Modern collision detection

The biggest issue in modern collision detection is the handshake problem, Basically means every one item you add to a given scene you must compare it with everything that already exists in that scene Given that a single character could have multiple colliders to determine where exactly an object hits the character,It is expected that comparing every collider against every other collider in a scene is unfeasible.To get around this process of determining collision detection is usually split up into two phases.

***The broad phase :*** In this phase we use axis aligned bounding boxes AABB’s To break up the colliders in our scene into collision islands.This phase is not meant to be accurate but it is meant to be quick and very efficient. The main algorithm used here is the sort and sweep algorithm which is a very efficient algorithm which scales well on the numbers of colliders in the scene .At the end of the broad phase we cannot determine whether an actual collision has occurred But we can say with certainty that if a collision is to occur it will occur between two colliders in the same collision island. In general these islands will consist of much fewer colliders thus eliminating the difficulties encounters with the Handshake problem.

***The narrow phase :*** In this phase each of the collision islands are examined in isolation. While the broad phase used axis aligned bounding boxes,The narrow phase use is the more accurate oriented bonding boxes contained within the axis aligned multi boxes.

# Time considerations

Collisions can only be determined at a given frame,So If we consider a fast moving small object such as a bullet, it is entirely conceivable that there would be space between a current collider for the bullet in this frame and the Collider of the bullet in the previous frame, and between the collider of this frame and that of the next and so on. Any collider that occupies those gaps for those frames will not intersect with the bullet collider. If collision detection is only done on a frame per frame basisand we have passed moving objects such as the case above we can expect collisions that should have occurred not to be detected.

There are multiple ways to deal with this issue typically fast moving objects such as bullets are done instantaneously, i.e. in one frame, with a ray cast.

Alternatively the bonding region for the bullet could be extended from the current frame and over and including the previous frames collider.