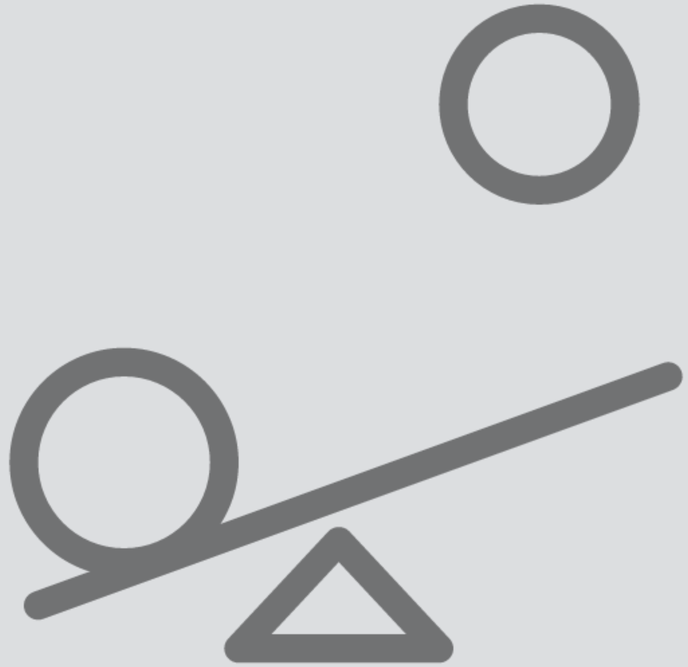
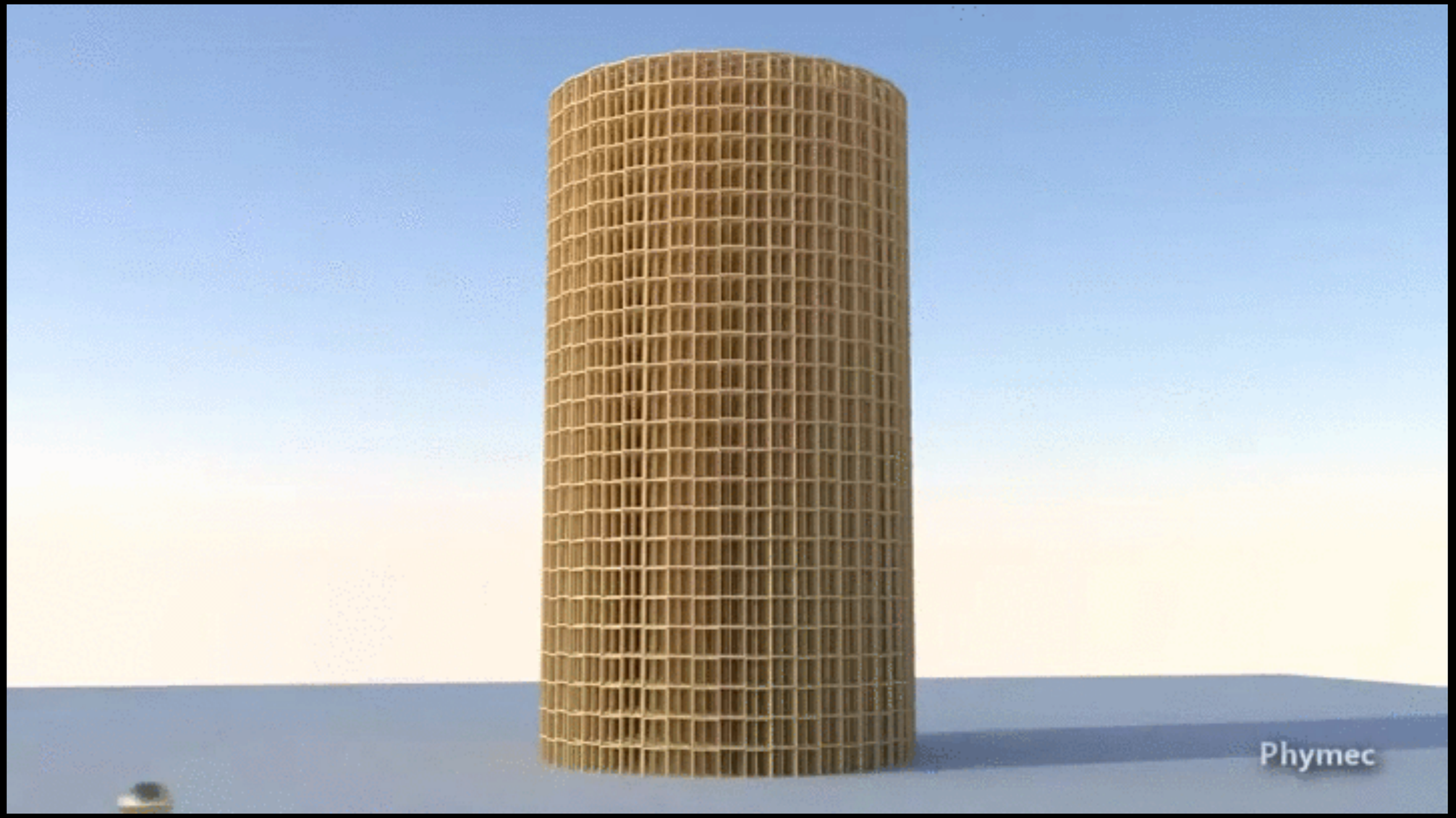
