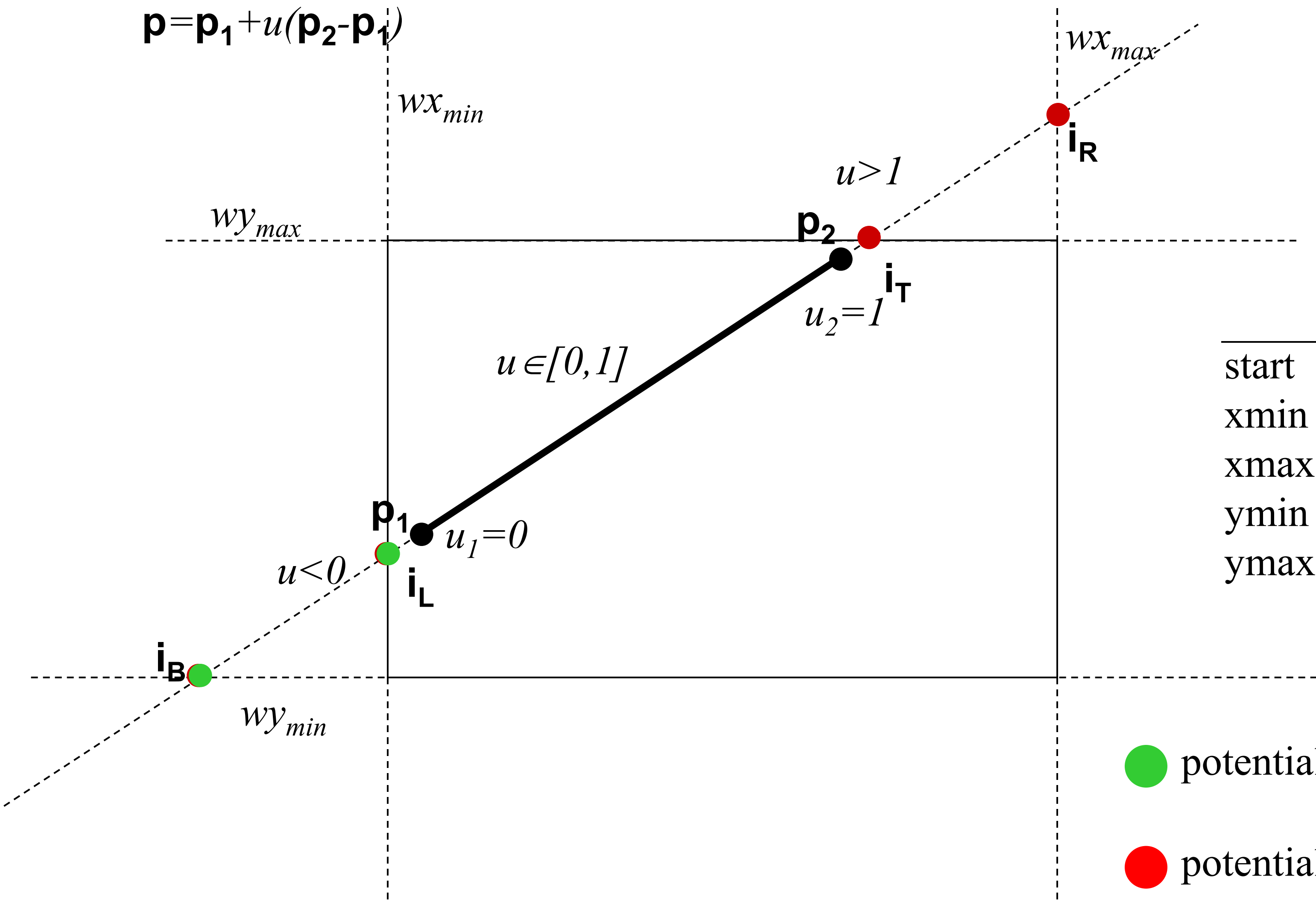



| | $u_1$ | $u_2$ |
|---|---|---|
| start | 0 | 1 |
| xmin | u($\mathbf{i}_L$) | 1 |
| xmax | u($\mathbf{i}_L$) | 1 |
| ymin | u($\mathbf{i}_L$) | 1 |
| ymax | u($\mathbf{i}_L$) | 1 |

