

## Game Design Challenge Finalist Team 2630

**Team Name:** Thunderbolts

**Location:** Emek hefer, HaMerkaz Israel

**Game Name:** RANGER DANGER

### **Game Overview:**

Team Thunderbolts 2630 presents: RANGER DANGER FIRST Robotics Competition season!

Climate changes have caused wildfires all over the jungle and burned it down. Teams must come together as rangers in order to restore the jungle and ensure a better future.

The first 15 seconds of the match are autonomous. During this period, robots will run pre-programmed code. Robots can score by getting off the hill and hanging LEAVES on the TREE or the BRANCH. Points earned by hanging LEAVES during this period will be doubled.

During the next 2 minutes and 15 seconds, teams will need to collect LEAVES and hang them on the TREE. Teams may also hang LEAVES on the BRANCH, to create vines of LEAVES. LEAVES can't touch the ground, vines that touch the ground won't count.

After teams successfully restore the jungle, they will have to escape from the jungle before the wild animals arrive.

Teams may also hang their alliance's SPROUT on their vine, to double the points of that vine. The SPROUT will only double the points from the LEAVES that are above it and are connected to the same vine. Robots will collect the SPROUT from their LOADING STATION.

In the last 30 seconds, Robots will climb up the CLIFF, supported only by the sides of three walls - the back wall and/or the sidewalls. Teams can park on the HILL instead. Parking on the HILL counts if at the end of the match the robot is supported only by the ramp.

Climbing the CLIFF counts if at the end of the match the robot is above the ground and supported only by the back wall and/or the sidewalls of the CLIFF.

The alliance that scores the most points wins the match and restores the jungle!

### **Notable Fouls:**

-Touching the opponent's robot while its bumpers are partially/fully contained in a safe zone is considered a technical foul.

-Interfering with an opponent's scored LEAF is considered a technical foul and the points for that LEAF will count regardless of its position.

### **Autonomous Scoring:**

- 1.Hanging LEAVES on the TREE - 6 points for each LEAF
- 2.Hanging LEAVES on the BRANCH - 6 points for each LEAF
- 3.Getting off the HILL - 4 points

### **Scoring:**

- 1.Hanging LEAVES on the TREE - 3 points for each LEAF.
- 2.Creating vines of LEAVES on the BRANCH - 3 points for each LEAF.



3. Parking on the HILL - 3 points.

4. Climbing up the CLIFF - 15 points.

5. Bonus points can be earned by hanging the SPROUT on a vine - this will double all the points for each LEAF.

placed above the SPROUT.

6. Foul - a credit of 3 points towards the opponent's match score, If technical foul - 6 points.

Ranking points:

An alliance can earn a total of 4 ranking points per match.

-2 RP are given to the winning alliance.

-1 RP is given to an alliance if they achieve a total of 18 points off the CLIFF.

-1 additional RP is given to an alliance if they hang a minimum of 8 LEAVES on the BRANCH.

**Describe Notable Field Elements:**

LEAF:

RANGER DANGER is played with LEAVES. A LEAF is a 10in./10in./10in. cube built from ABS tubes. The top side of the cube has a hook. The hook is placed so that it holds the LEAF from its center of gravity.

TREE:

This structure is a hexagon, located in the middle of the field.

Located on each side of the TREE are two poles and one rope that you can hang LEAVES on. At the beginning of each match, The colors of the TREE's sides will be randomized between 3 patterns.

BRANCH:

A shaft hanging 65in. off the ground, supported by two stands. Each alliance has one BRANCH to hang their LEAVES on. The BRANCH is designed in a way that allows 3 LEAVES to be hung on top of each other. Teams may expand their vines to the sides as much as the field allows.

CLIFF:

Each alliance has a CLIFF. Each CLIFF contains 3 ramps (called HILLS), 4 sidewalls, and a back wall.

In the endgame, robots may park on the HILL or climb up the CLIFF.

We chose NBR rubber for the CLIFF sidewalls for maximum friction.

LOADING STATION:

Each alliance has two LOADING STATIONS.

Each LOADING STATION has two loading ports - one low port and one high port. Human players slide LEAVES into the ports, one at a time. The high port is the same height as the mid-level of the TREE.

SPROUT:

Each alliance has one SPROUT, located behind the LOADING STATION. The SPROUT is a 4.85in. tall pyramid made of ABS tubes. It has a hook on top, similar to the LEAF.



## VISION TARGETS:

Vision targets made from reflective tape are located on the LEAVES, the LOADING STATIONS, and the TREE. The targets are utilized using image processing for automated alignment.

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

We know that teams have different levels of experience. One of the things that were extremely important to us was “high ceiling - low floor”. This means that the rookie teams will be able to design and build a competitive robot, and the experienced teams will have a challenge and an opportunity to showcase their excellence with an extraordinary robot.

We assume that less experienced teams will prefer to hang LEAVES on the TREE because it is low-height and reachable. We designed the TREE with 3 levels so these teams would have room to improve between competitions. The middle level of the TREE is the same height as the upper part of the LOADING STATION. This way teams can contribute even without any lift system.

Hanging LEAVES on the BRANCH requires an elevator mechanism, which might be too complex for less experienced teams.

Average teams will try to hang LEAVES on the BRANCH because we made it highly rewarding due to the ease of doubling the vine score. Also, 1 RP can be earned from hanging 8 LEAVES on the BRANCH. Those things will make teams choose to hang more LEAVES on the BRANCH rather than on the TREE.

In the climbing mission, teams can not only climb but also park on the HILL, which is an easier option.

We considered the importance of safe zones so that defense won't be too dominant of a strategy. We know that hanging LEAVES on the BRANCH is the hardest task, so we set the BRANCH area as a safe zone. There is another safe zone around each LOADING STATION.

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

Yes

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

The definition of the ELEMENT is: “a series of links or rings connected to or fitted into one another and used for various purposes (such as support, restraint, transmission of mechanical power, or measurement)”. We thought that implementing a chain that can be replaced by a rope and still have the same purpose is not exciting. We decided to implement the ELEMENT in our game in an unusual way, and not just a “typical” chain.

The game piece in our challenge is a LEAF.

The LEAF is meant to be hanged on the TREE or the BRANCH. If you choose to hang it on the BRANCH, you create vines of LEAVES. The longer the vine is, the more points you get. The vines can spread down or to the sides, as the team chooses. Vines answer the definition of the ELEMENT. A vine is a series of links, in this case - LEAVES, connected into one another - hanging while supported by another LEAF, used for the purpose of the game's main challenge.

A thing that makes our element use unique is the fact that teams are using their robots to assemble their chains (vines) during the game. In fact, the main objective of the game is to create chains as long as possible. We also wanted to create an exciting game dynamic where teams need to plan their vines efficiently and place their

LEAVES accurately in order to create long and sturdy vines.