FlightGear Conceptual Architecture

CISC322 W24 – Group: Chicken AI

https://www.youtube.com/watch?v=QLIAXT6_UuA

Team Members

Team Lead: Derek Youngman

- Introduction, Overview, Abstract, Architectural Style

Group Presenter: Marion Anglin

- Presentation, Architecture Components, Lessons Learned

Group Presenter: Shrinidhi Thatahngudi Sampath Krishnan

- Presentation, Global Control Flow & Data

Team Member: Akash Singh

- External Interfaces, Use Cases, Architectural Styles

Team Member: Abbey Cameron

- Architecture Components, Non-Functional Requirements, Conclusion

Team Member: Ximing Yu

- Concurrency, Use Cases

Introduction to Our Project

- Document FlightGear’s conceptual architecture abstractly
- 5 Primary topics:
    - Non-Functional Requirements, Components, Architectural Style
    - Concurrency & Data and Control Flow
    - Use Cases
    - Conclusion
    - Lessons Learned

Our Derivation Process

- Consult research on general flight simulator design
- Relate findings to FlightGear specific documentation
- Pool our findings together to summarize the entire system architecture

Introduction to FlightGear

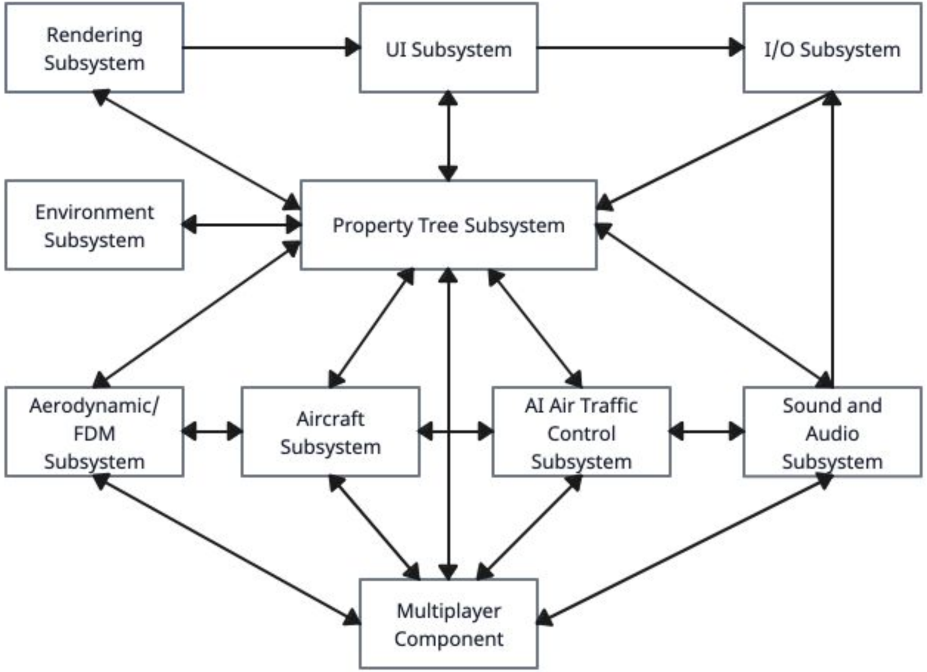
- Open-source flight simulator software
- Used for pilot training, research, and as a video game
- Available on a wide variety of operating systems, multiplayer is possible
- FlightGear is open-source, encouraging contribution from anyone, promoting its evolution and modifiability

FlightGear’s Architecture

Non-Functional Requirements

1. **Portability**: FG is able to run on various operating systems
2. **Modifiability**: FG supports the addition of new components by users
3. **Performance**: most important, as FG requires fast response times and high performance
   - FG’s performance critical subsystems: I/O, property tree, rendering, FDM

FlightGear’s Components



Architectural Styles

Publish-Subscribe Style

- Flight simulators need fast response times & high performance, Pub-Sub ensures this
- Allows for parallelism, standard for distributed simulation
- New components can be added & old ones modified
- FG's integral Property Tree Subsystem, components publish their info & subscribe to other info

Client-Server Style (Multiplayer Component)

Process Control Style (FDM Subsystem)

Concurrency
&
Data and Control Flow

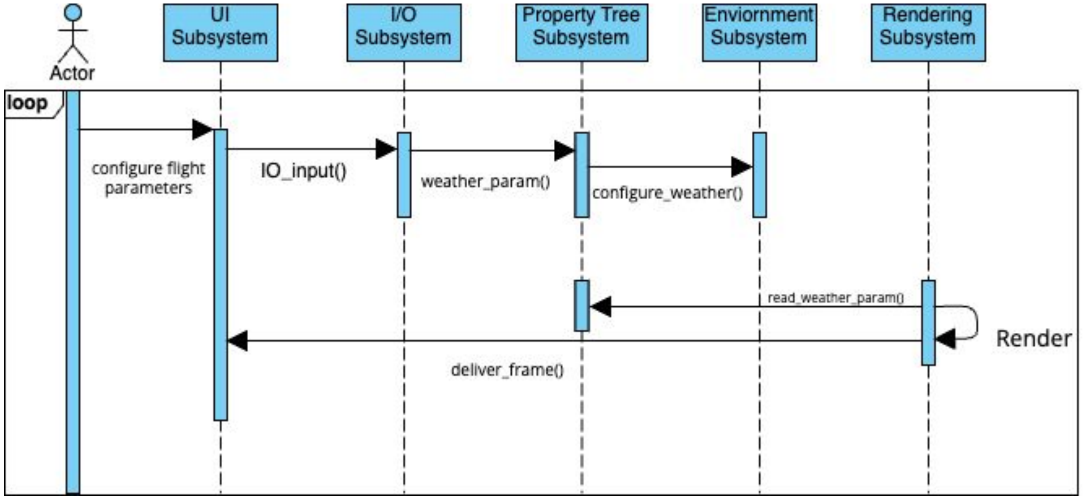
Concurrency

- Often supported by publish-subscribe architectural style
- Plays an important role in the multiplayer feature
- Also helpful in decoupling the AI traffic system from other processes
- High levels of concurrency may pose negative impact on testability, problems are harder to track down

Data and Control Flow

- Most of the data that was collected for flightgear was from DATCOM USAF program
- Data is primarily transferred through SATA (Serial Advanced Technology Advancement), which are hard drive interfaces that include registers to access the status of a device and set up transfers
- The property tree is considered the central nervous system and this is where almost all inter-subsystem communication is done

Use Case



Sequence Diagram for **Use Case 1**

Conclusion
&
Lessons Learned

Conclusion

- Conceptual architecture for FlightGear is mainly a publish-subscribe style, also featuring client-server, and process-control style
- features the property tree as the main component

Lessons Learned

- Overwhelming amount of information about FlightGear
- Approaching some topics required extensive research on other areas that were fundamental to understanding the topics we were instructed to discuss
- In the future, we would like to start earlier to uncover important information and organize our understanding more carefully to avoid the same level of stress

Resources

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