**Budget Proposal for Roadie**

Sponsor

**Electrical, Computer, Software & Systems Engineering at Embry-Riddle Aeronautical University**

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**Are We There Yet?**

# **Revision History**

|  |  |  |
| --- | --- | --- |
| Date | Reason for Change | Version |
| 1 October 2014 | Initial Draft | 0.1.0 |

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# **Introduction**

## **Purpose**

The purpose of this document is to provide the customers of Roadie with a preliminary budget as well as the selection process and justification for the items included in this budget. The justifications include analytical processes in the form of decision matrices and qualitative processes in the form of written justification. The quantitative and qualitative methods are backed by requirements traceability and risk analysis for the parts listed in this document.

## **Scope**

This document is intended to provide a monetary budget as well as justifications for each item. Core components, with a price of $20[**REF TO RUBRIC]** or higher are included in this document. The document contains the high-level design of Roadie as well as a description of the subsystems and functional description of Roadie. The sole purpose of the document is to provide the reader with an idea of the monetary costs involved in the creating of Roadie.

## **Team Information**

|  |  |
| --- | --- |
| Name | Role |
| Brian Powell | Team Leader |
| Michael Philotoff | Software Configuration Manager |
| Alex Senopoulos | Testing Leader |
| Brian Sterling | Development Leader |

# **Functional Decomposition of System**

Roadie is broken down into six main subsystems: (1) the Simon Carabiner subsystem, (2) the pocket Etch-A-Sketch subsystem, (3) the Rubik’s cube subsystem, (4) the playing card subsystem, (5) the line following subsystem and (6) the communications and coordination subsystem. The division of these subsystems is illustrated in **Fig. 1**.



**Fig. 1**: Division of Roadie into six subsystems.

The communication and coordination subsystem relays information to each of the challenge subsystems (line following, Simon carabiner, pocket Etch-A-Sketch, Rubik’s cube and playing card). As each of the challenge subsystems completes it task, it relays data back to the communications and coordination subsystem. These subsystems are further divided by functionality to create the high-level architecture as described in Section 2.1.

## **High-Level Architecture of System**

The system architecture of Roadie is designed in a layered approach, depicted in Fig 2 below, in order to better divide the work being done and to aid in the conceptualization of the system design.



Fig : High level description of the systems in Roadie.

The applications on the communications and coordination system in the form of feedback from the sensors (reflectance and camera) is translated by the middleware (software) to the physical communications means. From here, the arm subsystem and the movement subsystem are directed by the communications and coordination system in order to do complete the challenges. From there, middleware in the form of software is used to talk to the applications. In this instance, the application on the arm side represents the challenges (Simon Carabiner, pocket Etch-A-Sketch, Rubik’s cube, picking up a playing card), with the movement application being line following. As Roadie progresses along, it continues to send feedback from the movement system and the arm system to the communications and coordination system so that Roadie may understand what exactly is happening.

## **Decomposition of Communications and Coordination**

Fig 3 below, better illustrates the communications that occur amongst the systems in Roadie.

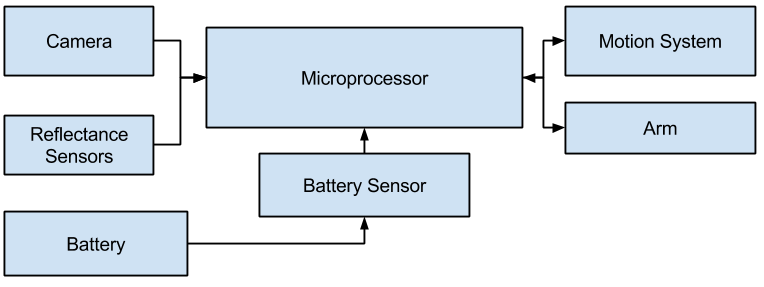


Fig : Decomposition of communications and coordination system for Roadie.

As the figure shows, the camera, the reflectance sensors and the battery, via the battery sensor, provide input to the communications and coordination system. From here, the communications system sends commands to both the arm and motion system so that they will be able to complete their individual tasks. As the arm and motion systems complete their tasks, they relay feedback back to the communications and coordination system for further guidance.

# **Requirements Traceability**

The following requirements refer to those in Roadie System Requirements Specification (SRS) 1.0.0-2014, Revision 18 September 2014. Each requirement is identified by its corresponding number in the SRS. This ID is then followed by the requirement text as well as an explanation of how each part will fulfill said requirement.

## **Camera**

Table 1 depicts the requirements that are satisfied by the camera selected in Section **BLANK** as well as the requirements that led to the selection of this particular camera.

|  |  |  |
| --- | --- | --- |
| Requirement ID | Requirement Text | Fulfillment |
| 3.1.7 | The system shall wait for red [RGB value TBD] LED in starting area to turn off before exiting the starting area. |  |
| 3.2.3 | The system shall identify the challenge zone and stop movement upon arrival. |  |
| 3.3.1 | The system shall correctly identify the challenge upon arrival. |  |
| 3.3.3.3 | The system shall correctly sense color blue [exact RGB values TBD] when illuminated on the Simon Carabiner. |  |
| 3.3.3.4 | The system shall correctly sense color red [exact RGB values TBD] when illuminated on the Simon Carabiner. |  |
| 3.3.3.5 | The system shall correctly sense color yellow [exact RGB values TBD] when illuminated on the Simon Carabiner. |  |
| 3.3.3.6 | The system shall correctly sense color green [exact RGB values TBD] when illuminated on the Simon Carabiner. |  |

Table : Requirements traceability for camera.