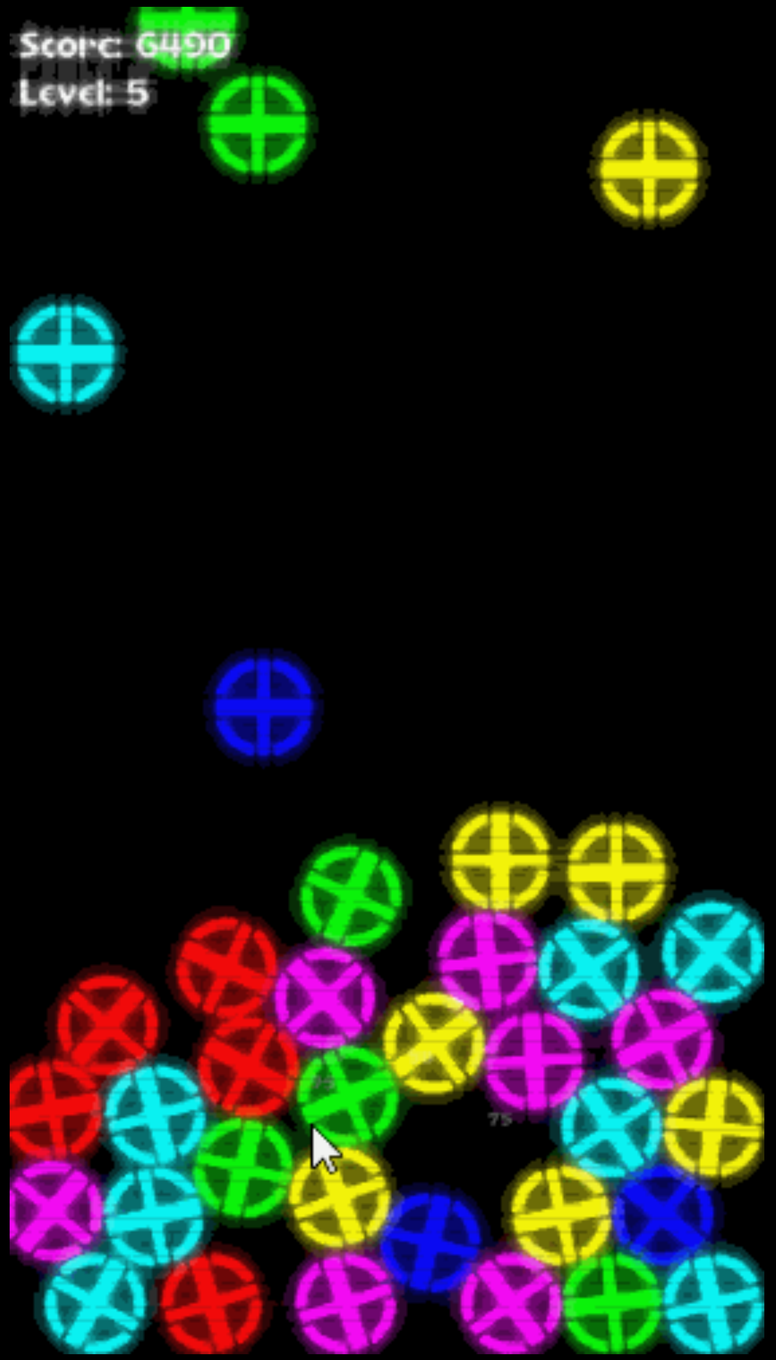
Physics engines.




