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3D Engine

716051 Tietotekniikka

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Abstract

The project is a from-scratch 3D engine running on Scala FX, written in Scala. Scala FX is mostly a re-skin for Java FX and the two are both functional inside the app. I have taken some functionality from Java FX, regarding the parts in which Scala FX documentation was sparse. The engine is fully scalable with different 3D objects, as long as the data is convertible to the format of three 3d points on a CSV row, each consisting of (x,z,y)-coordinates forming a triangle in a clock-wise order. The project was in my opinion executed on hard-difficulty as the scalability is virtually limitless, and the engine is able to handle all kinds of different shapes.

Differences from the plans

Instead of 2 to 3 coordinates per row, I used 9 to form a single triangle per CSV row. AD-keys are used to move sideways instead of turn, which is entirely handled by the mouse.

The class structure is vastly different as in plans to accommodate the different problems risen during development. More on this later, in part *Program Structure.*

Minimap was scrapped as non-integral part of the program, and mostly redundant, as information is attained with more clarity from the camera.

I’ve decided to also scrape all dependencies regarding calculations and the project runs entirely with my self-defined vector and matrix math. Only real dependency is Scala FX, which requires careful installation, but a ready-made jar file is included.

FOVSelect was a great start to the problem of having objects behind camera field of view, but it required a lot of expansion to get working.

Sources

<https://stackoverflow.com/questions/5666222/3d-line-plane-intersection>

<https://stackoverflow.com/questions/328107/how-can-you-determine-a-point-is-between-two-other-points-on-a-line-segment>

<http://www.ambrsoft.com/TrigoCalc/Plan3D/PlaneLineIntersection_.htm>

<http://www.songho.ca/math/line/line.html#intersect_lineline>

<https://stackoverflow.com/questions/5666222/3d-line-plane-intersection>

<http://eguruchela.com/math/Calculator/shortest-distance-between-point-plane>

<https://stackoverflow.com/questions/6615002/given-an-rgb-value-how-do-i-create-a-tint-or-shade>

<https://www.youtube.com/channel/UC-yuWVUplUJZvieEligKBkA>