MathsDemo Game Manual

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# Maths Demo

This is an application demonstrating matrix hierarchies and collision detection using the lasmath maths library. It contains three games, which the player can switch between using the number bar on their keyboard.

## Controls

|  |  |
| --- | --- |
| **Action** | **Key** |
| Go to Tank Game | 1 |
| Go to Robot Arm Game | 2 |
| Go to 3D Game | 3 |
| Quit | ESC |
| Reset all games | BACKSPACE |

# Tank Game

In this game, the player controls a green tank. The tank can be moved around the screen, stopping if it hits a wall or the screen edge and pushing around other objects it collides with. The tank’s turret is considered a part of the tank. The tank fires bullets from its turret, which bounce off walls and damage other objects in the game. Most objects are destroyed in 1 hit, but the spaceships and beige tank take two hits to destroy.

## Controls

|  |  |
| --- | --- |
| **Action** | **Key** |
| Turn tank | A,D |
| Turn turret | Q,E |
| Move forwards | W |
| Move backwards | S |
| Fire cannon | SPACEBAR |

## Features

This game demonstrates the use of a scene graph hierarchy to control the tank’s turret, and collision detection between circles(bullets), bounding boxes (the tank, its turret, walls, and other objects), and planes (the screen boundaries).

# Robot Arm Game

In this game, the player controls a robot arm. The arm can be moved, and the shoulder, elbow, and wrist joint rotated. The hand can grab other objects, move them around the screen, and drop them again. Held objects can be used to push other objects around. While dropped objects are stopped by the screen boundary, held objects can be moved off screen (and will snap back into bounds if dropped off screen)

## Controls

|  |  |
| --- | --- |
| **Action** | **Key** |
| Move Arm | LEFT ARROW, RIGHT ARROW |
| Rotate Shoulder | A,D |
| Rotate Elbow | W,S |
| Rotate Writs | Q,E |
| Grab/Release | SPACEBAR |

## Features

This game demonstrates a 4 level scene graph hierarchy (RobotArm->Shoulder->Elbow->Hand) and collision between boxes (objects, the hand) and planes (the screen boundaries). It also demonstrates objects moving to a different node in a scene graph without changing their position in the game.

# 3D Game

In this game the player controls a rocket (blue, with a yellow nose) flying around a solar system. The rocket can turn and roll, and accelerate forward. The player can switch between four viewpoints (the origin, the rocket, the blue planet, and the grey moon) and tilt, pan, or zoom their camera.

## Controls

|  |  |
| --- | --- |
| **Action** | **Key** |
| Yaw rocket | A,D |
| Roll rocket | Q,E |
| Pitch rocket | W,S |
| Accelerate rocket | SPACEBAR |
| Pan camera | LEFT ARROW, RIGHT ARROW |
| Tilt camera | UP ARROW, DOWN ARROW |
| Zoom camera | RIGHT SHIFT, RIGHT CTRL |
| Change camera | V |

## Features

This game demonstrates scene graph heirarchies (rocket->camera, planet->camera, planet->planet->camera) and 3D rotation. It also demonstrates using view and projection matrices