Modeling Management Final Report

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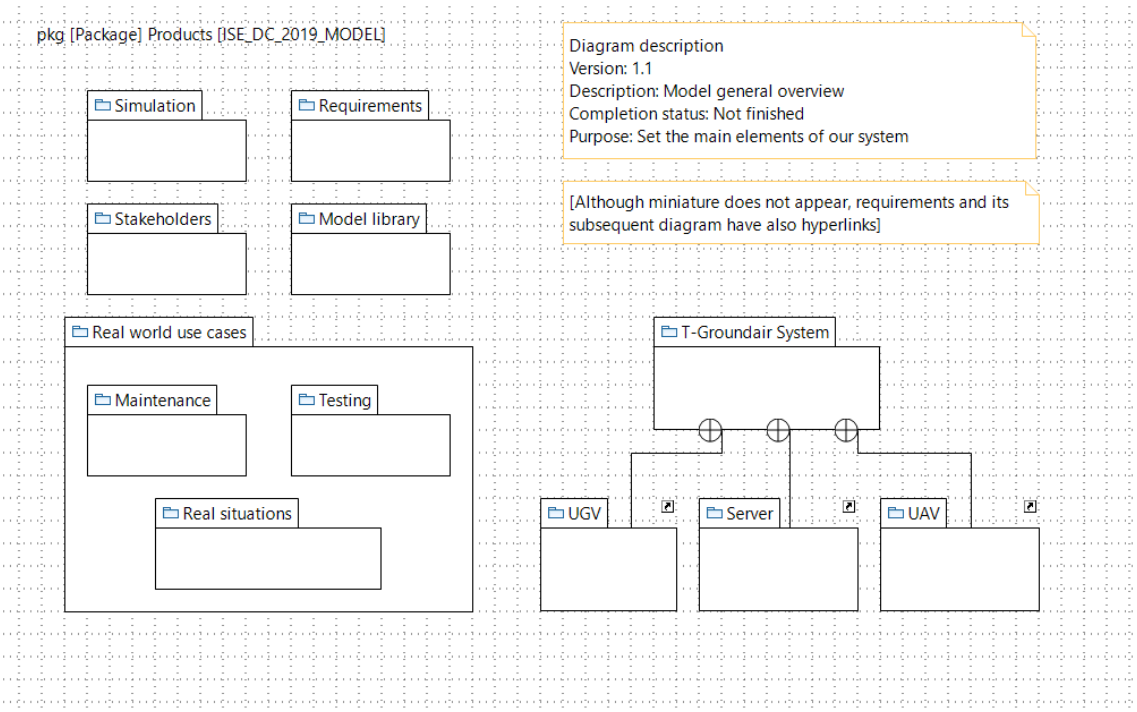
The aim of this report is giving an overview about the structure and contents of the SysML Model for the INGENIA-SE Project from the 2019/2020 Academic Year. Inside Project's Github Repository master branch, you can find the full model as well as the guidelines edited by the Modeling Management Team setting a common framework for development in this field. That document also constitutes a reference for knowing more about the followed workflow philosophy.

SysML Model Overview

The screen shown above is the first picture anybody should have when getting inside our SysML Model. As originally intended, it responds to a system which was being designed to be implemented physically. However, due to the COVID-19 situation and the change of the Project to simulation development, this perspective has also been added in the respective package.



Apart from the format issues discussed in the guidelines document, there are three main sections:

- T-Groundair System implementation, composed by an UAV, an UGV and a server for coordinating their actions, also acting as user's interface. Hyperlinks let the user progress to further details clicking on those packages.
- Real world use cases. This section was thought as the place to set the system specifications which were related with the system's deployment in a real environment. Some examples are a description of real working situations, testing and maintenance. These topics have not been addressed because of the change to a simulation objective.
- Other related aspects. Here, some other relevant information might be found, grouped in:
    - Requirements for the system which are set from the beginning of the Academic Year, previously to system's design. These requirements have been recently updated due to the changes in the Project because of the circumstances.
    - Simulation, where the Gazebo environment and its main components are exposed. A block definition diagram has been created for that purpose, with links to the features defined when describing real UAV, UGV and Server because of the significant similarities between the reality and the simulation model.
    - Stakeholders defined at the beginning of the Academic Year and updated during the Project. The name and a brief description of any person or organization with any kind of interest and/or influence in the Project are exposed in this table.

  Additionally, there is a model library package, finally not used, which was thought to ease people's contributions when repeated elements had to be used.

Requirements

When getting into requirements package, a clear division is set between functional and non-functional requirements. Each one of the diagrams accesible from the packages found there shows an specific group of the listed requirements in System Requirements Specification.

- Functional requirements, structured in UAV, UGV, Server and the general requirements grouped in system package. Those requirements diagrams which are associated with UAV, UGV and Server are also accessible from an specific hyperlink located inside their respective functional packages from T-Groundair main section.

- Non-functional requirements, containing requirements diagrams related with performance, security and safety, usability, error handling, and reliability and availability.

T-Groundair System Implementation

All the elements which are part of the real system implementation (UAV, UGV and Server) are structured in the same way in the diagram. They are defined with four kinds of information:

- Specific requirements, with the hyperlink to the corresponding diagram which was previously mentioned.
- Hardware, with diagrams listing and relating the main components which make those physical entities work propperly.
- Software, where some of the elements/modules which would be necessary for sending, processing or receiving orders as well as communicating entities in a real deployment of the system were thought to be shown. Because of not having been able to work with physical devices, this package is not so straightforward and clear, and it has not been developed. If we had got the chance of deploying the system, the kind of problems which would have been faced in this field might have clarified this section's content.
- Specific use cases. As the common point with simulation development, diagrams from this section are probably the most important ones for the development of the Project due to the circumstances. Each one of the entities have a normal operation mode and an emergency mode.
    - Normal operation mode. These diagrams describe the cycle of actions which are carried out by the elements once they are initialized by the user's interface. Each entity has its own associated activity diagram, but they are functionally connected. For example, the cycle for recognizing the balls in server cannot begin if the image has not been taken by the UAV. That is the reason for having a shortened version of UAV and UGV diagrams inside the Server one, for reflecting those dependendencies and showing all the elements working together from that perspective.
    - Emergency mode. If something unexpected happens, UAV and UGV must return to their respective home positions and server must stop sending orders. That sequence is shown in the corresponding activity diagrams.