● potential entrance

● potential exit

# Liang-Barsky: Algorithm

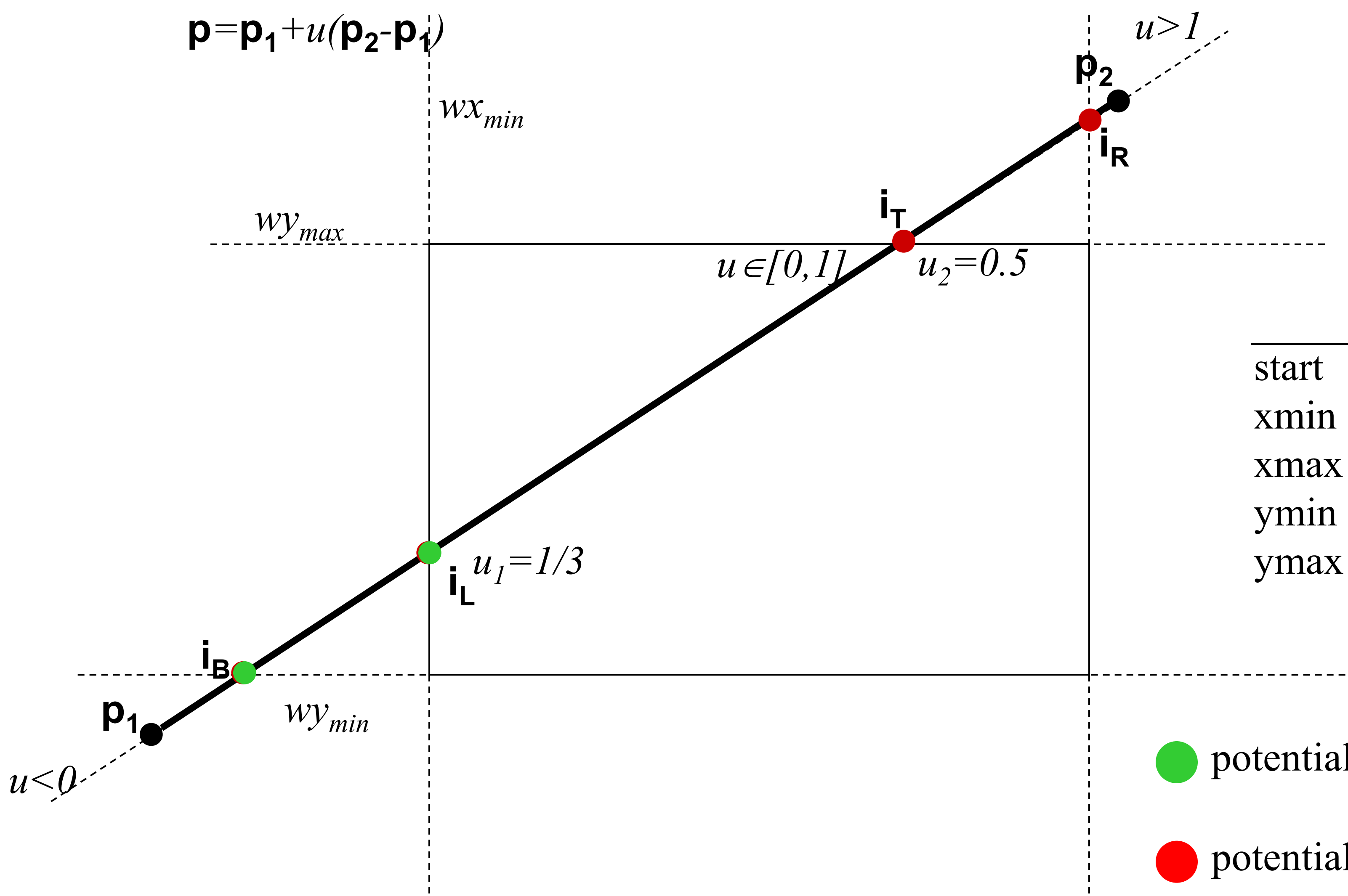



| | $u_l$ | $u_u$ |
|---|---|---|
| start | 0 | 1 |
| xmin | 0 | 1 |
| xmax | 0 | 1 |
| ymin | 0 | 1 |
| ymax | 0 | 1 |

potential entrance

potential exit

# Liang-Barsky: Algorithm




| | $u_1$ | $u_2$ |
|---|---|---|
| start | 0 | 1 |
| xmin | u($\mathbf{i}_L$) | 1 |
| xmax | u($\mathbf{i}_L$) | u($\mathbf{i}_R$) |
| ymin | u($\mathbf{i}_L$) | u($\mathbf{i}_R$) |
| ymax | u($\mathbf{i}_L$) | u($\mathbf{i}_T$) |

potential entrance

potential exit

# Liang-Barsky: Pseudo-Code

- Conceptually:
  Test and update $u_1$ and $u_2$ against each of 4 edges of clip window and
  if $u_1$ and $u_2$ swap positions
    return empty intersection
  otherwise
    use $u_1$ and $u_2$ to compute actual entrance and exit points

- Details:

  -compute $u$ of intersection with each window edge as follows:

*separated coordinate equations of* **p**=**p₁**+$u$(**p₂**-**p₁**)

$$u_{xmin} = \frac{-\Delta x}{x_0 - xw_{min}}, u_{xmax} = \frac{\Delta x}{xw_{max} - x_0}$$

$$u_{ymin} = \frac{-\Delta y}{y_0 - yw_{min}}, u_{ymax} = \frac{\Delta y}{yw_{max} - y_0}$$

  -horizontal or vertical lines: when numerator = 0 test
    sign of denominator

# Liang-Barsky vs Cohen-Sutherland

- LB generally more efficient:
  - LB: updates of $u_1$ and $u_2$ use one division, window intersections computed only once with final $u_1$ and $u_2$
  - CS: may repeatedly calculate intersections along a line, even if line is totally exterior to clip window and each intersection computation uses division and multiplication