Game Design Challenge Finalist Team 4159

Team Name: CardinalBotics

Location: San Francisco, California USA

Game Name: DNA Dash

Game Overview:

A sudden bout of radiation has damaged cell DNA! It's up to the nanobots to place the correct sequence of Nucleotides to repair the DNA Helices and deliver Aminos to the Ribosome!

3 DNA Helices are placed down the middle of the field, with one belonging to each alliance and the middle one shared by both. Each alliance has a Ribosome, positioned on the opposing alliances' side.

Before the match, each nanobot can choose to start with 5 Aminos (flat disks) or 3 Nucleotides (hoops). During auto, nanobots can cross the auto line (15pts per robot), hang Nucleotides, or deliver Aminos into the Ribosome closest to them. Aminos fed through the Small Subunit (low goal of Ribosome) will receive 6pts, and Aminos thrown into the Large Subunit (high goal of Ribosome) will receive 10.

From each DNA Helix protrudes 14 racks, each with 2 hooks extending outwards for hanging Nucleotides. Except for 2 racks at the very bottom, the color of each rack is randomized with one of 4 LED colors at the beginning of each match. Nucleotides come in 4 colors as well, each corresponding to a rack color. In auto, every Nucleotide hung on the Helix that matches the illuminated color will earn 10pts; if the colors do not match, the alliance will earn 4pts.

During teleop, nanobots continue to deliver Aminos and repair the DNA Helices. Each Amino fed into the Small Subunit will receive 3pts and each Amino thrown into the Large Subunit will receive 5pts. Nanobots should score in their alliance's Ribosome. Every Nucleotide that correctly matches the color of the rack on the DNA Helix will receive 5pts. If the colors don't match, the alliance will receive 2pts. Alliances can score Nucleotides on their DNA Helix or the shared Helix, but only by working together to complete the shared one will both alliances be awarded a ranking point.

Nucleotides can be picked up at the Nucleotide Loading Bay located on the alliance wall, where the human players can feed the correctly colored Nucleotide to the nanobot. There are 3 stacks of 5 Aminos along each side of the playing field, and they can also be picked up at the Amino Loading Bay on the alliance wall.

During endgame, the Loading Bays shut down. To get additional game pieces, the human players must throw them to their nanobots, Ribosome, or Helices. Nanobots will prepare for Protein Transport by climbing onto the Binding Sites (protruding horizontal bars) of their alliance's Ribosome. Each nanobot that successfully climbs will receive 30pts, and a nanobot that successfully parks in the Parking Zone (area around the Ribosome) will receive 10. If all 3 nanobots successfully climb, or 2 nanobots climb and 1 park, Protein Transport is completed and that alliance will receive 1 ranking point.

The alliance with the most points by the end of the match wins and repairs the cell. It will receive 2 ranking points. If the alliances tie, each will receive 1 ranking point.

Describe Notable Field Elements:

There are 3 DNA Helices placed in the middle of the field. Each alliance has a Helix and the middle one is shared between the alliances. Each Helix is 72.26in tall and 21.5in wide. Each has 14 racks, with 2 racks adjacent on 7 levels. Two hooks protrude outwards for hanging Nucleotides. This gives 28 chances to score per Helix. Each hook has a small lip at the end to prevent the Nucleotide from falling off. The adjacent racks are in color pairs of orange and green, yellow and purple. The bottom racks are always

orange and green to help nanobots align during auto. LEDs in the racks light up to show the desired color.

Nucleotides are circular rings with an outer diameter of 5in, an inner diameter of 3in, and a height of 1in. Each one is color-coded to match the LED colors of the racks on the Helices.

Aminos are teal-colored disks that are 11in in diameter and 1.45in tall. To score points, they are thrown or pushed into triangular towers called Ribosomes.

Ribosomes are 85in tall and have a high and low goal, also known as the Large Subunit and Small Subunit. The Small Subunit has 4in by 15in rectangular openings with rounded corners on each face of the Ribosome; they are 15in from the floor. The Large Subunit consists of a chain net and funnel that catches Aminos thrown at it. The lowest point of the Large Subunit is 45in from the floor.

Binding Sites are horizontal bars attached to each vertex of the Ribosome for climbing during endgame. They are 26.75in long with a thickness of .83in.

What are robots expected to do?

During auto, nanobots are expected to cross the auto line and score with Aminos or Nucleotides.

Nanobots can score in the Large and Small Subunit of the Ribosome during auto and teleop. During auto, nanobots must score in their opponent's Ribosome to avoid crossing the midline; they will score in their own Ribosome during teleop. To score in the Large Subunit, nanobots can shoot Aminos from anywhere on the field and are allowed to extend 30in beyond their frame perimeter when shooting. The Amino should hit the chains, which would slow down and guide the Amino into the Ribosome. To score in the Small Subunit, nanobots are expected to drop Aminos into openings on the sides of the Ribosome. Nanobots can obtain more Aminos from stacks lining the side of the field or from the Amino Loading Bay, a chute on the alliance wall. Nanobots can only carry up to 5 Aminos or 3 Nucleotides at a time.

During auto and teleop, nanobots can also hang Nucleotides onto the corresponding colored racks of the Helices. If nanobots put Nucleotides on the other alliances' Helix, points will be given to the other alliance. Nucleotides can be dispensed by the human player at the Nucleotide Loading Bay, a slot in the alliance wall.

During the endgame stage, the Loading Bays shut down and the parking zone of the opposing alliance becomes protected. The human player can throw elements to the nanobots, or attempt to score by aiming at a DNA Helix or Ribosome. The nanobots are expected to prepare for Protein Transport by climbing on the Binding Sites of their alliance Ribosome or park in the Parking Zone. One Binding Site should support only one nanobot.

Did you use the Game Design Challenge Element in your concept?

Yes

If yes, how?

The chain element is incorporated into the design of the Ribosome. Within the tower is an 85in pole, on top of which is a large circular hoop with a diameter of ~30in, and a smaller circular hoop with a diameter of ~24in. Together, they hold and evenly spread out the chains that hang downwards. The chains all meet together near the opening of the funnel where they connect to a smaller circular metal hoop that surrounds the pole. Collectively, they form the Large Subunit (high goal) of the Ribosome, a large chain net that catches Aminos.

When hit by an Amino, the chains will absorb the energy of the Amino and slow it down. This allows Amino to drop down into the Ribosome tower to score. This mechanic is similar to that in frisbee golf.

Another presence of chain in our game is our DNA Helix. In biology, DNA helices are made of chains of nucleotides that together code for the blueprint of the cell. The main objective of our game is to repair the DNA by correctly arranging the Nucleotides, allowing for the successful formation of the chain.