Seamless Engineering Milestone 1 - Requirements Template

Team number: Seamless Engineering Group 06

# Requirements

If there is one aspect a project must have in order not to be doomed to failure, it is a reasonable and comprehensive repository of both functional and non-functional requirements. A project's requirements must be well considered, balanced and easily understood by all team-members, but perhaps most importantly, they must not be dropped or compromised during half of the project.

Fill out the following templates according to your requirements.

Definitions

Source: Projektmanagement in der Entwicklung von Produkten für sicherheitskritische Anwendungen, Prof. Nolle, ITIV, 2021

|  |  |
| --- | --- |
| Must | Overriding requirements that must be complied with by both the purchaser and the supplier (by law, standard, rules, ...). |
| Shall | Indispensable requirements; a deviation is not permitted without formal agreement between buyer and supplier. |
| Should | Recommendation or indication of the implementation of a requirement; a deviation is only allowed in justified cases. |
| Will | Statement of intent in connection with a requirement. |
| May | Permitted execution or deviation, no requirement. |

Functional Requirements

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Product Requirement | | System Requirement | | | |
| ID | Title | ID | Description | Priority | Remarks |
| F1 | Throughput | F1.1 | The throughput of the system shall be 2 cubes per minute | Shall | Minimum throughput |
| F1.2 | The throughput of the system will be 6 cubes per minute | Will | Desired throughput |
| F1.3 | Two of object A may be placed in the object B slot on the transport platform. | May | This increases the capacity of the turtlebot to 4 object A and thus the throughput. |
| F2 | Reliability | F2.1 | Objects A and B shall only go in their respective slots on the transport platform. | Shall |  |
| F2.2 | The objects shall not be stacked upon one another. | Shall |  |
| F2.3 | Objects shall not be dropped. | Shall |  |
| F2.4 | There shall be a clear indication of the current state of the system, so turtlebot knows. | Shall | If the object is being loaded or transported, |
| F2.5 | The system shall operate event driven. | Shall | As opposed to being time driven. |
| F3 | Customer Satisfaction | F3.1 | The system shall keep track of all moving objects. | Shall | Every part of the system shall know at any point in time which object is where and can thus assure that it doesn’t end up in the wrong delivery box. |
| F4 | Emergency Stop | F4.1 | The system must stop all movements when the emergency stop button is pressed. | Must |  |
| F4.2 | The system must not drop any objects. | Must | Vacuum gripper remains active. |

Non-Functional Requirements

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Product Requirement | | System Requirement | | | |
| ID | Title | ID | Description | Priority | Remarks |
| NF1 | Easy usability of the system | NF1.1 | We will provide a customer-friendly user interface. | Will |  |
| NF1.2 | We may provide a graphical user interface. | May |  |
| NF2 | Portability of the System | NF2.1 | We shall use ROS as a coding platform, so the system will be easily portable. | Shall |  |
| NF2.2 | Embedded systems shall not be modified. | Shall | E.g. we shall not install additional packages on the turtlebot. |
| NF3 | Central settings area | NF3.1 | All settings shall be loaded by a single roslaunch file. | Shall |  |
| NF3.2 | All settings shall be contained in a single folder. | Shall |  |
| NF3.3 | Settings may be contained in a single file or split into multiple files. | May | Multiple files may be clearer than a single large file. |
| NF4 | Robustness against external interferences | NF4.1 | The system shall be able to resist against external interference. | Shall |  |
| NF5 | Optimized routes | NF5.1 | The turtlebot should follow the optimal path. | Should |  |
| NF5.2 | The turtlebot may deviate by up to 10% from the optimal path. | May |  |
| NF6 | Efficient use of sensors and actuators | NF6.1 | The system should try to minimize the number of roundtrips of the turtlebot. | Should |  |
| NF6.2 | The subsystems shall enter a low power state if possible. | Shall | E.g. the conveyor belt shall stop moving if no object is placed upon it |
| NF7 | Scalability | NF7.1 | The system shall be developed using ROS which assures scalability. | Shall |  |
| NF8 | Reusability | NF8.1 | Documentation shall be provided. | Shall |  |