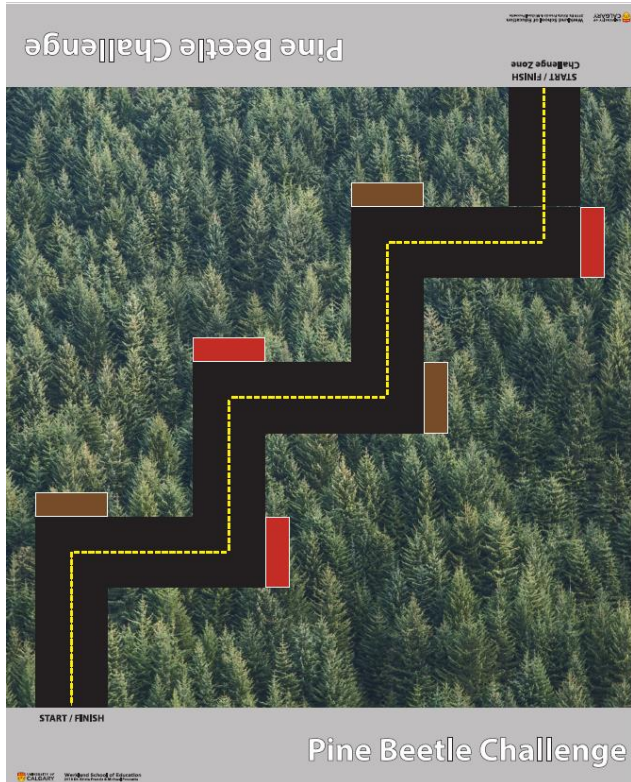


Pine Beetle Challenge

Task Description



In a remote region of Northern Canada, there is a pine beetle infestation that is threatening the entire forest, and poses a fire risk for a nearby community. The ground crews in the area are overwhelmed, and are in dire need of assistance. Your task is to design and build an automated robot that can go into the forest and remove the red infested trees, without hurting the ground crew, healthy trees, or underbrush in the forest. The infection is clustered around an old but well marked logging road, which could help a robot to find the diseased trees.

In order to avoid scaring the local wildlife it is imperative that your robot only spends 6 minutes in the forest, which is the home of the elusive and endangered polar mosquito. The robot can't venture outside of the designated forest except through the START/FINISH zones. Since the terrain is dangerous, you may only interact with your robot within the START/FINISH zones (Grey areas at either end).

Before the government invests in your robot, they have asked you to build a prototype using the EV3 Mindstorms Robotics kit. Prototypes will work in a simulated forest, and will be scored based on the rubric below.

Presentation

After your prototype demonstration on the final day, each group will have to give a 2-minute presentation about their design. This will be done before a panel of judges, and should include each member of the team. Some topics that might be worth presenting are:

- Design features and flaws
- How you identified sick trees
- How you programmed the robot to complete the task

Each team must prepare a minimum 2-slide PowerPoint to be shown during their presentation.

Materials Needed

- **Vinyl Mat.** We suggest printing a high-resolution copy of the mat, using a 4ft by 5ft format. It will cost approximately CAD 200 to print on smooth vinyl at a local print shop.
 - Please find [a copy in standard resolution HERE](#) (2 MB),
 - and [a high-resolution copy is available for download HERE](#) (42.4 MB).You may also need some tape to fixate the mat to the floor.
- Basic **EV3 Robot** built from the Instruction Manual.
- An attached [color sensor](#). It can be forward facing (detecting the color of the tree when approaching), or downward facing (detecting the color of the field on the mat).
- An **attached arm** or gripper designed and built with the medium motor. This arm/gripper will need to be able to pick up and carry a tree.
- **Trees.** We once made trees out of Lego – but they needed to be glued. Our new favorite is the hexacubes that can be shaped to have a hole in the center that makes pick up easier.
- **Scoring Sheet.** Please find our scoring sheet below, or [HERE for download](#).

Design Notes

The [color sensor](#) has a limited range. On our first attempt at this challenge, the robot needed to detect the color of the tree. This proved challenging because the robot had to get close enough, but not too close. We revised this challenge, so the robot can detect the color of the tree on the mat.

Please see a couple of Grade 5 students' robots completing the first turn <https://vimeo.com/415697745> and <https://vimeo.com/415696291>

Scoring Sheet

We suggest the scoring sheet below for the student co-opetition and their presentations. [A printable version can be accessed HERE.](#)

1) Robot Tree Removal Scoring

Red Trees (Infected)		Awarded		
Each knocked over tree	30 Points			
Each tree partially in START/FINISH area	60 Points			
Each tree completely in START/FINISH area	100 Points			
Subtotal				
Green Trees (Healthy)		Awarded		
Each tree still standing	20 Points			
Subtotal				
Bonus Points		Awarded		
Drives completely across forest mostly on road	100 Points			
Returns to START position after completing the challenge	100 Points			
Subtotal				
Robot Challenge Total				

2) Presentation Scoring

Clarity (Score for each person)		Awarded		
Did each presenter talk?	5 Points			
Was each presenter loud enough and clearly to understand?	5 Points			
Subtotal				
Content		Awarded		
Did the presenters explain what they did?	5 Points			
Did the presenters explain why they did it?	5 Points			
Did the presenters explain how they completed the challenges of the task?	5 Points			
Subtotal				
Presentation Slides		Awarded		
Were there pictures that complemented what was said? Was the robot and its key design features illustrated?	5 Points			
Is the layout aesthetically pleasing? Was the text sized appropriately?	5 Points			
Did the presenters talk about what was on their slides?	5 Points			
Subtotal				
Presentation Total				
Grand Total (Robot Challenge Total + Presentation Total)				