Lab 2 - Product Specification Outline

CS 411W Lab II

Product Specification

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<dd month yyyy>

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# Introduction

## Purpose

* Identify the product to be produced by its name.
* Describe the purpose of the Product
* Specify how it will be used and/or who the intended user community is
* Explain at a very high level what the product will do and what it won't do

<Note: this should be an encapsulation of the Product Description from Lab I>

## Scope

* Describe the application of the product, i.e., its objectives, relative benefits, and goals.
* Describe, at a high level, the prototype you will use to demonstrate the product.

<Note: This should be an encapsulation of the Prototype Description from Lab I>

## Definitions, Acronyms, and Abbreviations

* Definitions, acronyms, or abbreviations used in this document. This section should only include those terms or abbreviations that are not commonly known or are unique to your product.

<Note: This should be an updated Glossary from Lab I>

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**Example:**

Radio Frequency Identification (RFID) – an automatic identification method, relying on storing and remotely retrieving data using devices called RFID tags or transponders. An RFID tag is an object that can be attached to or incorporated into a product, animal, or person for the purpose of identification using radio waves.

## References

* Lab I (as a properly cited source)
* Collaborative References

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## Overview

* Describe what the rest of the Product Specification contains.

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**Example:**

This product specification provides the hardware and software configuration, external interfaces, capabilities and features of the Product XYZ prototype. The information provided in the remaining sections of this document includes a detailed description of the hardware, software, and external interface architecture of the <product xyz> prototype; the key features of the prototype; the parameters that will be used to control, manage, or establish that feature; and the performance characteristics of that feature in terms of outputs, displays, and user interaction.

# General Description

## Prototype Architecture Description

* This paragraph orients the reader to what the product (prototype) “looks like”
* Illustrate and discuss the overall architecture of the prototype.
	+ Identify major components
	+ Summarize their purpose or function

**Example:**

Product XYZ is comprised of the following major components:

* Propulsion System: provides the mechanism by which the product is able to initiate forward and reverse motion. This component will be demonstrated this prototype using a rubber band and winding crank to achieve forward motion.
* Fixed Position Wheels: Translate propulsion system outputs into motion.
* Variable Position Wheels: Provide for left, right, and centerline direction of motion in non-discrete increments.
* Cockpit: provides controls, mechanisms, and accommodation for operator control of product XYZ. This component will be simulated using a PC-based display and keyboard for input and presentation of status updates. A Blue-Tooth interface will be used to transfer commands from the Cockpit to a servo-control unit on the prototype. The servo-control will respond to steering and speed commands based on inputs from the PC.
* Exhaust Distribution Element: provides the external interface for transfer and distribution of combustion by-products. This interface will also be simulated on the PC-display.



Figure 1. Product xyz Prototype Architecture Diagram.

## Prototype Functional Description

* Provide a summary of the functions that the product will provide or perform and generally what they do or how they relate to each other.
* These functional descriptions may relate directly to one component, there may be multiple functions within any one component, or functional areas may transcend multiple components. The objective is to break the overall “prototype system” into functional entities that can be used to derive a more detailed subset of requirements to be included in Section 3 below.
* Use illustrations where appropriate to show information flow or functional relationships.
* Do not go into extensive detail regarding how each function is accomplished at this point. Detail follows in section 3.1.

**Example:**

The major functional components of the product xyz prototype include the following:

* User Command Entry and Status Display: This function provides the capability to prompt the Product XYZ operator for steering and speed commands and display results received from the xyz prototype.
* Propulsion and Steering Command Interpreter: This function receives commands from the User Command Entry and Status Display (UCESD) function via a Bluetooth interface and issues servo signals to control the propulsion and variable position wheel components. This function also provides status updates to the UCESD function.



Figure 2. Product xyz Command and Propulsion Diagram

## External Interfaces

* This section identifies the physical and logical interfaces used within and by the prototype. The characteristics of each type of interface used and the type of information transferred should be described.

### Hardware Interfaces

* Describe any hardware interfaces that are implemented in the prototype. This could include connectivity to modems, routers, or other external devices. These hardware interfaces should be apparent in the information provided in subsequent sections of this specification.

**Example:**

RFID Transaction Exchange Interface: This is a high-speed USB Type A interface which establishes the data exchange path between the <transaction server> and a standard RFID card reader. Information transfer exchanged on this interface includes the transaction identifier code and <transaction pertinent> information.



Figure 3. Type A USB Connector

### Software Interfaces

* Software interfaces include interfaces to standard or customized databases, graphics tools or libraries, or special purpose software packages (such as vendor-supplied control software for some device)

Example: Vehicle Identification Database (VID) Interface: The VID is an Oracle database accessed via SQL query from <some functional area in the software architecture>. License number, vehicle type, description, and a picture in JPEG format are stored in and retrieved from the VID.

### User Interfaces

* Identify the mechanisms for interacting with users (if applicable). E.g., flat-screen color displays capable of xxx by yyy resolution, keyboard for data entry, joystick for maneuvering.

### Communications Protocols and Interfaces

* Protocols and interfaces used with the product/prototype, such as TCP/IP via 100mb Ethernet, IEEE 802.3/802.11 etc. should be identified here.

# Specific Requirements

* This section contains the detailed requirements. Each requirement should be a single statement that describes a key attribute of the product.
* Requirements under each subsection should be grouped into functional areas. A functional area is a grouping of related requirements that provide related functionality. For example, in a word processor, the requirements for the grammar checker may be grouped under the functional area grammar checker.

