Scaler Dot Product

By Michael Edgar

The scaler dot product of two vectors is used to find if two vectors are facing each other. It is calculated using the following formula:

V = (V1, V2, V3 … Vn)

U = (U1, U2, U3 … Un)

V.U = (V1\*U1) + (V2\*U2) + (V3\*U3) + … (Vn\*Un)

If the value of the scaler dot product is positive, the two vectors are facing the same direction, if they are negative the vectors are facing in different directions and if the dot product is 0, the two vectors are perpendicular.

Example: V = (3, 4, -2) U = (2, -2, 6)

V.U = (3\*2) + (4\*-2) + (-2\*6)

V.U = 6 + (-8) + (-12)

V.U = 6 -8 -12

V.U = -14 since -14 < 0 the angle between V and U is greater than 90 degrees.

# 2014 Winter Exam

1. Mathematics and in particular vector mathematics would be used throughout games. Given the following situation:

Vector3 roguePosition = new Vector3 (3, 4, 5);

Vector3 victimPosition= new Vector3 (1, 3, 1);

Vector3 rogueForward = Vector3.normalise (new Vector3 (-3, 1,-4));

Vector3 victimForward = Vector3.normalise (new Vector3 (-6, 4, 1));

(i) How far is the rogue from the victim? (2 Marks)

(ii) Derive the vector “rogueToVictim” (2 Marks)

(iii) Determine, by appropriate use of a scalar dot product, whether the rogue is behind the victim. (3 Marks)

(iv) Determine, by appropriate use of a scalar dot product, whether the rogue is facing the victim. (3 Marks)

(v) In World of Warcraft, the class rogue has a move called “Backstab” To be able to use this move the following three conditions must be satisfied.

• The rogue must be behind the victim

• The rogue must be facing the victim

• The rogue must be within 3 yards of the victim.

Can the rogue backstab the victim?

1. RoguetoVictim (RtV) = victimPosition - roguePosition

RtV = (1, 3, 1) – (3, 4, 5) = (-2, -1, -4)

|RtV| =

=

=

= 4.58

1. RtV = (1, 3, 1) – (3, 4, 5) = (-2, -1, -4)
2. RtV = (-2, -1, -4)

victimForward = (-6, 4, 1)

RtV.victimForward = (-2.-6) + (-1.4) + (-4.1)

= 12 – 4 – 4

= 4

4 > 0 -> rogue behind victim

1. RtV.rogueForward = (-2.-3) + (-1.1) + (1.-4)

= 6 – 1 – 4

= 1

1 > 0 -> rogue facing victim

1. Rogue behind Victim? Yes (iii)

Rogue facing Victim? Yes (iv)

Rogue within 3 yards? No (i)

Rogue backstab Victim? No