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| --- | --- | --- | --- |
| **Project #** | **Project Name** | **Project Track** | **Project Family** |
|  |  |  |  |
| **Start Term** | **Team Guide** | **Project Sponsor** | **Doc. Revision** |
|  |  |  |  |

# Project Description

## Project Background:

In this section enter a **brief** description on the project background. Includes item like:

* Motivation
* Past projects
* Related Projects

## Problem Statement:

In this section enter a 1-2 sentence description of the fundamental problem your senior design project is trying to solve.

## Objectives/Scope:

1. In this section enter a numbered list of high level project objectives.
2. These objectives are what you hope to accomplish in order to solve the problem statement summarized above.

## Deliverables:

* + In this section enter a bulleted list of the deliverables (i.e. the output) of your project.
  + Include not only the documented deliverables for SDI & II, but those specific to the project, the team guide and the project sponsor, if one exists.

## Expected Project Benefits:

* + Summarize what your teams feels will be the expected benefits to the project stakeholders at the end of SDI&II.

## Core Team Members:

* + List of Team Members

# Strategy & Approach

## Assumptions & Constraints:

1. In this section enter a numbered list of key assumptions and constraints that could impact your project.
2. For example, it is assumed that the motor type being used in the 10kg Robotic Platform is XYZ.

## Issues & Risks:

* In this section you should enter all of the things that you expect the team to lose sleep over during the next 22 weeks.
* For example
  + The lead time of component ABC is 10 weeks.
  + The casting process has been shown over the last two projects to be one of the greatest challenges and will be a key technical hurdle to overcome for the success of the project.
  + No one on the team has a strong fluid mechanics background so analysis of the flow in subsystem EFG will require external consultation.

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| **Project #** | **Project Name** | **Project Track** | **Project Family** |
| P08023 | Air Muscle Artificial Limb | Assistive Devices and Bioengineering | Artificial Organ Engineering |
| **Start Term** | **Team Guide** | **Project Sponsor** | **Doc. Revision** |
| Fall 2007 | Dr. Lamkin-Kennard | Dr. Lamkin-Kennard |  |

# Project Description

## Project Background:

The long term goal of this project is to design a robotic arm capable of the full range of hand and finger motions. This first phase of the project will primarily focus on the new design of a robotic hand that is powered by air muscles. There exists a design of such an arm that the team will be analyzing and attempting to improve. Some of the major goals are to achieve 2 degrees of freedom in the finger motion as well as three degrees of freedom in the thumb motion. The hand also wants to be scalable as a long term goal. The team will be divided into three subgroups all of which will be given different project tasks.

## Problem Statement:

## The primary objective of this project is to design and develop an anatomically accurate, robotic hand that incorporates air muscles as a force generating mechanism. The robotic hand should utilize control algorithms that accurately reproduce human finger motions. In addition, the team is aiming to reproduce as many degrees of freedom in the fingers as possible.

## Objectives/Scope:

## 1. Optimized air muscle design and configurations

## 2. Control strategy/algorithms

## 3. New hand design - drawings, design requirements

## 4. 1-3 Single controlled fingers from the new hand design.

## Deliverables:

* + Functional hand that meets the project needs.
  + New Design, Drawings, Sketches
  + Documented Air Muscle Data

## Expected Project Benefits:

* + Reinforcing the biomechanical program at RIT.
  + Hand will be a great teaching tool.
  + Basis for future senior designs

## Core Team Members:

* + Jonathan Kasper – Project Manager
  + Jenna Fike – Technical Lead
  + Matt Lewis
  + Ellen Cretekos
  + Joas Hanzlik
  + Nick Rappa
  + Marc McKann
  + Eric Giang

# Strategy & Approach

## Assumptions & Constraints:

## The team must first understand muscle behavior and control strategies. Working with an existing hand will enable the team to properly complete their analysis prior to design of the new hand model. After an understanding of the current model is attained by the team, their next task will be to add scalability as an attribute to the project. The team will be focusing on design issues throughout the entire project which will help to aid the transition from the current to the future arm design. Proposed Budget: $2500 Note: The budget is somewhat flexible however the above value matches the scope of the project very well at this point.

## Issues & Risks:

Project Issues/Risks/Constraints

* Project Understanding and Digesting By Team
  + New Project
  + New Area of Study for Many
* Available Resources
  + Obtaining Resources
  + Order Parts/Hardware
  + Lead Time
* Controls Issues
  + Understanding All DOF of A Human Hand
  + Getting Up To Speed With Solenoid Valves