# Concept Generation

* Coordinated plays
  + Leading passes
* Multiple kickers to reduce necessary rotation time
* Vacuum (?)
* Smart kicking (finds best shots, including walls)
  + Make goals off of opponent robots
* AI can “scope out” the competition - learns what they do and adapts
* AI uses adaptive learning
* Robots can translate and rotate simultaneously
* Put spin on the ball
* Kick and swipe strategy
* Smart control of ball (can keep it centered as we maneuver)
* Distraction techniques
  + Fool their vision algorithms
  + Fool their AI
* Turbo motion control
* Model predictive control
* Victory dance

## Key Categories

## Two-robot play:

* Base: static independent roles
* Dynamic independent
* Static coordinated roles
* Dynamic coordinated roles
* Considerations:
  + More/less effective passing plays
  + Vulnerability to robot malfunction
  + Difficulty of implementation
  + Computation overhead

### Kicker:

* Multiple kickers (left and right)
* Kickers on multiple sides of robot
* Kickers that can kick into the air
* Solenoid
* Legos
* Pneumatic
* Keep the ball in place
* Spin on the ball

### Entertainment:

* Sound effects
  + Speakers
  + PWM...
* Victory dance
  + Spinning
  + Coordinated dancing
  + High five
* LEDs/lights
* Decoration
* Effective strategies
  + Passing to each other (parallel down field)
  + Kicking/passing off walls
  + Getting ball unstuck
* Mocking strategies
  + Take advantage of avoidance strategies
  + Trick vision algorithms

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| **Roles for Two-Robot Play** | | **Concepts** | | | | | | | |
| **Static Independent** | | **Dynamic**  **Independent** | | **Static**  **Coordinated** | | **Dynamic**  **Coordinated** | |
| **Criteria** | **Weight** | Rating | Weight | Rating | Weight | Rating | Weight | Rating | Weight |
| Play Effectiveness | 40 | 5 | 200 | 7 | 280 | 7 | 280 | 9 | 360 |
| Resistance to malfunction | 10 | 5 | 50 | 7 | 70 | 3 | 30 | 4 | 40 |
| Implementation Simplicity | 25 | 5 | 125 | 3 | 75 | 4 | 100 | 3 | 75 |
| Computational Overhead | 25 | 5 | 125 | 4 | 100 | 6 | 150 | 4 | 100 |
| **Totals** | **100** |  | **500** |  | **525** |  | **560** |  | **575** |

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| **Kicker** | | **Concepts** | | | | | | | | | |
| **Basic Solenoid**  **Design** | | **Kickers on 3 sides** | | **Vertical Kicking** | | **Double Kickers  (left and right)** | | **Putting spin on the ball** | |
| **Criteria** | **Weight** | Rating | Weight | Rating | Weight | Rating | Weight | Rating | Weight | Rating | Weight |
| Simplicity  (Build & use) | 40 | 5 | 200 | 5 | 200 | 2 | 80 | 3 | 120 | 4 | 160 |
| Effectiveness (Shoot/Pass) | 35 | 5 | 175 | 6 | 210 | 8 | 280 | 7 | 245 | 8 | 280 |
| Cost | 25 | 5 | 125 | 2 | 50 | 4 | 100 | 3 | 75 | 4 | 100 |
| **Totals** | **100** |  | **500** |  | **460** |  | **460** |  | **440** |  | **540** |

We identified three distinguishing characteristics for our kickers that would set different designs apart. The first one, simplicity, is closely tied to how much time and effort it will take to implement the idea. Before we implement any strategies using the kicker, we will need to make sure that the basic functionality of our robot is well optimized. For that reason, kicker optimization will likely be very constrained by time, so we will need something that we can implement simply.

Our next criterion is that it is effective. If the work that we put into the kicker does not help us to win games and entertain audiences, then it is not worth doing.

The final criteron is cost. We are

For our kickers, we decided that a reasonable baseline would be to compare against a solenoid piston. For that