Phymec


LS Show


Score: 6490
Level: 5

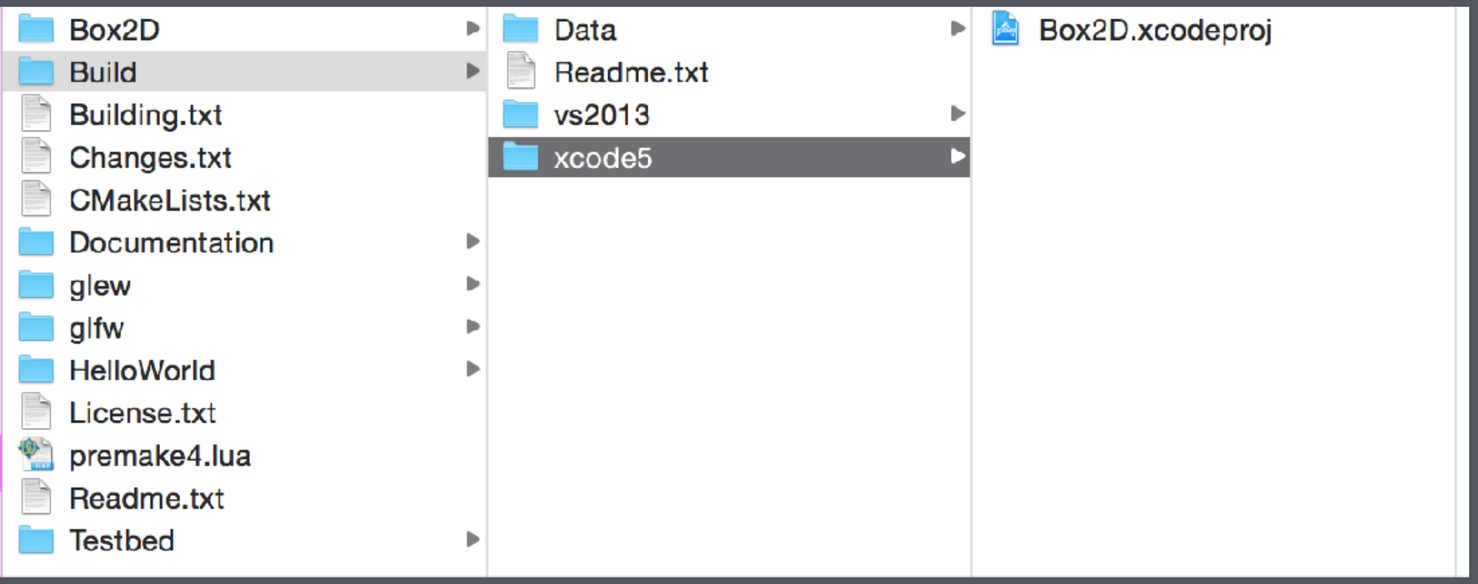

File
Algodoo v2.1.0

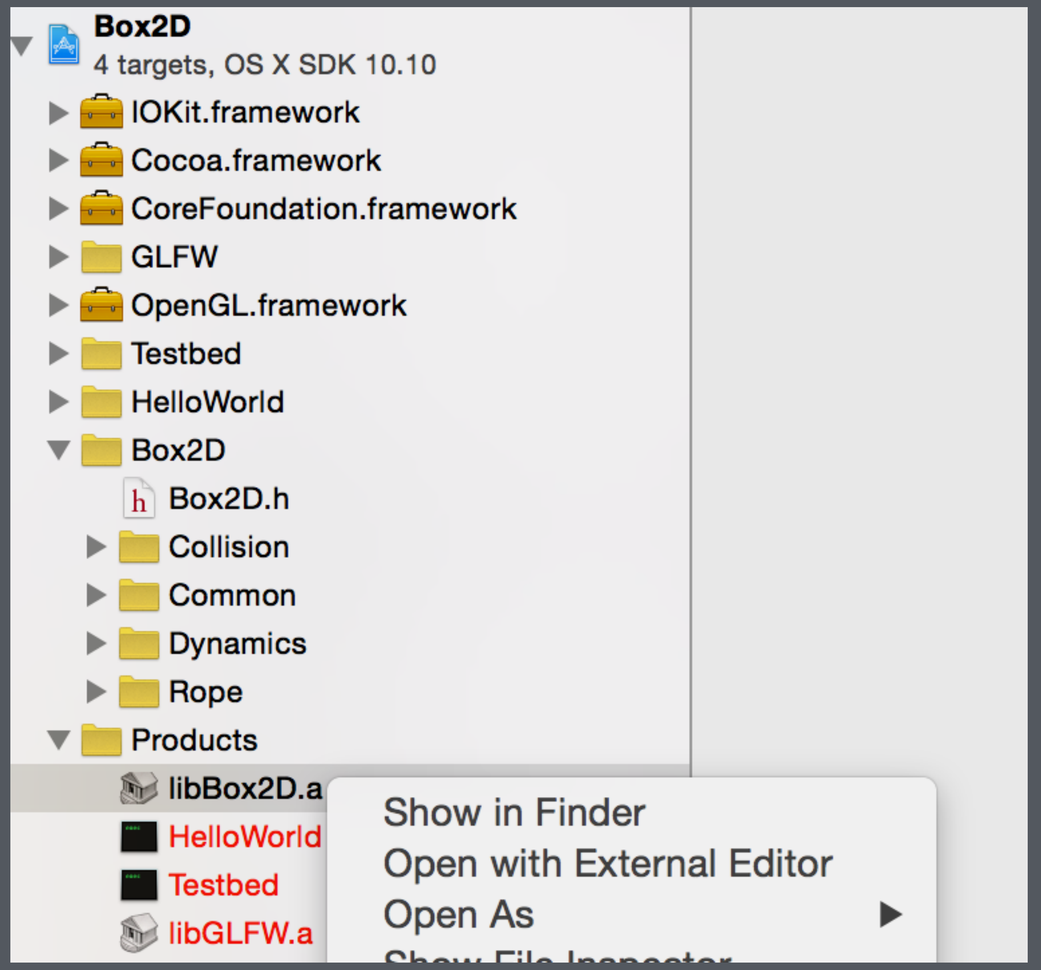
Box2D

http://box2d.org/

https://github.com/erincatto/Box2D/releases

Building Box2D


Box2D
Build
Building.txt
Changes.txt
CMakeLists.txt
Documentation
glew
glfw
HelloWorld
License.txt
premake4.lua
Readme.txt
Testbed
Data
Readme.txt
vs2013
xcode5
Box2D.xcodeproj


Box2D
4 targets, OS X SDK 10.10
IOKit.framework
Cocoa.framework
CoreFoundation.framework
GLFW
OpenGL.framework
Testbed
HelloWorld
Box2D
Box2D.h
Collision
Common
Dynamics
Rope
Products
libBox2D.a
HelloWorld
Testbed
libGLFW.a
Show in Finder
Open with External Editor
Open As

Using Box2D

Set the Box2D/Box2D folder as an additional include path in your project

Set the path where you copied the Box2D library as an additional library path in your project.

Link libBox2D.a or libBox2D.lib (if on Windows)

Creating a Box2D world.

Include the header

```
#include "Box2D/Box2D.h"
