

## Game Design Challenge Finalist Team 341

**Team Name:** Miss Daisy

**Location:** Ambler, Pennsylvania USA

**Game Name:** HyperHive

### **Game Overview:**

Worker bees are rapidly disappearing, leaving their hives in need of help! Luckily, beekeepers have designed robotic bee drones to avert disaster. In HyperHive, alliances of bees gather NECTAR (tennis balls) and work with the opposing alliance to connect COMBS (hexagonal chain links) to help the colony thrive.

The game is played on a rectangular field, the HIVE. Robots start in one of three locations around the field and can choose to pre-load 1 COMB or 15 NECTAR. Robots earn five points by leaving their AUTONOMOUS BOX. During the teleoperated stage of the game, robots continue to score NECTAR and COMBS in order to supply and protect their colony. A hexagonal goal covered in Velcro is mounted above each alliance station. It serves as the high goal, displaying any NECTAR as it is scored. The low goal is a rectangular cutout located under the high goal that holds NECTAR in a box.

Alliances collect NECTAR which is continuously being released into the HIVE from six DISPENSERS. The DISPENSERS are hexagonal structures, arranged on the vertices of the INNER HEX, a hexagonal area in the middle of the HIVE. The NECTAR dispenses at six balls per second (one from each dispenser per second) starting in the teleoperated period and ending ten seconds before the end of the match, releasing a total of 750 NECTAR. When successfully scored into the high and low goals, NECTAR earns 1 and  $\frac{1}{3}$  points, respectively.

Robots are also able to gather COMBS. There are a total of 36 COMBS, each worth 15 points, that can be scored by either alliance. Upon delivering the COMB to the HUMAN PLAYER STATION, BEEKEEPERS (human players) score the COMB by linking it into a chain along the side of the field. An alliance can only deliver COMBS to their respective alliance's HUMAN PLAYER STATIONS. When both alliances have linked seven COMBS, each alliance earns a ranking point for fortifying the HIVE in qualification matches. After scoring seven COMBS, the alliance's high goal flips, revealing new scoring space.

During the endgame, teams make their way back to the INNER HEX. Each bee can prepare to take flight by choosing to hang one of three different bar levels: level one for 30 points, level two for 60 points, or level three for 90 points. If at least two of an alliance's robots successfully hang at any level, the alliance receives a ranking point in qualification matches or a 30-point bonus in elimination matches.

The alliance with the most points at the end wins the match and has successfully bee-come ready to thrive!

### **Describe Notable Field Elements:**

In HyperHive, robots compete on a carpeted field, the HIVE. In the center, there are six hexagonal structures, the DISPENSERS, placed in a hexagonal orientation from the centerpoint of the HIVE, forming the INNER HEX. In the INNER HEX, a central pillar supports three levels of bars for each alliance from which robots can hang during the endgame. The pillar has two 82"-wide bars on each level, with the outer end of each bar supported by a DISPENSER. Each DISPENSER has six exterior pegs, one on each of the faces, from which robots retrieve COMBS. Each COMB is a plastic hexagonal chain link that is 18" across. Inside each DISPENSER, there is a rotating mechanism allowing NECTAR to exit from each face of the DISPENSER.



NECTAR are regulation tennis balls and are scored on a hexagonal Velcro target, 4' across, mounted above each ALLIANCE'S DRIVERS' STATION. The low goal is a 8"x30" rectangular cutout that is placed 16" from the carpet, directly below the high goal.

At each HUMAN PLAYER STATION, there are 6"x26" chutes, 12" off the carpet, for robots to pass the COMBS to BEEKEEPERS. Along the outside of one long side of the field, there are three vertical posts. These posts are placed 9' 1" apart, with the center post aligned with the central line between the ALLIANCE DRIVER STATIONS. These posts are not accessible to robots. Instead, BEEKEEPERS link the COMBS and create a chain spanning from the closest post to the central post. When BEEKEEPERS score the 7th ring, a field motor rotates their alliance's high goal, switching to a clean surface to score NECTAR. There are also two additional vertical posts behind each ALLIANCE STATION, spaced 10' 2" apart called RESERVES. BEEKEEPERS can link 8 additional COMBS between these posts.

### **What are robots expected to do?**

HyperHive presents a wide array of possible robot actions to competing teams, allowing for high-level strategy and diverse styles of play. In the autonomous period, teams attempt to score NECTAR into the high or low goals and deliver COMBS to their BEEKEEPERS while operating under pre-programmed instructions. Robots also earn points for leaving their AUTONOMOUS BOX, where they begin the match.

In the teleoperated period, teams scavenge the hive for NECTAR, find and deliver COMBS, and try to inhibit their opponents' ability to score. Teams strive to score at least seven COMBS to flip their high goal. This provides a strategic element for teams to decide the optimal moment to flip the goal in order to maximize their possible points. Teams can continue scoring surplus COMBS behind the driver stations in RESERVES. Additionally, teams must decide if they want to shoot NECTAR onto the high goal or into the low goal, bearing in mind that NECTAR becomes harder to score on the high goal as it is filled. Due to the diminishing returns of the high goal, there may come a point in the match where teams choose to score in the low goal.

Some alliances may elect to have a robot play defense against their opposing alliance. These robots try to deny the opposing teams from scoring NECTAR and COMBS, or block paths in the INNER HEX in an attempt to slow them down.

As the endgame commences, robots prepare to leave the HIVE. Teams swarm the INNER HEX and coordinate with their alliance to choose one of the bars to hang on. Robots that remain suspended at the end of the match earn a ranking point in qualification matches or bonus points in elimination matches.

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

Yes

#### **If yes, how?**

HyperHive's implementation of chain bridges the gap between human players and robots, creating an immersive game for drive teams and audiences alike. The chain serves a purpose that no other element could replace, as the ability to link game pieces to one another is unique to the characteristics of a chain.

In our implementation of the ELEMENT, COMBS connecting along the side of the field function as links in a chain. In building their chain, alliances use COMBS to fortify their hive. We also leveraged the ELEMENT to allow for human player involvement, which is a key focus of this game. Robots retrieve and deliver COMBS from the DISPENSERS to the HUMAN PLAYER STATIONS. BEEKEEPERS are responsible for scoring these COMBS by linking them between posts on the side of the field or behind the DRIVER STATIONS. They can decide when to score these pieces—if they choose, all COMBS can be scored at one time at the end of the match.

Visually, the building of the chain also involves the audience. Spectators watch as alliances incrementally build their chain alongside the field, allowing them to easily track the progression of the match. The chain also encourages cooperation in qualifications matches, as both alliances must contribute to the chain in order to score a ranking point. Alliances can root for their opponent as they both work towards fortifying the HIVE. Our use of the ELEMENT inspires teams to think outside the box, serves as a unique opportunity to reinforce FIRST values through gameplay, and makes HyperHive a bee-autiful game.