Lesson Summary

Activity:

Students will have to conduct a series of experiments using the Arduino platform as an “unmanned mobile scientific instrument package” which will roam autonomously on the surface of Mars looking for the best location for a terrestrial space station.

If the students decide to accept this challenging mission they will have a “hands on” challenge. The challenge is to set up a series of electronic experiments as well create a software program to execute the experiments.

This “unmanned mobile scientific package” will have to perform the following functions; communicate with earth using flashing LEDs, test for the presence of water on the surface of Mars, safely and efficiently navigate the surface of Mars using two ultra-sonic sensors in conjunction with two servo motors. The two servo motors receive feedback from the ultra-sonic sensor in order to perform collision avoidance maneuver.

The students will have to use the engineering design process and evaluate their Mars explorer. The mission evaluation will be in the form of an engineering report and presentation.

Objectives:

Within this lesson students will learn to program the Arduino Uno. A large advantage to an Arduino Uno is the open sourced prototyping platform which is based upon easy to use hardware and software. The Arduino hardware is microprocessor which is attached to a three wheeled vehicle. This “robot “with the microprocessor is used in conjunction with the open sourced Arduino software in order to perform various tasks. The tasks are controlling digital / analog circuits, creating motion with servos, along with using infrared red and ultrasonic sensors.

The Arduino software is based upon a commercial utilized; software “C++”. The free Arduino software is contained with an IDE (interactive development environment) in which there are many online resources.
Mission Directives:
The Mars robot has successfully landed and the mission control requires an acknowledgment from the robot that it is functioning. The President of the United States on a conference call with the director of NASA is anxiously waiting for confirmation that the expensive robot is okay.

Your engineering team is setting up the communication link with the mission control on Earth. Your team has to use Morse code to make the LED flash the word “OKAY” three times.

Step 1: Read the color band on a resistor verify is a 220 ohm resistor.

Step 2. Connect one end of the black jump wire to ground on the GND pin on the Arduino board

Step 3. Connect the other end of the black jump wire to the negative row on the bread board

Step 4. Connect one 220 ohm resistor to positive lead on LED and use separate jump wire to connect to pin # 7 on the digital pin

Step 5. Create a new file and open Arduino IDE (interactive development environment)

Step 6: In the program go to void loop() Use pinMode() command to set pin # 7 to be an output and set to High (on)

Step 7: Use delay() command to set the length of the time in (microseconds) to turn on the LED

Step 8: In the program go to void loop() Use pinMode() command to set pin # 7 to be an output and Low (off)

Step 9: Use delay() command to set the length of the time the LED is off

Step 10: Verify and upload sketch (program to the Arduino) examine LED to see if it works.

Additional unit plan information is available at http://bit.ly/2a4TeCF

Lesson One: Flashing LED Circuit & Code