

T-637-GEDE Game Engine Architecture

Problem Set 1 – Due Monday February 9th, 2015

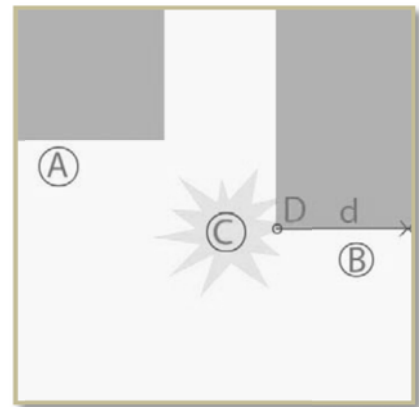
Problem 1 – Engine Design (25%)

Imagine you are starting a game project. You have already chosen a particular genre of a game: A futuristic hover car racing game, set on visually different planets (other details are up to you). What game engine would you use (would you perhaps consider building your own)? Justify your decision by comparing and contrasting some alternatives.

Problem 2 – Applying Math to a 3D Game Problem (25%)

A game character runs down a hallway and notices two enemies. Our character stops and throws a flash grenade towards the enemies, the grenade has a 360 degree blast angle and a blast radius of 8 units. The grenade lands at point $C = (10, 2, 9)$. The moment the flash grenade goes off the enemies are at points $A = (1, 2, 9)$ and $B = (17, 2, 6)$.

As can be seen in the rough sketch of the environment (see figure), there is a corner at point $D = (13, 2, 8)$ that forms the wall $d = \langle 9, 0, 0 \rangle$.



What enemy will be affected by the blast? Assume they only occupy one point in space (i.e. have no “thickness”). Show your calculations.

Please note that the sketch is only there to show approximate locations and cannot be used for precise measurements.

Problem 3 – Game Loop and Object Update (25%)

A player’s pirate ship is sailing at 12 knots per hour towards a harbor. The pirate ship is currently located at $P = (7, 2, 1)$ and is sailing towards the harbor at $H = (-6, 2, 9)$. The game simulation runs at **60 FPS**. Where will the pirate ship be located after one frame if one unit in the Cartesian coordinate system represents one knot? Show your calculations.

Problem 4 – High Resolution Timer (25%)

When considering whether a 32 bit register would be enough to hold a high resolution timer you must consider the clock rate of the CPU. How much time would it take a **32 bit** register to wrap around (start again at 0) on a **2.8 GHz CPU**. Show your calculations