FRC 4909 – Bionics

Billerica Memorial High School

Game Analysis Guide

Goal: Create a successful robot that regularly wins matches on its own merits and skills

Part A - Identifying Tasks

1. Read the manual! What are the important rules to keep in mind?
2. How do you score points?
   1. Make a list of all potential ways to score (no matter how obscure)
3. How do you stop your opponent from scoring?
   1. Make a list of all potential ways to stop your opponent from scoring.
4. Identify penalties that may limit scoring
5. Identify any important robot-field interactions
6. What is the maximum score possible?
   1. To determine max score, look at different ways to score and determine if any are limited
      1. Example: Game of putting cans in a bucket – Limitations = number of cans available; size of bucket
7. Rank the ways to score and the ways to stop your opponent on a scale of 1-100 by benefit to winning the match
   1. Values are arbitrary; 100 is best task to win match
8. Rank the tasks on a scale of 1-10 in terms of difficulty to complete.
9. Determine the benefit to difficulty ratio
   1. Do your ratios align with your personal preferences?
   2. The goal is to identify the tasks which give the highest ratio of benefit to cost
   3. The task with the highest ratio is the most optimal according to your analysis

*Keep tasks general!!!*

Part B - Prioritization of Tasks

1. Create a list of robot qualities (“what should the robot be like?)
   1. Based off the list of optimal tasks
   2. Most desired qualities that are critical to the success of the most optimal tasks
   3. Example qualities: Speed, Power, Agility, Low Center of Gravity
2. Create a list of robot functionalities
   1. List of abilities that the robot should have
      1. Just the ability, not the implementation
   2. Examples of abilities: Traversing the field, Picking up objects, Depositing objects

The combination of these two lists act as the Functional Requirements for the robot.

*How do we build a robot that achieves the stated abilities and qualities?*

*Prioritization of Tasks Example*

Game: Score baseballs in 3 goals at three different heights. More points for balls scored in the higher goals. Goals are located on opposite end of field.

List of Qualities

1. *Speed* - The robot needs to be fast to repeatedly cross the field to gather baseballs and score them.
2. *Accuracy* - The robot needs to reach desired positions in an accurate fashion, to have the precisions required to score the baseballs in the goals.
3. *Agility* - The robot needs to be quite maneuverable in order to avoid obstacles and opponent robots in an effort to gather the baseballs.
4. *Low Center of Gravity* - In order to reach the high valued goals, the robot must reach high in the air. Thus, the robot must not tip at these heights.

List of Functionalities

1. *Drive* – The robot needs the ability to drive across the field in less than four seconds, to maximize the amount of baseballs scored. The drive will also provide the ability to play defense against opposing robots.
2. *Picking up baseballs* – The robot needs to be able to instantly pickup any baseball it touches, with a minimal amount of lining up. A large tolerance, allowing for minimal accuracy in lining up is desired to make the process as fast as possible. Being able to hold two baseballs at a time is desired, as it minimizes the number of trips across the field that are needed.
3. *Placing baseballs* – The robot needs to be able to elevate to the height of the highest goal in less than two seconds and place two baseballs in the goal.

How do we build a robot that achieves the stated abilities and qualities?