Mock Kickoff: 12/16/17

STRATEGIC DESIGN

THE MIDKNIGHT INVENTORS

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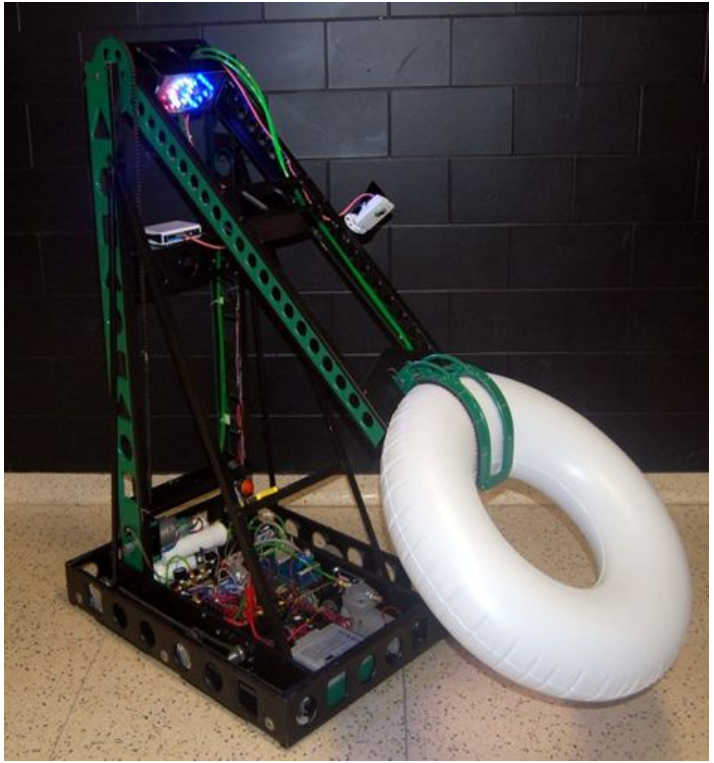
OVERVIEW

- What is Strategic Design?
- Simplicity
  - “Units of Robot”
  - Beyond Simplicity
- Game Analysis
- Chokehold Strategies
- Priority Lists
- Conceptual Design/Concept Lock
- Iteration

WHAT IS STRATEGIC DESIGN?

- Setting priorities to define the season & our robot's strategic advantages
- It is NOT mechanical design!
  - Optimizing our process
  - Designing within our means
  - Determining the *'what'* before the *'how'*
- Helps us to plan our build season so that:
  - The robot is clearly defined
  - Our competition season brings success!

SIMPLICITY



SIMPLE ROBOTS ARE MORE ROBUST, EASIER TO FIX, EASIER TO BUILD & OFTEN MORE EFFECTIVE

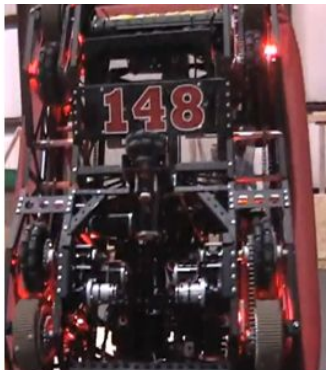
- Choosing which functions to focus on is *extremely important!*
- Consider this robot; one point of motion to move the arm up/down, rather than many-jointed mechanisms.

“UNITS OF ROBOT”

If you only have a limited number of resources to spend on making your machine; would you rather be really good at a few things, or kind-of-OK at everything?

BEYOND SIMPLICITY

- Ensure that the benefits heavily outweigh the risks if selecting a complicated design
  - Omnidirectional drive systems are difficult to design, program & drive, but offer greater mobility (and ‘lazy’ lineups for drivers)
  - Traditional drive systems are more reliable to build & maintain, can be an equally effective mobility solution and are not as easily defended



GAME ANALYSIS

- Read the Manual!
  - How do you score points?
  - Preventing opponents from scoring points
  - How does the ranking system work?
  - Fouls & Penalties
- What's the obvious scoring choice?
  - Go crazy! Think out of the box.
- Any 'chokehold' strategies?

CHOKEHOLD STRATEGIES

This robot was a great example of a chokehold strategy in action; it redirected the balls coming back into the field from the human players, directly back into the goals via the two pinball-machine style arms. This meant that their opponents couldn't even take the balls into their own robots - they never touched the floor!

If implemented correctly, the robot will be *game-breaking and unstoppable*.

KICKOFF DAY!

SET GOALS

1. Win Matches
   - ❑ How? Optimize Alliance Score vs. Opponent Score.
2. Seed High
   - ❑ How? Focus on 2nd order sort for seeding.
3. Be a desirable pick
   - ❑ How? Have strategic depth & complement alliance partners.