```

Create the Box2D world.

```
b2Vec2 gravity(0.0f, -10.0f);

b2World *physicsWorld = new b2World(gravity);
```

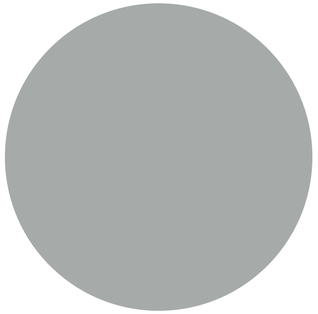
Step the world using elapsed time.

```
void Update(float elapsed) {
    physicsWorld->Step(elapsed, 10,10);
}
```

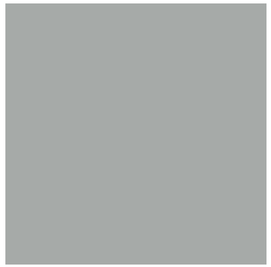
On a fixed timestep!

Creating a **physics object**.

Step 1: Create a **shape**.



```
b2CircleShape shape;
shape.m_radius = 0.3f;
```



```
b2PolygonShape shape;
shape.SetAsBox(0.3, 0.3);
```

Step2: Create a fixture definition.

```
b2FixtureDef fDef;
fDef.friction = 1.0f;
fDef.restitution = 0.2f;
fDef.density = 10.0f;
fDef.filter.groupIndex = 0;
```

… and set our shape to it.

```
fDef.shape = &shape;
```

Step 3: Create a body definition and set its type and position.

```
b2BodyDef bodyDef;
bodyDef.position.x = 0.2;
bodyDef.position.y = -0.5;
bodyDef.type = b2_dynamicBody;
```

..or

```
bodyDef.type = b2_staticBody;
```

for static entities.

