Enhanced Architecture

Group 1

SAAM Analysis Continued

Developers	Implementability	**Positive**: Aligns with current architecture, simplifying implementation.	**Negative**: Requires significant architectural changes, complicating implementation.
Flight Training Schools	Integration	**Positive**: Simplifies integration into existing protocols and systems.	**Negative**: Potentially complicates integration with additional systems and protocols needed.
FlightGear Community Contributors	Documentation	**Positive**: Less extensive updates required for existing documentation.	**Negative**: Requires comprehensive new documentation to accommodate a separate system.
Software Integrators	API Availability	**Positive**: Maintains or improves API integration with existing systems	**Negative**: May require new APIs or modifications, complicating integration with other systems.

Group members

Abstract & Introduction - Marcus

Possible Implementations of the NEW Feature - Mark (Team Lead)

SAAM analysis - Matthew

Effects of the Enhancement - Mark

Use Cases - Armaan

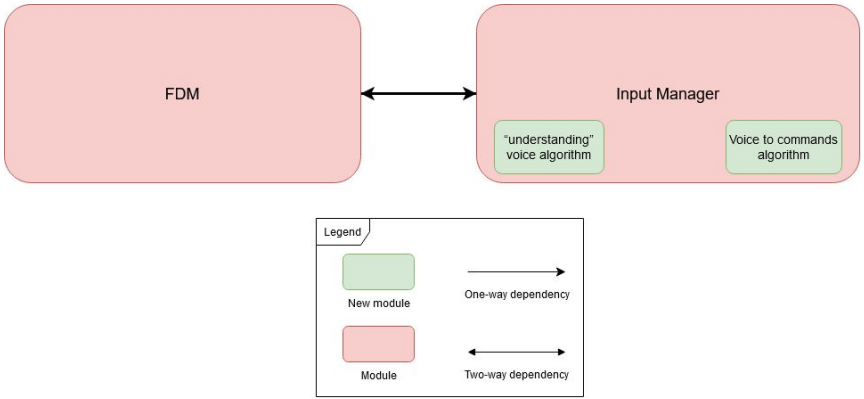
Plans for Testing & Potential Risks - Jacob (Presenter)

Conclusion and Lessons Learned - Darcy (Presenter)

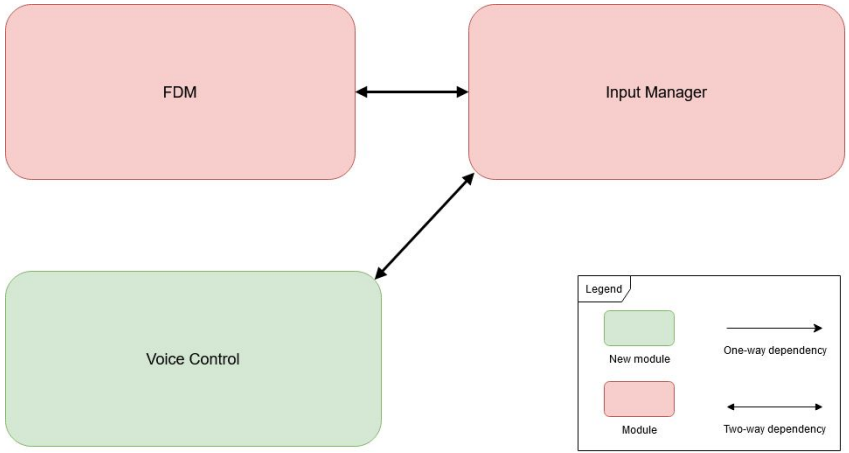
Voice Control in FlightGear

- Integration of voice control allows for new ways for players to interact with the simulated environment
- Implementing voice control enhances the realism and accessibility of FlightGear
- Voice Control can be implemented in existing modules or by adding a dedicated voice control module.

Implementing voice control into an existing module



Adding a dedicated voice control module



SAAM Analysis

Stakeholder	NFR	Embedded Implementation Effect	New Module Implementation Effect
End Users	Usability	**Positive:** Enhances usability by integrating voice control seamlessly into the existing interface	**Negative**: Might introduce a learning curve and cognitive effort due to a new, separate system.
Developers	Maintainability	**Positive**: Easier to maintain due to minimal changes in architecture.	**Negative**: More challenging to maintain due to added complexity of a new module.

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Impacted Subsystems

- Input Manager: Incorporates voice recognition and conversion algorithms, adding new files like
- Flight Dynamics Model (FDM): Continues efficient processing of commands from Input Manager, including voice commands.
- GUI and Cockpit Gauges: Updates to display settings based on voice command inputs in real-time.
- Sound System: Provides auditory feedback to confirm voice commands have been executed.
- API and System Integration: Updates to APIs for seamless integration of voice control with external software.
- Documentation and Testing: Expanded to include new voice control features, ensuring clarity and usability for developers and contributors.

Effects on NFRs

Effects on NFRs

Stakeholder	NFR	Effect
End Users	Usability	Introduce learning curve and cognitive effect due to new system.
Developers	Maintainability	More maintenance due to added complexion
Developers	Implementability	Significant architectural changes
Flight Training Schools	Integration	Complicates integration with other needed systems and protocols
Community Contributors	Documentation	New documentation needed
Software Integrators	API Availability	New APIs or modifications

Effects on Maintainability

- Will be more difficult due to new files and dependencies
    - Such as taking input from a microphone
- Not expected to drastically affect the maintainability of architecture
- Relatively small feature with minimal complexity

Effects on Evolvability

- Would not be affected
- However, Input Manager could be affected for any FDM control clashes
- Voice algorithms would need to be changed to account for a potential change in control format

Effects on Testability

- Not be very complicated
- Only a few tests to make sure it is working properly
  - Making sure input is taken properly
  - Right words are being understood
  - Voice commands are accurately converted to standard control commands

Effects on Performance

- Minimal effect on performance
- Systems are not computation or graphics heavy
- Potential issue with performance in analysis of raw voice input
    - Could be a costly activity
    - Since the FDM module does not have to “wait” for the Input Manager to return an input command like it would for graphical processing, if there were to be an issue processing some vocal input, the FDM would continue with the simulation like normal without waiting for a control input.

Potential Risks

Potential Risks

Usability

- Users should have accurate voice controls
- Users should be able to use voice controls without significant latency or resource consumption
- Voice control should be accessible to users

Any compromisation to usability could damage FlightGear's accessibility appeal

Testing

Benchmark Testing

- Tests to evaluate responsiveness under increased computational and resource demand
- Tests will assess resource utilization
  - CPU Usage
  - Memory Usage
  - Frame Rate
  - Latency
  - Etc.
- Provide insight on FlightGear’s Performance across various hardware

Accuracy Testing

- Test the accuracy of the voice recognition system
- Manual tests
  - Users will document their intended command
  - Users will document the resulted command
- Facilitate responsiveness

Conclusion

- Identification of key stakeholder needs to guide the process
- Ensure that voice controls address specific requirements
- Necessity of architectural adaptability to accommodate new technology without disrupting system integrity and performance
- Proper documentation to ensure contributors can effectively interact
- Comprehensive testing ensures the feature performs as intended and does not negatively impact the system
- User experience is paramount as addressing impacts on system efficiency is crucial in preventing alienation of specific users
- Community engagement throughout the process allows real-world and time feedback and expectations