Functional Requirements Document

Intelli Drive 4x4 v1.0

Developed by:
Leonardo Fusser (1946995)

Company:
IECE (Intelli Electronic Car Enthusiasts)

Date:
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Privacy Information

This document may contain information of a sensitive nature. This information should not be given to persons other than those who are involved with this system/project or who will become involved during its lifecycle.

General Information

System or Project ID/Acronym:	Intelli RC Toy Car	**Creation Date:**	27 September 2021
Client Agency:	CET department	**Modification Date:**	-
Author(s):	Leonardo Fusser	**Authorized by:**	Dr. Manijeh Khataie

Change Control

Revision Date	Author	Section(s)	Summary
2021/09/28	Leonardo Fusser	Whole document.	Created initial FRD.

Approval Information

The signatures relay an understanding of the purpose and content of the document by those endorsing it.

	Approve		Approve with Modifications		Reject

Comments:

Approval Signatures

Role	Name/Title	Signature	Date
Client Sponsor	Dr. Manijeh Khataie *(instructor)*		
Sponsor	Mr. and Mrs. Fusser *(parents)*		
Project Manager	Leonardo Fusser *(student)*		

Overview

The Intelli RC Toy Car consists of two main functional objects, that being a handheld remote and a small toy car. The movements of the small toy car are controlled by the end-user with the handheld remote. The handheld remote is a custom assembly, that includes a custom enclosure, but follows the same conventional look as other handheld video game remotes. As stated, the control of the movements of the small toy car come from the handheld remote and get transferred to the small toy car itself wirelessly. Similar to the handheld remote, the small toy car is also a custom assembly, that includes a custom car frame layout, but also follows the same conventional look as other small toy cars. When the handheld remote or small toy car are initially turned on, a unique initialization sequence occurs. The end-user cannot manipulate these two functional objects at this time. Once done, the end-user will be able to control the small toy car with the handheld remote as per normal operation.

1. General

1.1. Project Description

This project is a fully functional remote-controlled small RC toy car. There are two main components, those being a small toy car and a handheld remote.

1.2. Background

Conditions that created the need for the application:
- The need for a modern small RC toy car.
- The need for more functions.
- The need for more features.
- The need to fix/address older small RC toy car flaws.

1.3. Purpose

Business objectives and business processes:
- To create a new brand in the market.
- To compete with existing brands.
- To provide a better customer experience.
- To grow as a brand and create new products.

1.4. Assumptions and Constraints

Assumptions:
- Availability of hardware/software platforms.
- Developments in the technology.
- Developments in the market.

Constraints:
- Government regulations.
- Standards imposed on the solution.
- Project budget.
- Time.
- Cost.

1.5. Interfaces to External Systems

Interfaces the user will interact with:
- Pushbuttons on hand-held remote.
- Joystick on hand-held remote.
- ON/OFF power button on handheld remote.
- ON/OFF power button on small toy car.

1.6. Points of Contact

Important and key participants in the project:
- Project Manager.
- Project sponsor.
- User contacts.
- Stakeholders.
- Development project leader.
- Agency employee whose signature constitutes acceptance of the FRD.

1.7. Document References
- Project outline/instruction sheet.
- Preliminary design.
- Progress report.

2. FUNCTIONAL REQUIREMENTS

The functional requirements describe the core functionality of the application. This section includes the data and functional process requirements.

2.1. Features

The Intelli Drive 4x4 v1.0 has a unique set of characteristics that make it stand out to other similar products. The Intelli Drive 4x4 v1.0 is very user friendly, by allowing the user to replace any part of the product without much hesitation. Complete documentation is able to the user, which also outlines all exploded views of assemblies and schematics of the product (for both small toy car and handheld remote). This product also has a unique user-interface on the handheld remote which provides the user with ease of operation of the product. The small toy car will have most of the important circuitry consolidated onto one custom designed PCB, so that there is a limit to the actual number of separate circuit boards, which in turn will make it easier to service for the user. The same applies to the handheld remote.

2.2. Functional Process Requirements

Process requirements describe what the **application must do**. Process requirements relate the entities and attributes from the requirements to the users' needs.

State the functional process requirements in a manner that enables the reader to see broad concepts decomposed into layers of increasing detail.

Process requirements may be expressed using data flow diagrams, text, or any technique that

provides the following information about the processes performed by the application:

- Detailed view of the development processes.
- Processes decomposed into finer levels of detail.
- Detailed schedule of the steps of the product, meetings, Audits, progress report.

2.3. OPERATIONAL REQUIREMENTS
- Reliability.
- Performing.
- Quality.

2.3.1. Human Interface Design
The only user interface that is available on the product is the LCD display, located on the handheld remote. The LCD display serves as a simple user interface, providing the status of the product's functions in real-time. The only other user interface that is available on the product are the joystick and pushbuttons on the handheld remote. These control the movements of the product.

2.4. Security
- No user may access Gerber files (for small toy car PCB and handheld remote PCB), any of the datasheets used to design the product, any Autodesk Inventor files, any source code to program the product (for small toy car and handheld remote) or any files/documents that pertain to the product's technical design (with exception of product schematic).

2.5. Reliability
- Result from this system's failure:
  - ➢ Complete or partial loss of the ability to perform a mission-critical function.
  - ➢ Loss of revenue.
  - ➢ Loss of employee productivity.

2.6. Recoverability
If the provided user-documents (including product schematics) does not seem sufficient to restore product functionality, customer service will be available to further assess the situation and determine what is needed to restore the user's product. *User-documents include a troubleshooting section.

2.7. Performance

Expected speed:
- ➢ When motors running at full speed: ~10'000 RPM (with load).
- ➢ When motors running at full speed: ~13'000 RPM (no load).

Expected battery life:
- ➢ Around 20 minutes (with load).
- ➢ More than 1-hour (with mediocre load).
- ➢ More than 24-hours (with no load).

3. REQUIREMENTS TRACE ABILITY MATRIX

Week	Process	Status
Week #1	Initial project introduction.	Completed.
Week #2	Project research.	Completed.
Week #3	Project research (cont.).	Completed.
Week #4	Project prototyping.	Completed.
Week #5	Project prototyping (cont.).	Completed.
Week #6	Project prototyping (cont.).	Active.

Glossary

Project manager:
- ➢ Person in charge of planning and execution for a given project.

Project supervisor:
- ➢ Person in charge of coordinating all labor needs for a given project.

Project sponsor:
- ➢ Person or group who owns the project and provides resources and support for the project, program, or portfolio to enable its success.

Stakeholder(s):
- ➢ Person or group that has an interest in a company and can either affect or be affected by the business.