RECNT: Red Rover - Send Your Bot Right Over!

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Introduction and Justification

"Space is for everybody. It's not just for a few people in science or math, or for a select group of astronauts. That's our new frontier out there, and it's everybody's business to know about space."
~Christa McAuliffe, Teacher and Challenger Astronaut

NASA has just celebrated the 50th anniversary of the Apollo 11 moon landing and is preparing for Artemis, the next manned mission to the moon in 2024. With the launch of the Mars 2020 rover, Automation and Cyber Security are definitely an important part of the process to land the rover safely on the Martian surface. Students today not only have the world, but the universe as their playground. Through an activity involving an oversized map of Mars, students will learn different areas of Mars as well as apply some foundational requirements for automation as defined by The International Electrotechnical Commission and The International Society of Automation. Students will investigate these three requirements:

1. Protect the device by verifying the identity of and authenticating any user requesting access – Only the students that wrote the code for their rover can begin the code.
2. Use control – Students ensure their code is saved in a location that is free from unauthorized access.
3. Restrict the data flow – Students to ensure their entire code is safe by breaking it into different parts.

Activity

Students are tasked with having their Edison rover traverse the Martian surface. Students will start at one location near the edge of the Martian surface (i.e. Utopia Basin). Students then must program the rover to two different locations (i.e. Noachis Terra then Amazonis Planitita). While formulating their code students must:

1. Identify a way for their code to be initiated only by them. The Edison robot has a variety of different features that give the students plenty of choices.
2. Ensure their code is not saved in a generic or easy to access location, like the desktop of their computer.
3. Save their code into portions. This will help the students not only accomplish their task, but prevent unwanted users to access and run their code.

After the students have formulated their code, and have successfully ran it, the students will put their cyber security skills to the test. They will have one of their peers try to:

1. Initiate the students code
2. Identify where they have saved their code
3. sort the students code into the correct order and identify which areas of Mars they have visited.

Standards

MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

CCSS.MATH.CONTENT.8G.B7. Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.

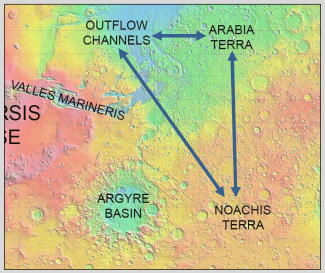
6-8.AP.A.1. Use flowcharts and/or psudeocode to address complex problems as algorithms.

6-8.CS.HS.1. Design and evaluate projects that combine hardware and software components to collect and exchange data.

Continuation

To continue the exploration of the Martian surface, students can participate in:

- Elaborate on their code
  - i.e. Flash lights at certain points
- Avoid certain areas of the Martian surface
  - Higher portions
- Reach certain areas in a given number of Martian days (Sols)
  - i.e. One second could equal one sol
  - Reach Tharsis Rise from Utopia Basin in 12 sols
- Use the Pythagorean Theorm to calculate the distance between points



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