Budget Proposal

for Autonomous Panda System

Sponsor

The Department of Electrical, Computer, Software & Systems Engineering at Embry Riddle Aeronautical University

Released October 7, 2014

Funky Town Fancy Pandas Development Team

**Abstract:** The budget proposal and functional design is contained in this document in conjunction with the preliminary budget, justifications, and decisions for each of the major components.

# Revision History

|  |  |  |
| --- | --- | --- |
| **Version** | **Date** | **Description** |
| 0.1.0 | Sept. 28, 2014 | Initial draft of the document |

Contents

[Revision History 2](#_Toc399953027)

[1. Introduction 5](#_Toc399953028)

[1.1 Purpose 5](#_Toc399953029)

[1.2 Scope 5](#_Toc399953030)

[1.3 Team Information 5](#_Toc399953031)

[2. Functional Decomposition System 5](#_Toc399953032)

[2.1 High-Level Architecture of System 5](#_Toc399953033)

[2.2 Decomposition of Vehicle Hardware Layer 5](#_Toc399953034)

[2.3 Decomposition of Communication Hardware Layer 5](#_Toc399953035)

[3. Requirements Traceability 5](#_Toc399953036)

[3.1 Microcontroller 5](#_Toc399953037)

[3.2 Sensors 5](#_Toc399953038)

[3.3 Motors 6](#_Toc399953039)

[3.4 Arm 6](#_Toc399953040)

[3.5 Frame 6](#_Toc399953041)

[3.6 Batteries 6](#_Toc399953042)

[4. Budget Decision Matrices and Justifications 7](#_Toc399953043)

[4.1 Microcontroller 7](#_Toc399953044)

[4.1.1 Items Under Consideration 7](#_Toc399953045)

[4.1.2 Decision Matrix 7](#_Toc399953046)

[4.1.3 Justification 7](#_Toc399953047)

[4.2 Sensors 7](#_Toc399953048)

[4.2.1 Items Under Consideration 7](#_Toc399953049)

[4.2.2 Decision Matrix 7](#_Toc399953050)

[4.2.3 Justification 7](#_Toc399953051)

[4.3 Motors 7](#_Toc399953052)

[4.3.1 Items Under Consideration 7](#_Toc399953053)

[4.3.2 Decision Matrix 7](#_Toc399953054)

[4.3.3 Justification 7](#_Toc399953055)

[4.4 Arm 7](#_Toc399953056)

[4.4.1 Items Under Consideration 7](#_Toc399953057)

[4.4.2 Decision Matrix 7](#_Toc399953058)

[4.4.3 Justification 7](#_Toc399953059)

[4.5 Wheels 7](#_Toc399953060)

[4.5.1 Items Under Consideration 7](#_Toc399953061)

[4.5.2 Decision Matrix 7](#_Toc399953062)

[4.5.3 Justification 7](#_Toc399953063)

[4.6 Frame 7](#_Toc399953064)

[4.6.1 Items Under Consideration 7](#_Toc399953065)

[4.6.2 Decision Matrix 7](#_Toc399953066)

[4.6.3 Justification 7](#_Toc399953067)

[4.7 Batteries 7](#_Toc399953068)

[4.7.1 Items Under Consideration 7](#_Toc399953069)

[4.7.2 Decision Matrix 7](#_Toc399953070)

[4.7.3 Justification 7](#_Toc399953071)

[5. Risk Analysis 7](#_Toc399953072)

[5.1 Microcontroller 7](#_Toc399953073)

[5.2 Sensors 7](#_Toc399953074)

[5.3 Motors 7](#_Toc399953075)

[5.4 Arm 7](#_Toc399953076)

[5.5 Wheels 7](#_Toc399953077)

[5.6 Frame 7](#_Toc399953078)

[5.7 Batteries 7](#_Toc399953079)

[6. Total System Budget 7](#_Toc399953080)

[Glossary 7](#_Toc399953081)

[Acronyms & Abbreviations 8](#_Toc399953082)

[References 8](#_Toc399953083)

# Introduction

The introduction of this document defines the purpose, scope, and team information for the project.

## Purpose

The purpose of this document is to identify the preliminary budget for the Autonomous Panda System (APS). It is intended to provide the customers of the APS with justifications for major item decisions. These justifications include decision matrices, risk analysis and fulfillment of requirements.