GAME ANALYSIS

1. Outline all scoring opportunities
2. Discuss strategic options and find compatible scoring opportunities
    - ex. A 2013 robot that was meant to cycle, was already is already optimized to take from feeder stations for the end-game.
3. Chart strategies, find opportunity costs & time each task may take

GAME ANALYSIS

- Discuss all possible strategies
  - *Even if you think it sounds dumb!* Think back to the chokehold discussion - how many of you would have said ‘you’re crazy!’
- Points-Per-Second
  - Scoring? Endgame? Defense?
  - Strategic Value vs. ‘cool factor’
  - Easy tasks w/ high payoff
  - Sometimes keeping your opponent from scoring is more valuable than your score!

Landfill vs Station Scoring Analysis

	Acquire and lift can (s)	Place stack and return (s)	Acquire and stack tote (s)	"# of stacks = 135 / (B + C + 6*D)"
Landfill (world's best intake)	20	15	2	*2.87*
Landfill (good intake)	20	15	8	*1.63*
Station	20	15	4	*2.29*
	Assume same design ^^^	Assume same design ^^^	Prototype for numbers ^^^	

PRIORITY LIST

A priority list is our set of the most important things to consider in both our robot strategy, and our design of the machine we end up building. This list will drive the decisionmaking & tradeoffs we choose during the robot design & build process. Will we focus on our ability to drive? To pick up a game piece? To play defense? Some of those may seem obvious, but if we don't discuss them it's possible to overlook an important facet of the FRC game challenge.

STRATEGIC DEPTH:

- ❑ Look for what's common between the strategies discussed
- ❑ Recurring actions between multiple strategic options allows you to play the game adaptively to your opponents' & partners' strategies

CONCEPTUAL DESIGN

FINALLY: THE ‘HOW’ OF THE ROBOT!

Focus on different types of mechanisms & how they accomplish tasks

- ❏ *Ex*. Lifting can be done with a linear elevator, a scissor lift, or a 2- or 4-bar linkage arm. Many executions of the same action.

Looking at old FIRST games is *good!*

- ❏ Mimic design features to help refine our prototypes
- ❏ Designs from old games can help w/ time estimates

Copying blindly is *bad*.

- ❏ Trade-offs other teams made in the past may not apply to our team or the new game

CONCEPT LOCK

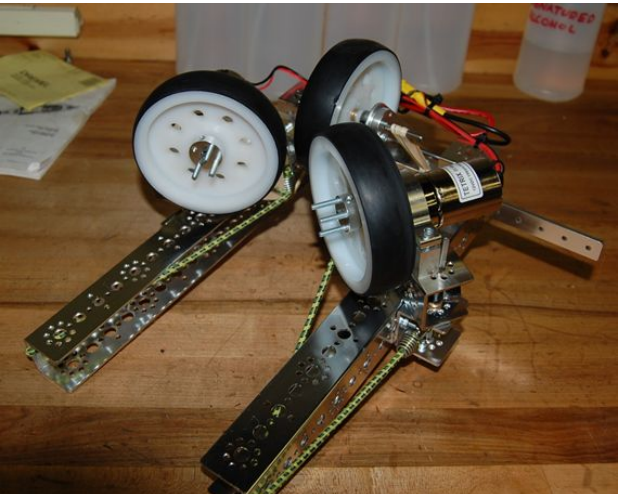
By the end of week one, we will lock-in the concept of the robot's strategy and functionality when completed.

- Our priority list is *SACRED!*
- Lock applies to all subteams
  - Mechanical: What basic type of design will our robot be performing the objectives with?
  - Electrical: Pick sensors that work best for this design & strategy
  - Programming: Move forward with Autonomous modes that serve our strategy

ITERATION

it-er-a-tion (noun)

- Repetition of a mathematical or computational procedure applied to the result of a previous application, typically as a means of obtaining successively closer approximations to the solution of a problem



Consider this evolution of the 2011 ‘minibot’. These started off huge at the beginning of the year and got smaller & faster as the season went on.

BASIC KICKOFF PROCESS

Step 1: Review Materials
- ❑ Robot, Game, Arena & Tournament Manuals

Step 2: Analysis
- ❑ Charting scoring opportunities
- ❑ Taking notes about the field
- ❑ Points-Per-Second Analysis

Step 3: Trade-off Discussion
- ❑ What's most important for our goals in this game?

Step 4: Priority List
- ❑ What is our robot going to do?

Step 5: Concept Discussion
- ❑ How will it do those things?

QUESTIONS?

CONTACT US:

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