## Functional Requirements

* State each functional requirement in a concise and complete format.
* Illustrations, such as display formats, data entry fields, etc. can be used to expand concepts or requirements.
* Action/response matrices are useful tools for articulating sequences of events in a functional context

### Functional Requirement 1

**Example:** 3.1.1 User Command Entry and Status Display. This function shall provide entry of user commands and display of status from the prototype system. The following functional requirements shall be provided:

1. An Operator Input Display which provides data entry fields for the following in the format illustrated in Figure 4:
	1. Speed
	2. Steering direction
2. A Status Display which provides the following as illustrated in Figure 4:
	1. Bluetooth communication status (enabled/disabled)
	2. Ordered Speed
	3. Ordered Steer Direction
	4. Motion Status (moving, stopped)



Figure 4. User Command Entry and Status Display Format.

### Functional Requirement 2

**Example**: 3.1.x Exhaust Distribution Simulation: This function provides for simulation of distributing exhaust gasses from the propulsion system. The following functional capabilities shall be provided/simulated:

1. Calculation of amount of exhaust gas being produced. This calculation will be performed based on the ordered speed and motion status using the following equation: Exhaust Volume=(Ordered Speed \* PI)/some-constant
2. Exhaust gas display showing the calculated Exhaust Volume distributed in a cylinder measuring 5 inches in diameter by 36 inches in length and discharging at a rate of 25% of the calculated Exhaust Volume per second.

Example: 3.1.x Steering Control: This function accepts steering commands issued from the Cockpit and controls the servo that drives the steering mechanism. The function manages the action/response sequences presented in Table 1.

|  |  |
| --- | --- |
| **Command/Condition** | **Response** |
| Steering Control Message Received | Decode message to determine direction and amount to steer |
| Direction and amount of steer established | Determine how much to move the steering servo to meet steering order requirement |
| Required servo movement calculated | Move servo required amount |

**Table 1. Steering Control Functional Requirements**

## Performance Requirements

* Describe any performance requirements in this section. Performance requirements should possess numeric boundaries, etc. They should be stated in measurable terms. Each requirement should be stated as an individual statement with a unique identifier.

### Performance Requirement 1

**Example:** 3.2.1 Rubber band Propulsion System (RPS): The RPS shall meet the following performance requirements:

1. Capable of being wound 365 turns

2. Capable of surviving 500 winding events without breaking

**Example:** 3.2.2 Bluetooth Communications> the Bluetooth Communications link shall meet the following performance requirements:

1. maintain connectivity from 5 to 25 feet in an unobstructed line-of-site environment
2. support information transfer at a rate of 5 messages/second

**Example:** 3.2.3 Steering Control: the prototype shall be able to control steering in accordance with the following:

1. steering angles range from 0 (centerline) to 45 degrees left or right of centerline
2. movement rate of the steering mechanism cannot exceed 15 degrees per second while the prototype is in motion.

### Performance Requirement 2

## Assumptions and Constraints

* Describe any assumptions that have been made and that would affect the requirements if they turned out to be false. An example assumption is that a specific piece of hardware will be available before the product goes into testing.
* Describe any dependencies or constraints that exist. A dependency may be that a specific subsystem, hardware, or software component exists. A constraint may be that data transfer that would normally be performed via a secure network is conducted by simulating the exchange for purposes of demonstrating the prototype.

|  |  |  |
| --- | --- | --- |
| **Condition** | **Type** | **Effect on Requirements** |
| Vehicles cannot occupy more than one space | Constraint | Bounds the problem of matching vehicle entries and exits to available spaces |
| Only valid data entries will be provided | Assumption | Allows for minimal error checking for the purposes to developing and demonstrating the prototype |
| A RFID reader is available for the prototype | Dependency | The RFID reader function must be simulated if one is not available |

**Table 2. Effects of Assumptions, Dependencies, and Constraints on Requirements.**

## Non-Functional Requirements

* Describe the non-functional requirements that characterize the performance of the product. Examples of these are security, maintainability, and reliability. Place those that are pertinent to your product in this section.

### Security

* Identify security requirements. I.e. encrypted data transfer, database access control, multi-level password protection, physical security, etc.

Example: Product xyz provides multi-level password control for cockpit access. Two levels are provided. The initial access level allows issue of speed and steering controls. The second level allows authorization of system updates as well as access to specific parameters controlling rate of steering adjustments and acceleration to the ordered speed.

### Maintainability

* Identify what components of the system are “maintainable”. Indicate responsibility for maintenance.

Example: Product xyz provides a low-maintenance configuration for accomplishing field-plowing. The Cockpit System is updated on a quarterly basis via Bluetooth download to provide the very latest updates for exhaust Volume monitoring and distribution. Maintenance procedures for all other components are conducted semiannually and can be performed by personnel appropriately skilled in farm equipment maintenance and repair.

### Reliability

* Describe how reliable the end-product needs to be. Is access needed 24/7? What might an “availability budget” be (i.e. the product needs to complete 96% of it’s transactions without error or kickback).
* Are there critical items that must be available all of the time and non-critical functions that can be non-functional without effecting critical performance?
* State rational supporting the reliability statements.

# Appendix

* Put items that provide additional information, but do not belong in the body into appendixes. Examples might be supporting materials, diagrams, etc.
* The list of equipment, software, and other materials required for the prototype should be included in the appendix.