## Scope

This document is intended to provide the customers of APS with a list of parts with justification and pricing information. In this list of parts, only major components have been considered. These major components are those with price above $20 [**citation**] and are essential to the early prototyping of the APS. This document also contains a high-level break down of the APS that provides an overview of the initial design of the system.

## Team Information

|  |  |
| --- | --- |
| **Name** | **Role** |
| Kurt Pedrosa | Team Leader/Scrum Master |
| Merissa Roth | Software Leader |
| Mary Luongo | Hardware Leader/Product Owner |
| Luis Bogran | Development Leader |
| Kok Peng Tan | Developer |

# Functional Decomposition System

## High-Level Architecture of System

## Decomposition of Vehicle Hardware Layer

## Decomposition of Communication Hardware Layer

# Requirements Traceability

## Microcontroller

|  |  |  |
| --- | --- | --- |
| **ID** | **Requirement Text** | **Fulfillment** |
|  |  |  |

## Sensors

|  |  |  |
| --- | --- | --- |
| **ID** | **Requirement Text** | **Fulfillment** |
| 4.1.3 | The APS shall monitor the red LED on the floor. |  |
| 4.1.5 | The APS shall follow the line on the floor. |  |
| 4.1.6 | The APS shall remain within the playing board. |  |
| 4.1.7.1 | The APS shall identify the game station. |  |
| 4.1.8 | The APS shall stop moving once the finish line is crossed. |  |
| 4.2.2 | The APS shall play with the Simon Carabiner for 15 seconds. |  |
| 4.2.3 | The APS shall rotate one (1) row of the Rubik’s Cube 180 degrees. |  |
| 4.2.8 | The APS shall pick up one (1) playing card from the stack of cards. |  |

## Motors

|  |  |  |
| --- | --- | --- |
| **ID** | **Requirement Text** | **Fulfillment** |
| 4.1.4 | The APS shall start moving when the red LED powers off. |  |
| 4.1.6 | The APS shall remain within the playing board. |  |
| 4.1.8 | The APS shall stop moving once the finish line is crossed. |  |

## Arm

|  |  |  |
| --- | --- | --- |
| **ID** | **Requirement Text** | **Fulfillment** |
| 4.2.1 | The APS shall press the middle button on the Simon Carabiner to start playing. |  |
| 4.2.2 | The APS shall play with the Simon Carabiner for 15 seconds. |  |
| 4.2.3 | The APS shall rotate one (1) row of the Rubik’s Cube 180 degrees. |  |
| 4.2.6 | The APS shall draw “IEEE” on the Etch-a-Sketch using the knobs located on the Etch-a-Sketch. |  |
| 4.2.8 | The APS shall pick up one (1) playing card from the stack of cards. |  |

## Frame

|  |  |  |
| --- | --- | --- |
| **ID** | **Requirement Text** | **Fulfillment** |
|  |  |  |

## Batteries

|  |  |  |
| --- | --- | --- |
| **ID** | **Requirement Text** | **Fulfillment** |
| 4.1.1 | The APS shall receive power from an independent, on-board, battery. |  |

# Budget Decision Matrices and Justifications

## Microcontroller

### Items Under Consideration

### Decision Matrix

### Justification

## Sensors

### Items Under Consideration

### Decision Matrix

### Justification

## Motors

### Items Under Consideration

### Decision Matrix

### Justification

## Arm

### Items Under Consideration

### Decision Matrix

### Justification

## Wheels

### Items Under Consideration

### Decision Matrix

### Justification

## Frame

### Items Under Consideration

### Decision Matrix

### Justification

## Batteries

### Items Under Consideration

### Decision Matrix

### Justification

# Risk Analysis

## Microcontroller

## Sensors

## Motors

## Arm

## Wheels

## Frame

## Batteries

# Total System Budget

# Glossary

# Acronyms & Abbreviations

|  |  |
| --- | --- |
| Entry | Expanded Phrase |
| FTFP | Funky Town Fancy Pandas |
| DOF | Degrees of Freedom |
| APS | Autonomous Panda System |
| LED | Light-emitted Diode |
|  |  |
|  |  |

# References