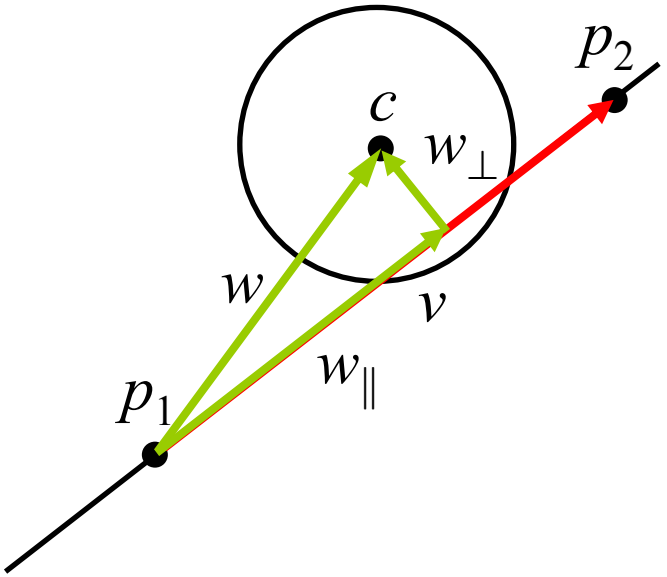
# Collide ball and line segment




$$v = p_2 - p_1$$
$$w = c - p_1$$
$$w_\parallel = v(w \cdot v)/|v|^2$$
$$w_\perp = w - w_\parallel$$

$$d = |w_\perp|$$

Condition for intersection with the line: $d \geq r$

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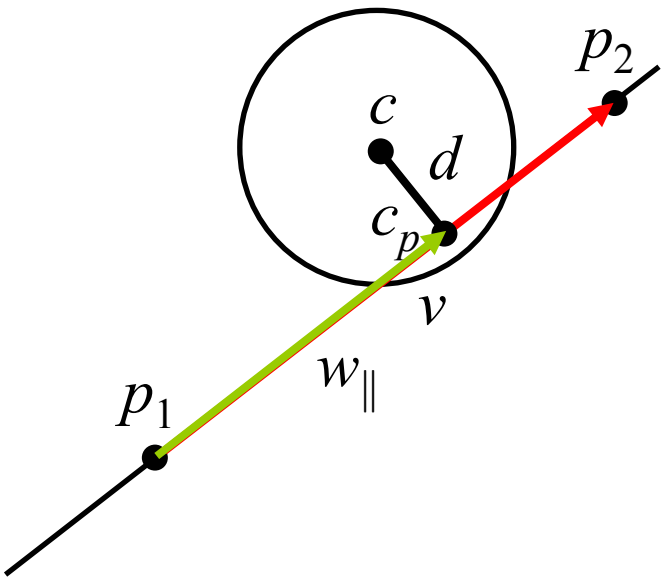
- Need to determine if the intersection with the line is between $p_1$ and $p_2$ or not
- approximate approach: overlap

  is small, so pretend the ball touches line at $c_p$




$c_p$ on the same side as $p_2$ from $p_1$:

$$w \cdot v \geq 0$$

$c_p$ closer to $p_1$ then $p_2$:

$$|w| \leq |v|$$

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- Collision (approximate) if:
  $d \leq r$ and $w \cdot \mathrm{v} \geq 0$ and $|w| \leq |v|$
- Precise collision: need to compute two intersections, check if at least one is inside

# Update velocity

- Assume no energy lost
- The component of the velocity $u$ **along** the line segment is preserved, the other reflected
- $u_{\perp} = u - v\,(u \cdot v)\,/|v|^2$
- $u_{updated} = \; u_{\parallel} - u_{\perp} = u - 2\,u_{\perp}$