Now create it!

```
b2Body *body = physicsWorld->CreateBody(&bodyDef);
b2Fixture *fixture = body->CreateFixture(&fDef);
```

Putting it all together:

```
b2CircleShape shape;
shape.m_radius = 0.3f;

b2FixtureDef fDef;
fDef.friction = 1.0f;
fDef.restitution = 0.2f;
fDef.density = 10.0f;
fDef.filter.groupIndex = 0;
fDef.shape = &shape;

b2BodyDef bodyDef;
bodyDef.type = b2_dynamicBody;

b2Body *body = physicsWorld->CreateBody(&bodyDef);
b2Fixture *fixture = body->CreateFixture(&fDef);
```

Now what?

Connect the simulated Box2D body with an entity.

```
class Entity {
public:

    Entity();

    void Update(float elapsed);
    void Render(ShaderProgram *program);

    SheetSprite sprite;

    float x;
    float y;
    float rotation;


    b2Body *body;
    b2Fixture *fixture;

};
```

```
void Entity::Update(float elapsed) {
    if(body) {
        b2Vec2 position = body->GetPosition();
        x = position.x;
        y = position.y;
        rotation = body->GetAngle();
    }
}
```

```
    Entity platform;
    platform.sprite = SheetSprite(tilesTexture, 648.0/1024.0,
0.0/1024.0, 70.0/1024.0, 70.0/1024.0, 0.8);



    b2PolygonShape shape;
    shape.SetAsBox(0.4, 0.4);

    b2FixtureDef fDef;

    b2BodyDef bodyDef;
    bodyDef.position.y = -0.5;
    bodyDef.position.x = 0.0;
    bodyDef.type = b2_staticBody;

    platform.body = physicsWorld->CreateBody(&bodyDef);
    platform.fixture = platform.body->CreateFixture(&fDef);

    entities.push_back(platform);
```

Make sure the size of your entity is the same as your box2d shape!

Character physics using Box2D.

Fixed rotation!

```
bodyDef.fixedRotation  = true;
```

Setting velocity.

```
body->SetLinearVelocity(b2Vec2(0.0, 3.0));
```

Detecting collisions.

Need to make a subclass of b2ContactListener and add a BeginContact method to it:

```
class ClassDemoApp : public b2ContactListener {
    public:

        void BeginContact (b2Contact *contact);
};
```

Now we can pass our class in as a contact listener.

```
physicsWorld->SetContactListener(this);
```

Now our BeginContact method will be called every time there is a new contact!

```
void ClassDemoApp::BeginContact (b2Contact *contact) {

    b2Fixture *fixtureA = contact->GetFixtureA();
    b2Fixture *fixtureB = contact->GetFixtureB();

}
```

We can look at the fixtures in the contact and compare to fixtures in our entities to check what is colliding.

```
void ClassDemoApp::BeginContact (b2Contact *contact) {

    b2Fixture *fixtureA = contact->GetFixtureA();
    b2Fixture *fixtureB = contact->GetFixtureB();

    for(int i=0; i < entities.size(); i++) {
        if(fixtureA == player->fixture && fixtureB == entities[i].fixture
         && entities[i].type == TYPE_COIN) {

            // player touching a coin

        }
    }
}
```

We have to be careful because we cannot remove objects in the callback. If we want to remove, we must add them to a list and remove after we do our Step.

```
void ClassDemoApp::BeginContact (b2Contact *contact) {

    b2Fixture *fixtureA = contact->GetFixtureA();
    b2Fixture *fixtureB = contact->GetFixtureB();

    for(int i=0; i < entities.size(); i++) {
        if(fixtureA == entities[0].fixture && fixtureB == entities[i].fixture &&
entities[i].type == TYPE_COIN) {
            coinsToRemove.push_back(&entities[i]);
        }
    }
}
```

We have to be careful because we cannot
remove objects in the callback. If we want to remove,
we must add them to a list and remove after we do our Step.

```
physicsWorld->Step(elapsed, 10,10);

for(int i=0; i < coinsToRemove.size(); i++) {

        physicsWorld->DestroyBody(coinsToRemove[i]->body);
        coinsToRemove[i]->body = NULL;
        coinsToRemove[i]->visible = false;

}
coinsToRemove.clear();
```

Bullets and sensors.

You can make an object into a sensor that tracks collisions but doesn't create responses.

```
b2FixtureDef fDef;
fDef.isSensor = true;

b2BodyDef bodyDef;
bodyDef.type = b2_dynamicBody;
bodyDef.gravityScale = 0.0;
```

By setting its gravity scale to 0, you can make it unaffected by gravity and just set its velocity directly.