Universidad Politécnica
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Escuela Técnica Superior de Ingenieros Informáticos

Grado en Ingeniería Informática

Trabajo Fin de Grado

Diseño y Desarrollo de un Prototipo de Simulación para Robots Aéreos basado en Unreal 5, ROS2 y Gazebo (Informe Intermedio)

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Resumen

Aquí va el resumen del TFG. Extensión máxima 2 páginas.

Agradecimientos

Gracias

Índice general

1. Introducción

1.1. Descripción General

La simulación de drones es un campo relativamente nuevo, sin embargo, eso no implica que sea poco extenso. En los recientes años se han eralizado grandes avances e investigaciones con diversos fines. Desde el estudio de sus fisicas para su posterior implementación en entonrnos virtuales para su simulación, como estudios para descubrir los posibles usos que se les puede dar a estas versátiles máquinas, como puede ser su uso en seguridad de edificios, mantenimiento de campos de placas solares e incluso entretenimiento con enjambres de cientos de estos pequeños robots.

Asi pues, este trabajo tiene como objetivo crear un simulador de vuelo de drones en el entorno gráfico de Unreal Engine 5 realizando una integración con la librería de comunicación de C ROS2 para así crear un sistema de manejo automático de la trayectoría del dron. La implementación de la gran mayoría del proyecto se realizará en C++.

1.2. Unreal Engine 5

Como he mencionado previamente, el simulador se va a desarrollar para el motor de juego Unreal Engine 5 (UE5) desarrollado por la compañía Epic Games. Esta herramienta es muy reciente y cuenta con unos avances gráficos enormes, pudiendo llegar a generar entornos que luven casi idénticos a los reales dando la impresión d eser grabaciones reales y no simulaciones generadas por ordenador. Asimismo cuenta con un sistema de físicas y colisiones integrado, lo que fácilitará las tareas de implementación más adelante. Como añadido, este entorno también cuenta con herramientas de Inteligencia Artifical, que se pueden usar para que controlen los actores que podamos llegar a tener en la escena.

El principal motivo para realizar el desarrollo en este motor, es con vistas a futuro, gracias a la gran capacidad gráfica que proporciona y la oportunidad de hacer uso de IA, hacer el entrenamiento de los drones dentro del simulador para luego poder transferirlo a máquinas reales y así no arriesgarse a dañar los reales.

1.3. ROS 2

ROS 2, o también conocido como Robot Operating System 2, es un SDK (System Development Kit) open source, el cuál ofrece una plataforma estándar para desarrollar software de cualquier rama de la industria que implique el uso de robots. Este framework se desarrolló en 2007 por el Laboratorio de Inteligencia Artificial de Standford y su desarrollo se ha continuado desde esntonces.

La versión de este framework con la que estamos trabajando es la versión humble, la ultima versión publicada a la fecha de realización de este trabajo. Entrando a describir más específicamente en que consiste este software, ROS se compone de 2 partes básicas, el sistema operativo ros, y ros-pkg, un conjunto de paquetes creados por la comunidad que implementan diversas funcionalidades como puede ser; localización; mapeo simultáneo; planificación; percepción y simulación...etc.

Sin embargo, el uso principal de este conjunto de librerías es el paso de mensajes entre un controlador y la máquina en cuestión. En este trabajo, el objetivo, adenás de poder tener un dron cuyo movimiento sea lo más fiel a la realidad posible, implementar ROS 2 para poder realizar el control del dron de forma "externa", y así simular un vuelo real.

2. Title of next chapter

2.1. Overview

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2.2. The next section

La insertación de código fuente se puede hacer directamente desde el archivo[1]:

Listing 2.1: Un programa en C

```

int main() {
  char saludo[128] = "Hola mundo";
  printf("1: %s\n", saludo);
}
```

O con insertando un flotante de tipo Algoritmo y luego insertando igual que antes el archivo fuente:

Algoritmo 2.1 Una clase de Java

```

public class UnaClase {

  private static final SALUDO = "Hola Mundo";

  public UnaClase() {
    System.out.println(SALUDO);
  }

  public static void main(String[] args) {
    new UnaClase();
  }

}
```

[1]Para insertar, hay que ir al menú insertar -> Archivo -> Documento hijo y seleccionar tipo de inclusión Listado de código fuente.

Se puede hacer referencia al flotante: Algoritmo 2.1 o a la referencia del listado: Listing 2.1.

Y se puede delimitar lo que se muestra utilizando las opciones del paquete *Listing*, mediante *firstline* y *lastline*, usando estas opciones en el recuadro de configuración.

Nota:
Como se puede ver si se introduce el título al insertar el documento hijo aparece *Listing*, se recomienda utilizar un flotante de tipo “Algoritmo” para mostrar código fuente.

3. Title of next chapter

3.1. Overview

bla bla bla bla bla bla bla bla bla b la bla bla bla PPS bla, see [Ric21, Mar63].

3.2. The next section

4. Title of next chapter

4.1. Overview

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4.2. The next section

A. Title of the first appendix chapter

A.1. Overview

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A.2. The next section

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Nomenclatura

R_a	arithmetic average roughness
PPS	Polyphenylene sulfide
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