🎯 Hitbox & Bounding Box Fun!

Let's pause Pong and learn some cool game dev tricks! 😎🎮

🟦 What's a Bounding Box?

- 🧊 It's an invisible box around an object.
- 🎯 Games use it to check for collisions!
- 🧠 Simple shapes = faster calculations.
- ❓ Can a circle use a box? (Yes!)

⚡ Why Hitboxes?

- 👾 Hitboxes make games faster and simpler!
- 💥 If boxes overlap, we say there's a hit!
- 🎲 Works for enemies, walls, paddles, balls…

💡 **Bounding Box vs. Hitbox**
(General Idea)

- **Bounding Box**: A rectangle (or sometimes another shape) that contains an object.

- **Hitbox**: The part of the object that is *considered* for collisions — may or may not match the visual shape or bounding box.

🧵 In Tkinter:

- Tkinter shapes like `create_oval`, `create_rectangle`, etc., store their positions as bounding boxes.

- `.coords()` gives you the `[x1, y1, x2, y2]` of the object's bounding box.

- We often use that bounding box directly as a **hitbox**, because it's simple and already available.

👨‍💻 Try It Out in Code!

- 🟩 We'll move one box left with a button.
- 🔍 If boxes touch: Collision!
- 🎨 Boxes change color to show hit.
- ❓ What will happen when they collide?

?Question?

❓ Why does it 'collide' if the shapes aren't touching?

Hint: Bounding Box!

💻 Bounding Box Logic

- if (pos1[2] >= pos2[0] and pos1[0] <= pos2[2]
- and pos1[3] >= pos2[1] and pos1[1] <= pos2[3]):
- 💥 Collision!
- else: No collision

?Question?

❓ Can you imagine a time when the hitbox should be smaller than the object?

Hint: Should you lose a life/game over because your cape touched an enemy?

⚙️ In Other Languages/Libraries:

✅ **Examples of libraries that may use or allow custom hitboxes:**
- **Pygame (Python):**

  - `Rect` objects are common for collisions, but you can define your own hitbox logic.

- **Unity (C#):**

  - Uses colliders (`BoxCollider`, `CircleCollider`, `PolygonCollider`) for hit detection.

- **Godot (GDScript):**

  - Supports bounding boxes but allows custom collision shapes per sprite.

- **Scratch (Block-based):**

  - Uses a pixel-perfect "costume touching" detection, which is more accurate than bounding boxes.

🧠 Wrap-Up Questions

- 🕹️ How does this apply in our Pong game?
- 🎉 Next up: build the Paddle!