RBE 550 – HW4 Section 6.3: Collision Checker

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*Overview of SAT Collision-Checker*

The collision-checker module uses the **Separating Axis Theorem (SAT)** to test overlap between the vehicle’s oriented bounding box (OBB) and obstacle polygons.  
For each polygon edge, an outward normal defines a projection axis. If any axis yields non-overlapping projection intervals, the polygons are disjoint and the pose is collision-free.  
Figures 1 and 2 illustrate detected and non-detected overlap cases, while Fig. 3 shows the decision flow used in the implementation.

***SAT-based Collision Check pseudo code***

COLLIDES(pose, obstacles) returns True if a collision is detected.

Function COLLIDES(pose, obstacles):

  veh\_rect ← oriented box for vehicle footprint

  For each obstacle polygon:

   If polygons overlap via Separating Axis Theorem: return True

  return False

***Collision checker:***

Fig. 1 — Collision case (annotated).

The vehicle’s-oriented rectangle overlaps an obstacle polygon; SAT finds no separating axis and collision detected.

A screenshot of a computer

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Fig. 2 — Clear case (annotated). The vehicle’s rectangle is near the obstacle but not overlapping; a separating axis exists and no collision.

A screen shot of a computer

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Fig. 3 — Another example of clear case (annotated). The vehicle’s rectangle is near the obstacle but not overlapping; a separating axis exists and no collision.

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**Fig. 4 — SAT Collision-Checking Flowchart**

A diagram of a collision check

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